

EEVC-2014

European Electric Vehicle Congress
Brussels, 2nd - 5th December 2014

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Can electric bikes get more people in the United States to cycle?



Presentation Outline

- Why do e-bikes matter in the US?
- What is an e-bike?
- North American e-bike user survey
- Demonstration project
- US regulations & policy
- Conclusions

WHY DO E-BIKES MATTER IN THE US?

US Transport Sector Impacts



Safety

- 32,788 fatalities in 2010 (-3% from 2009)
- 1.09 fatalities per 100 MVMT (VMT +0.7% in 2010)
- 2.2 M injuries in 2009
- 5.3 M crashes in 2011
- \$230 B total cost (including medical)
- Leading cause of death for ages 4 to 34

Accessibility, Reliability and Mobility

- 4.8B hours travel delay (34 hours/auto commuter)
- \$121 billion cost of urban congestion

Household Expenses

- Second biggest monthly expense, after housing

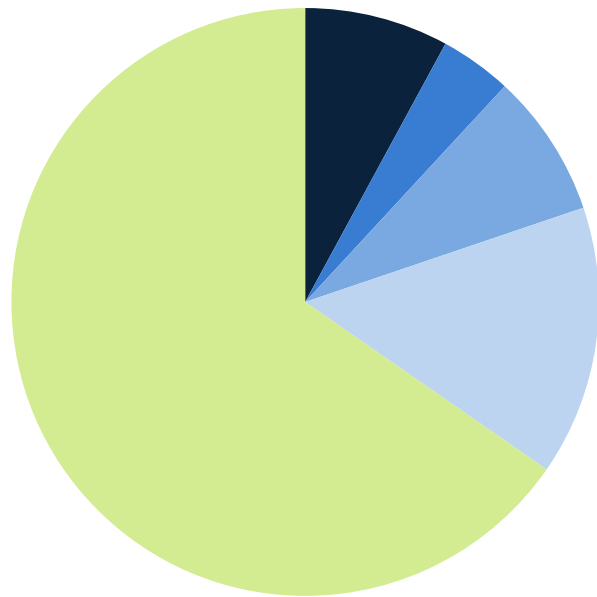
Environmental

- 28% of GHG emissions (78% CO₂, 58% NO_x, 36% VOCs)
- 29% of energy consumed (mostly petroleum)
- 70% of petroleum consumption (60% imported)
- 3.9 billion gallons of wasted fuel

Commute Mode Share for Portland

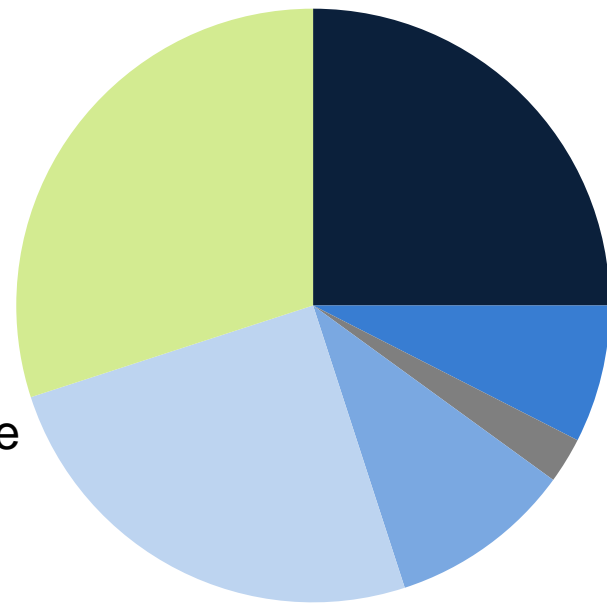
Reduce per capita daily vehicle-miles traveled (VMT) by 30 % from 2008 levels.

2009



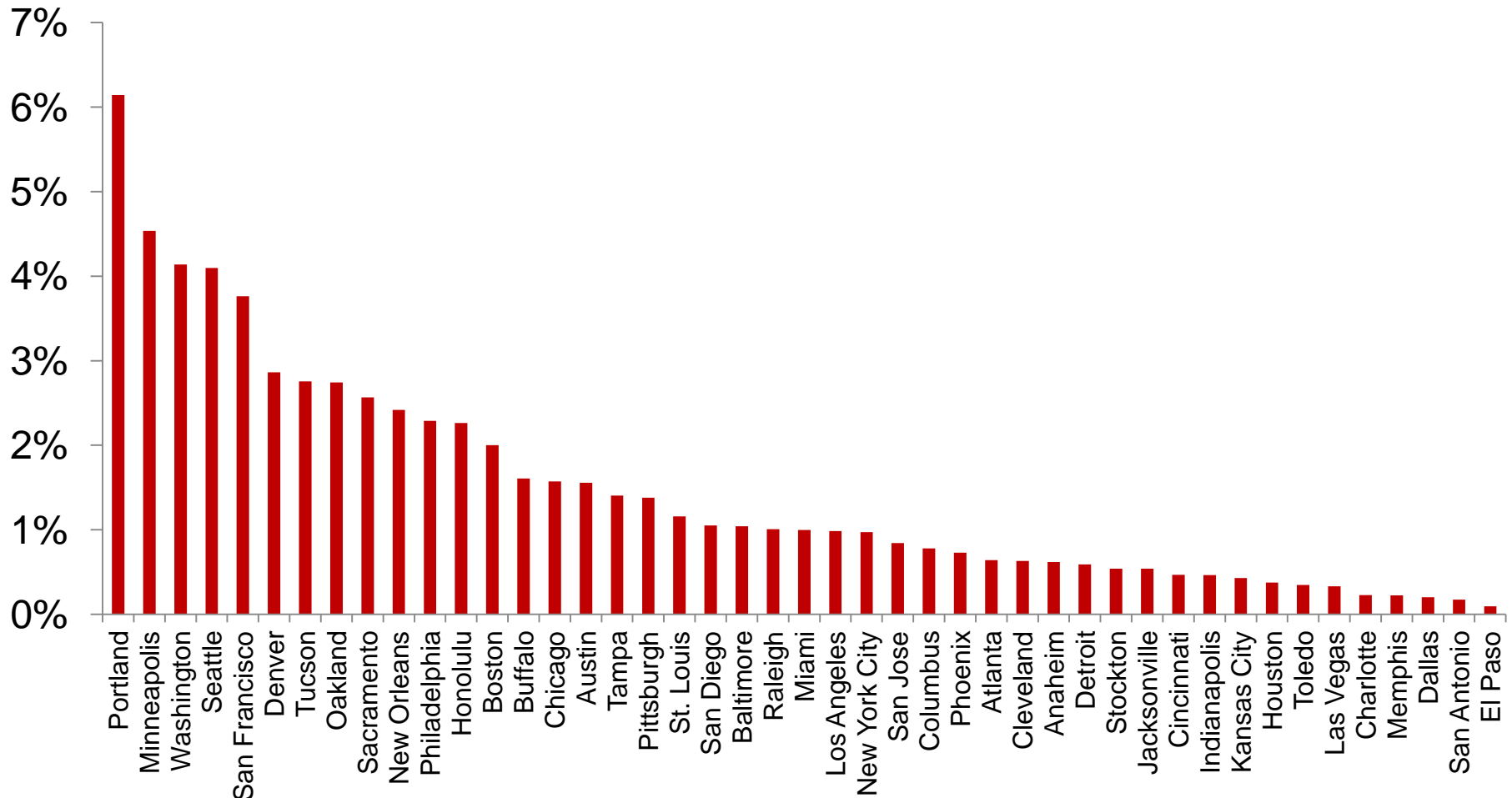
- Bike
- Walk
- Carpool
- Transit
- Drive Alone

2030



- Bike
- Walk
- Telecommute
- Carpool
- Transit
- Drive Alone

Large US Cities Ranked by % Bicycle Commuting



Source: US Census Bureau, 2012 American Community Survey

Shifting the four types of cyclists



4% Strong & Fearless



9% Enthused &
Confident



56% Interested
but Concerned



31% No Way,
No How

Why don't people bike more in the US?

- Safety
- Lack of infrastructure
- Weather
- Inconvenience
- Logistic issues
- Lack of fitness or physical limitations
- Lack of time
- Too much effort
- Can't carry what you need
- Lack of confidence

WHAT IS AN E-BIKE?

What is an electric bike?



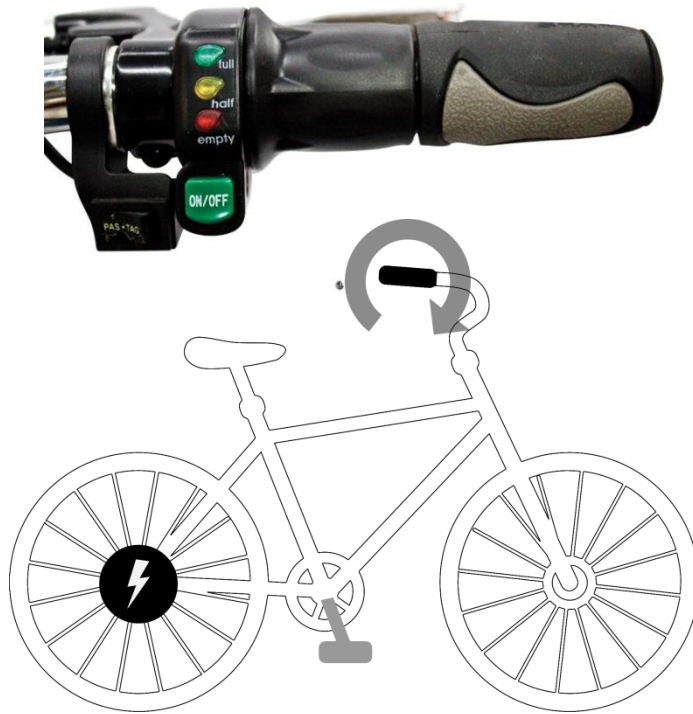
Battery

Power controls
&
Gear shifts

Motor (Hub or Chain drive)

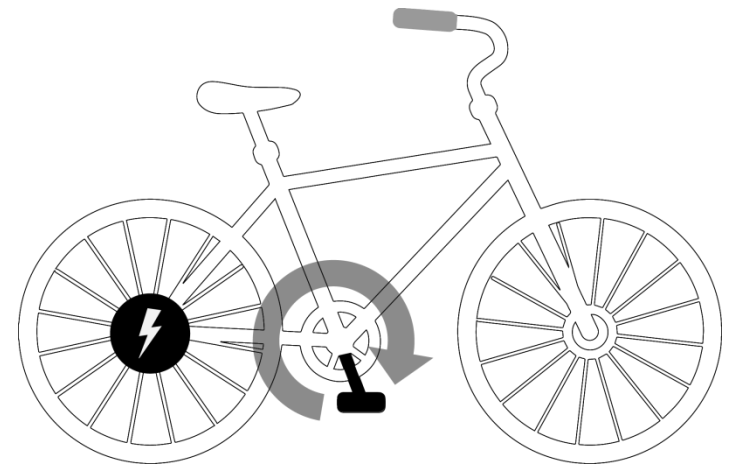
Different types of the e-bikes

Throttle



Powered bicycle (PB)

Pedelec



Powered-assisted bicycle (PAB)

Not considered “e-bikes”

Moped

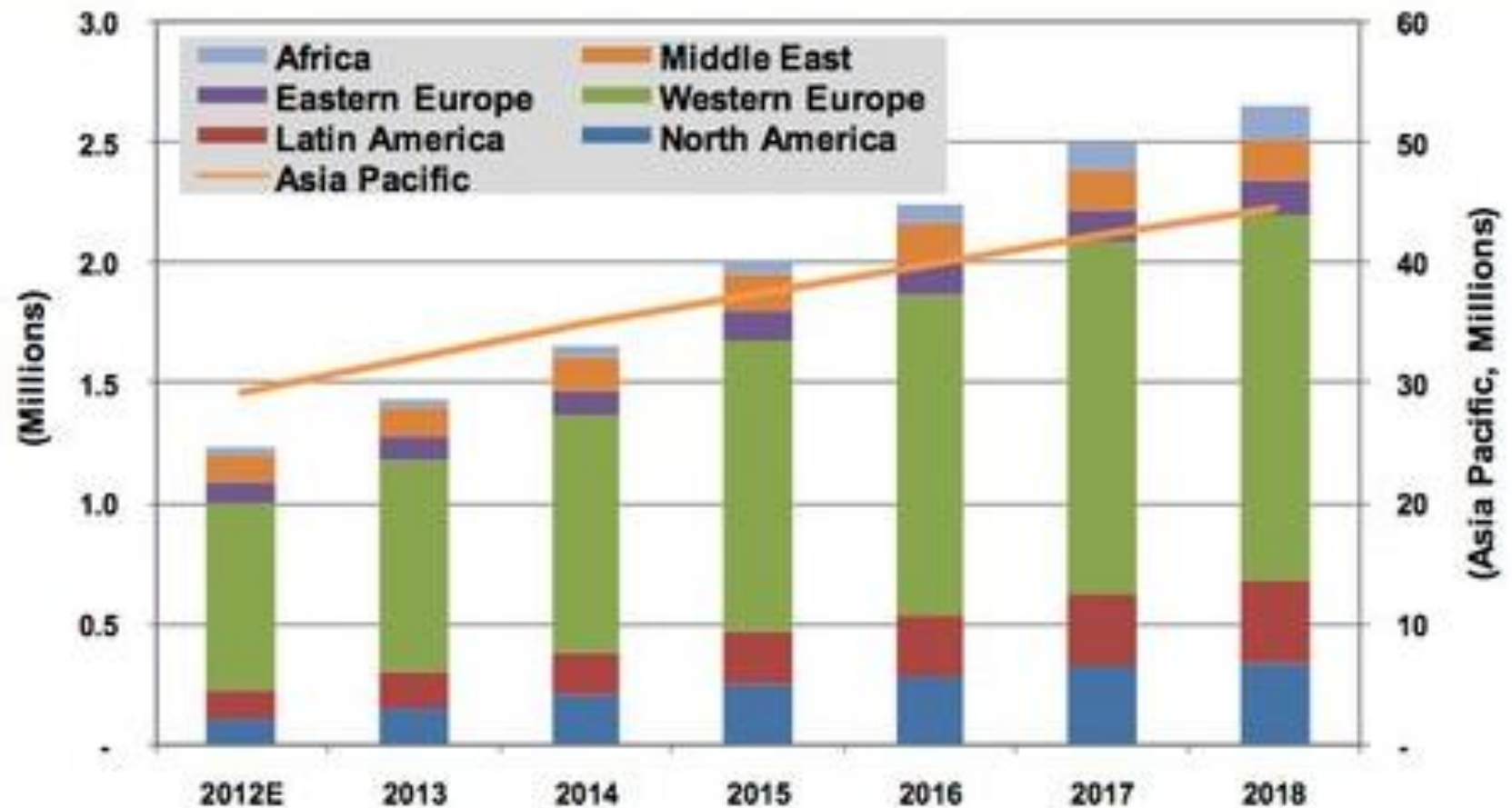


Scooter



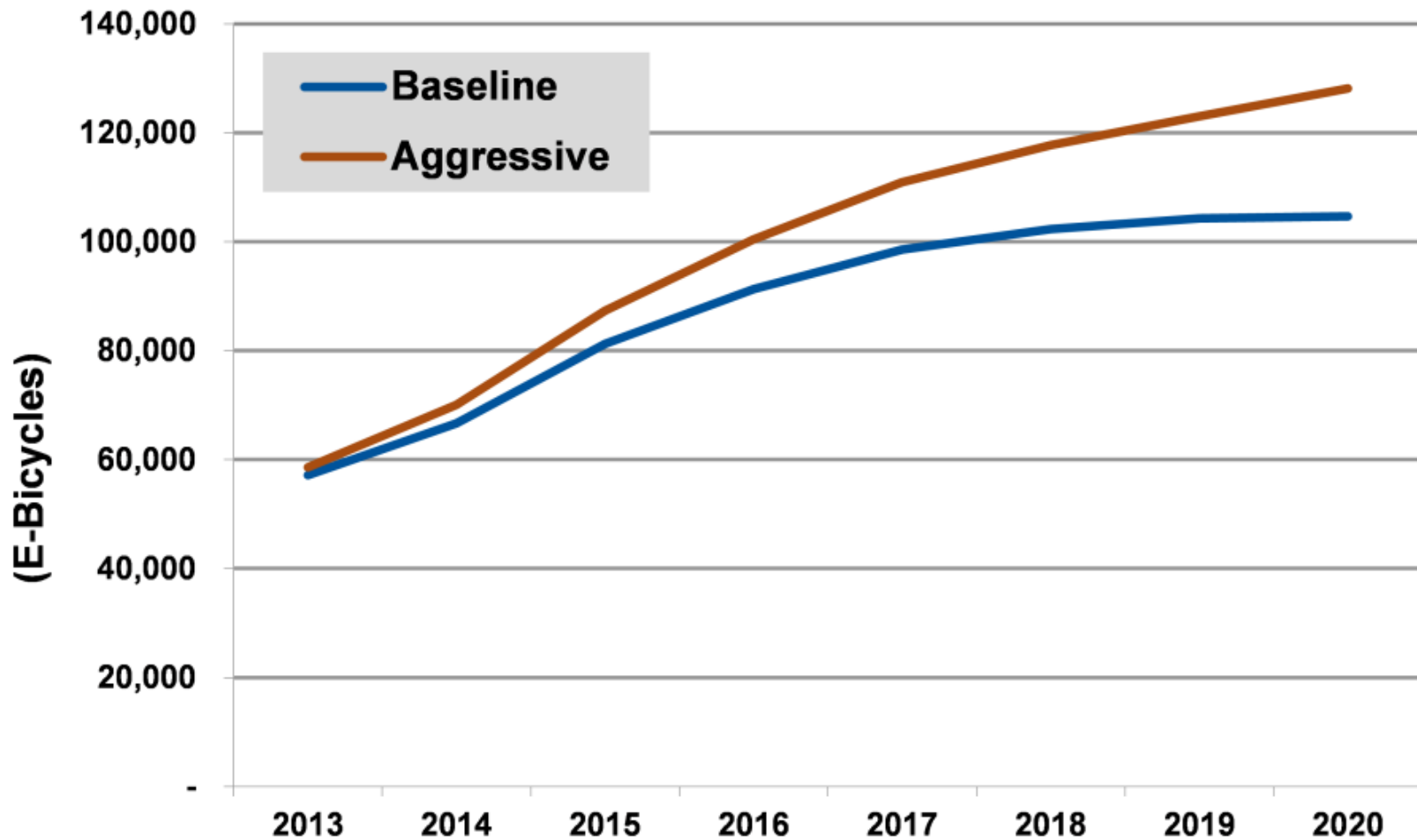
Market for E-bikes

Electric Bicycle Sales by Region, World Markets: 2012-2018



Source: Navigant/Pike Research

Projected US Growth



Source: Navigant/Pike Research

NORTH AMERICAN E-BIKE USER SURVEY

What Is Our Research Question?

Will e-bikes...

- Get more people to bike, and
- Get people to bike more often.

Survey Methodology

- Adapted a survey instrument from the Institute of Transport Studies at Monash University
- The survey was distributed through e-bike blogs & forums, Facebook pages, Twitter accounts, e-mails to manufacturers and retailers, and via postcards to retailers in the Portland region.
- March 7 – July 1, 2013
- 553 e-bike owners responded to the survey

Electric bike survey

Do you have an electric bike?



We want to hear from you about your e-bike experiences.

Please use the link to our online survey:

<http://tinyurl.com/e-bike-survey>

 **OTREC**
OREGON TRANSPORTATION RESEARCH
AND EDUCATION CONSORTIUM

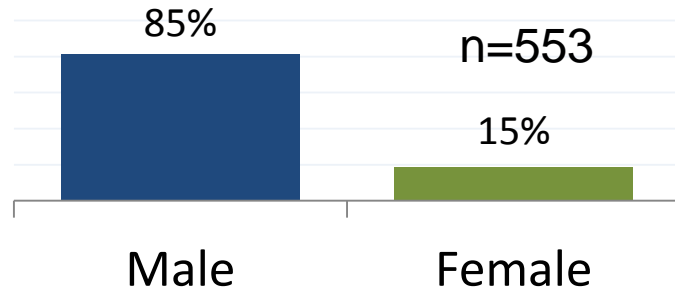
 Portland State
UNIVERSITY

Geography of survey respondents

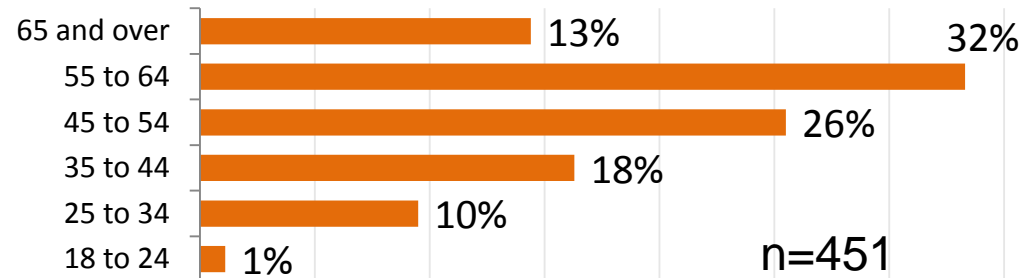


Demographics

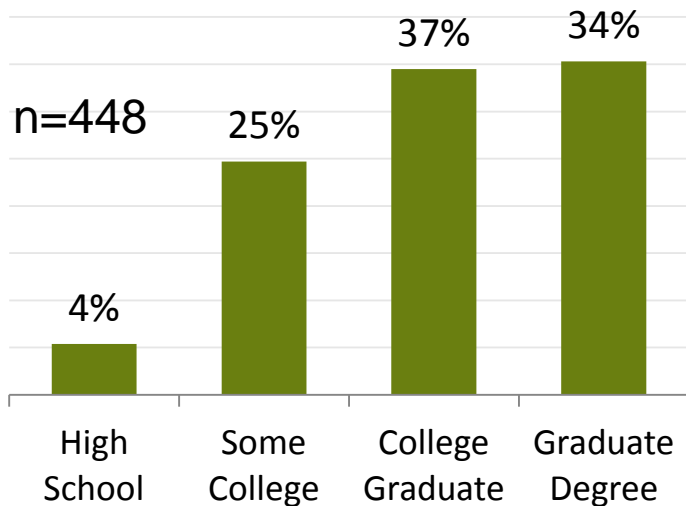
Gender



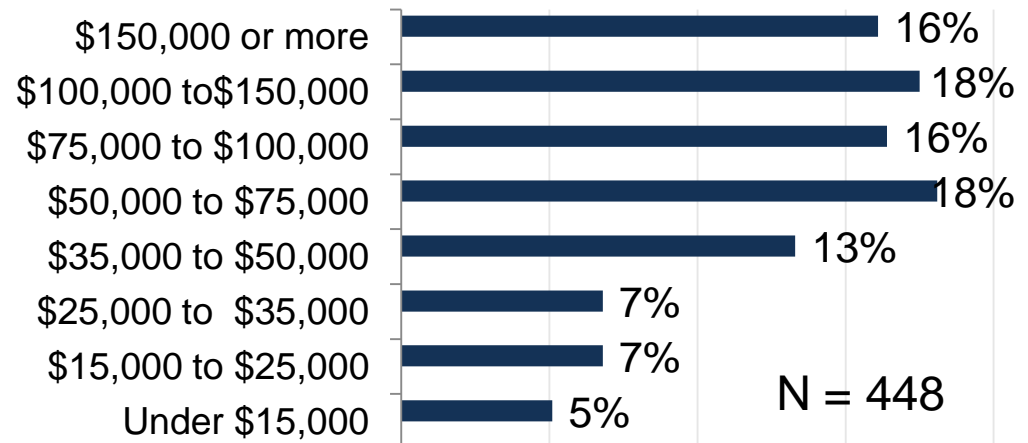
Age



Education



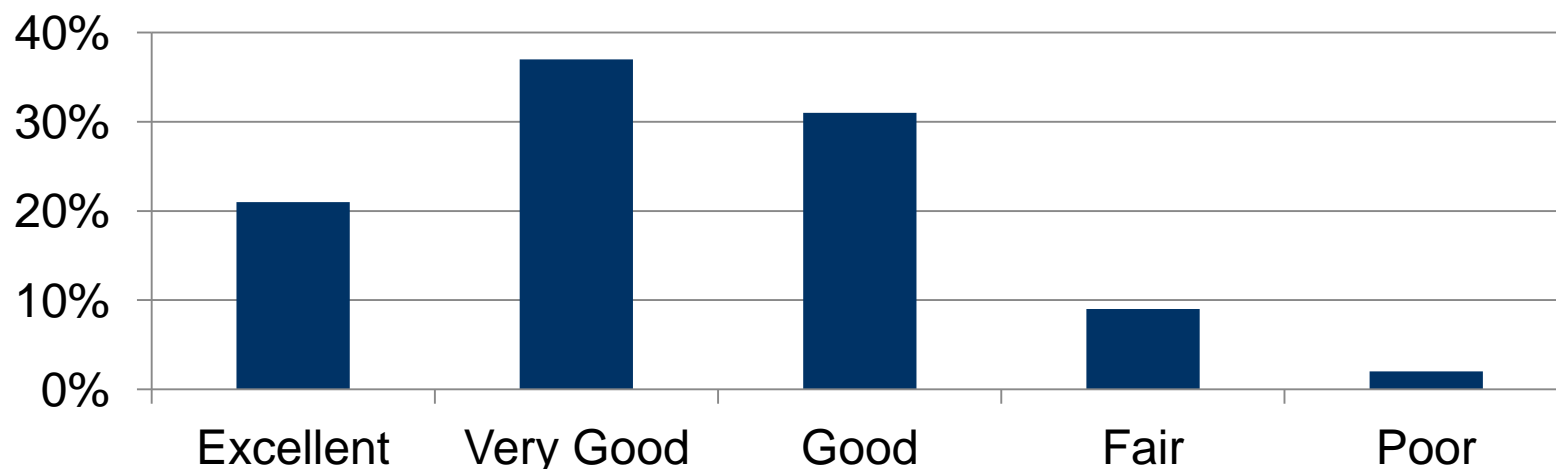
Income



Demographic summary

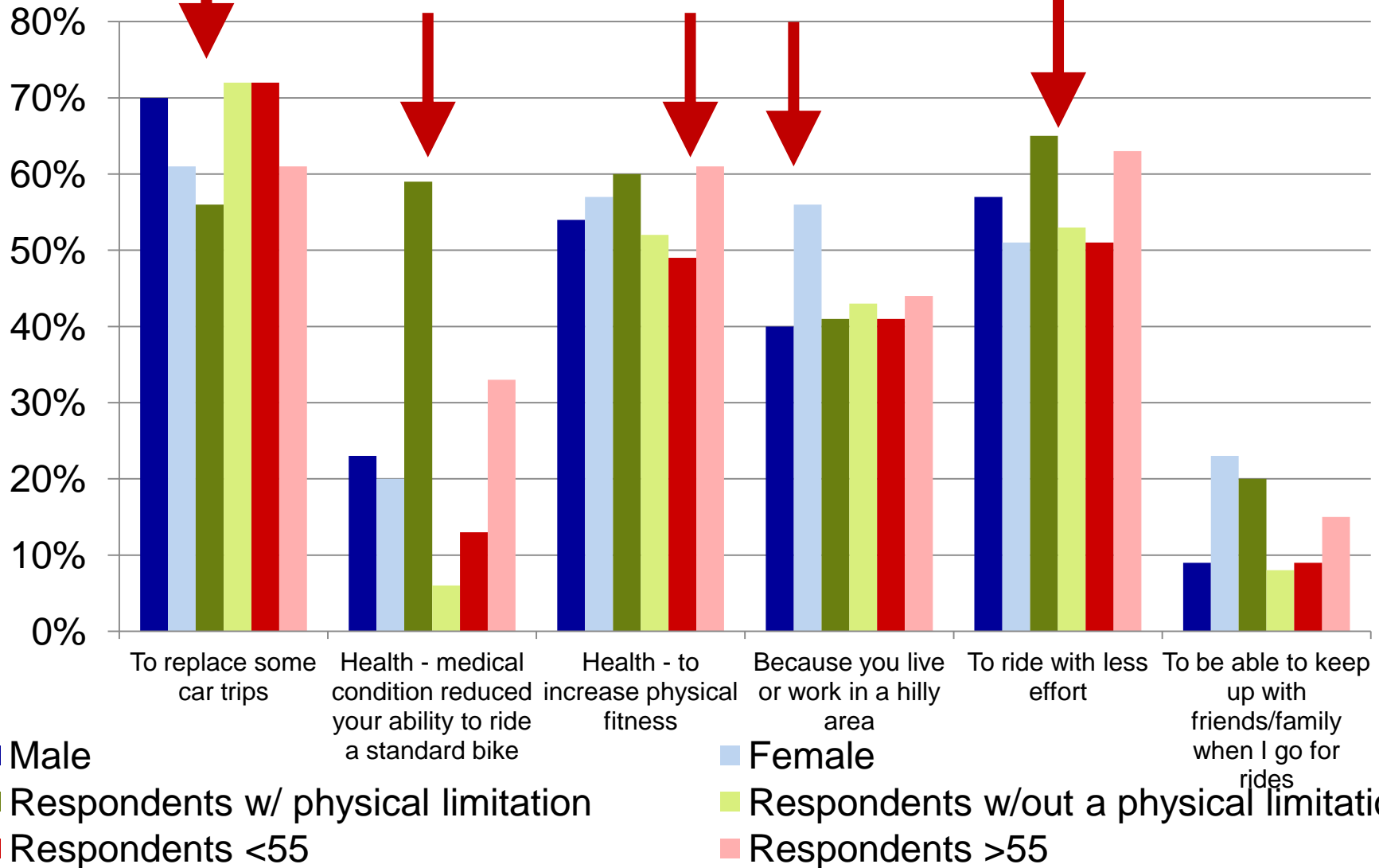
- 90% White, 5% Asian, 5% other (n=428)
- 90% have access to a motor vehicle, 7% no vehicle
- 30% indicated that they have a physical condition that makes riding a standard bike difficult (n=450)

How would you rate your general health?

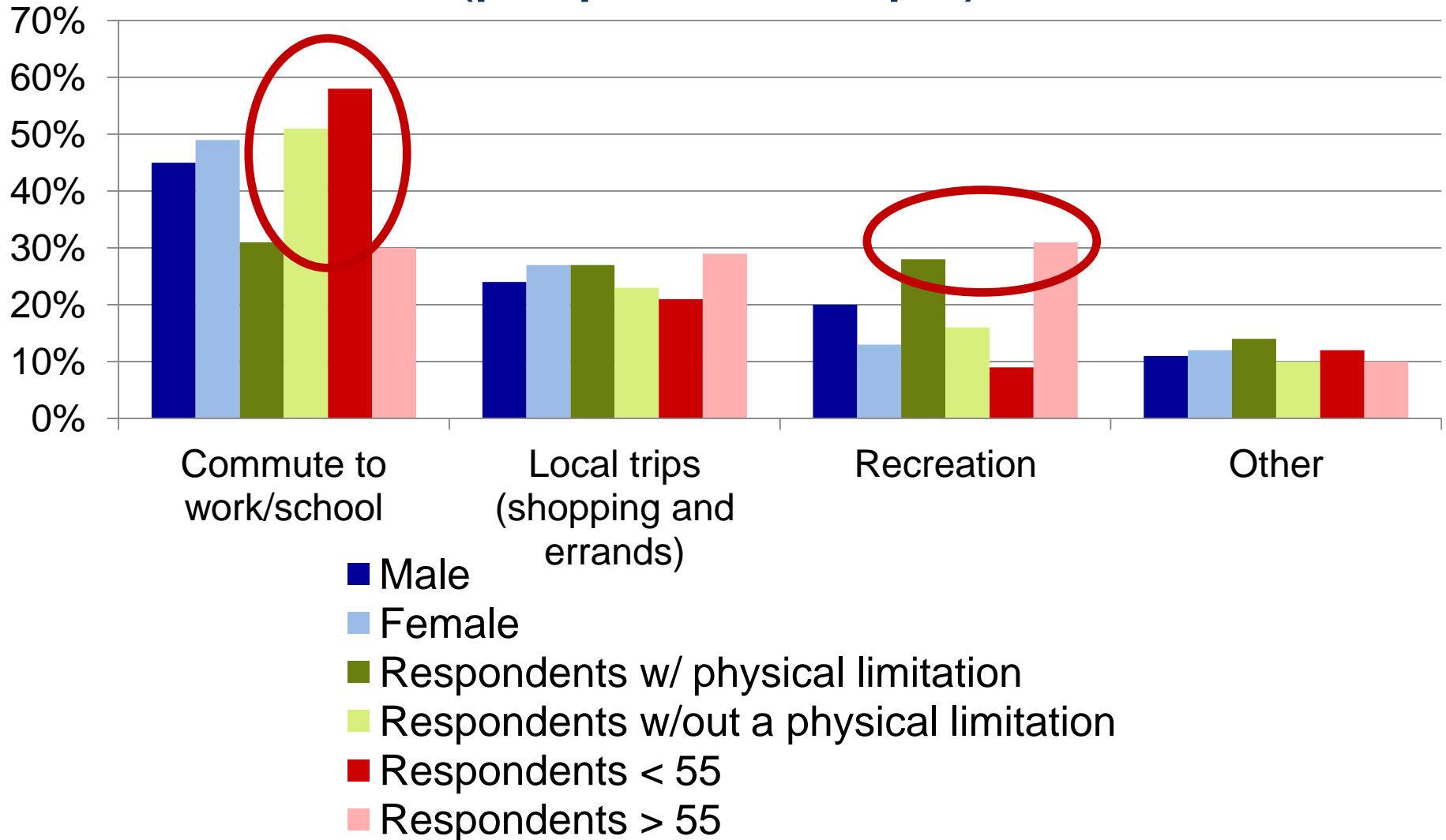


n=449

What were the *main* reasons you bought an electric bike, or converted a standard bicycle?



What is the *main* reason that you use your electric bike (purpose of trips)?



Bike Use

- 94% indicated they had rode a standard bike as an adult
- **55%** rode their standard bike weekly or daily prior to e-bike purchase --this went up to **93%** after purchase
- Of the **6%** that hadn't rode a bike as an adult, of those **89%** ride their e-bike daily or weekly
- Over 90% use their e-bikes weekly or daily



*“To replace 95% of car trips and make commuting fun” –
Survey Respondent*

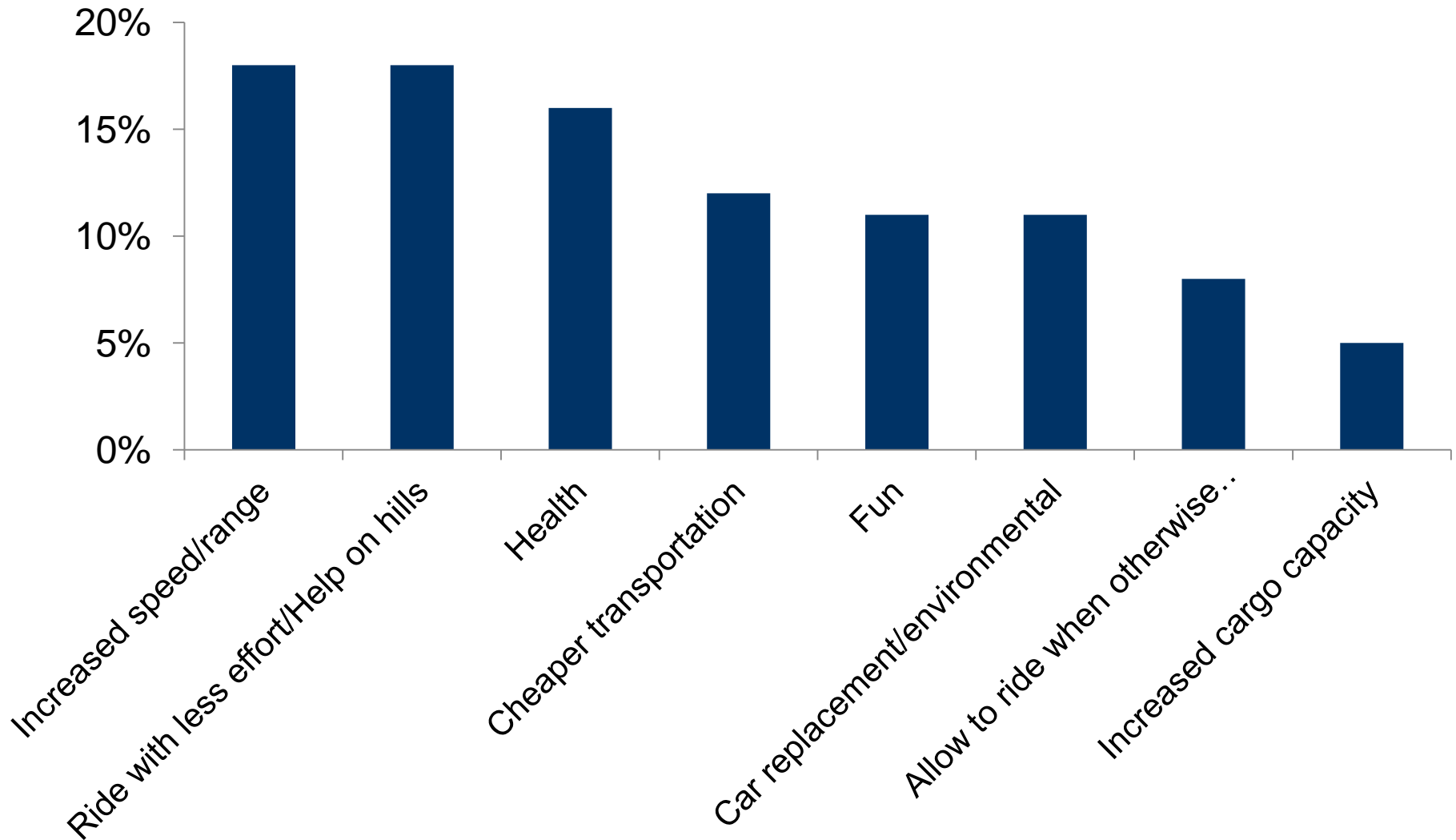
Getting around

- 45% indicated that they take a different route on their e-bike than a standard bike
- 35% don't avoid hills on e-bike and 31% will take more direct or higher traffic route on e-bike but 30% say they take lower traffic or less direct route
- Three quarters (73%) ride to different destinations on their e-bikes than they did on a standard bike

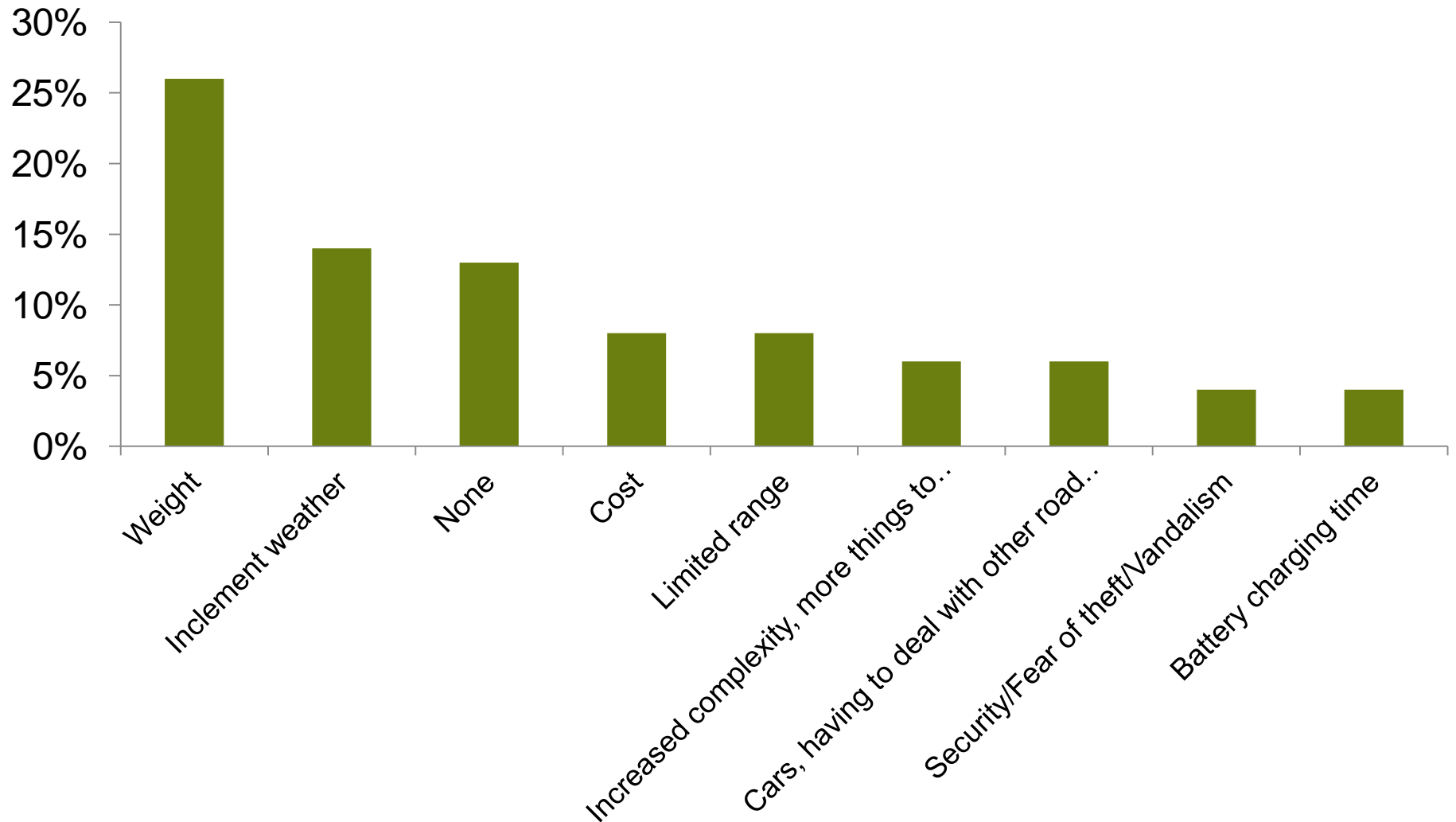


"I have bad knees(I'm retired, 68 years old). If I pedal a bike my range is limited by pain to about 5 to 6 miles. The e-bikes has a range per charge of 30 to 35 miles." – Survey Respondent

What are the main advantages to riding an e-bike?



What are the main disadvantage to riding an e-bike?



Limitations of survey

- No response rate
- Method of delivery
- Online survey and self reporting use
- Not random and potential bias

Survey conclusions

- Have a potential to get more people on bikes
 - Older adults
 - People with physical limitations
 - Women (?)

I live in a hilly town and would never commute to work on a standard bike -- I wouldn't be able to make it up the hills. My electric assist bike makes commuting by bike possible.

I am age 78, legally blind, live alone in a semi-rural area. 4 miles to the nearest scheduled bus route and town, 7 miles to my favorite shopping area, 12 miles to my church.

Survey conclusions

- Encourages more people to bike more often & to more distant locations
 - Commuters
 - Less sweaty, not strenuous
 - Not avoiding trips or locations
 - Enjoy biking!
 - Reported increase in bike usage

I use the e-bike primarily as a substitute for the car where I would have otherwise would have driven a car.

I can carry my son and a week's worth of groceries.

DEMONSTRATION PROJECT

Kaiser Permanente E-bike Project

- Currie iZip E3 Compact
 - Top Speed: 18 mph (29 kph)
 - Range: 15-22 miles (24-35 kph)
 - Weight: 42 lbs
 - Folding
- Kaiser Employees at 3 campuses (1st/last mile commuting)
- 18 month trail & 180 people



Top motivations for participating in project

| Top reasons cited | # | % |
|--|----|----|
| I'm curious how an e-bike would fit into my commute. | 20 | 26 |
| E-bikes may be good alternative transportation | 17 | 22 |
| It may help me get more exercise or increase my activity level | 16 | 21 |
| I'm curious about features and performance of e-bikes | 14 | 18 |
| It might be a good way to cut commuting costs (gas, time, parking) | 13 | 17 |
| It may help me climb hills easier | 12 | 16 |
| Number of respondents (n) | 77 | |

Biking habits of participants who ride a bike regularly or frequently

| | Commute to work or school | | Personal errands | | Visit family or friends | | Entertainment or socializing | | Exercise or recreation | |
|-----------------------|---------------------------|-----|------------------|-----|-------------------------|-----|------------------------------|-----|------------------------|-----|
| | # | % | # | % | # | % | # | % | # | % |
| 4-7 days/week | 10 | 14% | 3 | 4% | 2 | 3% | 2 | 3% | 8 | 11% |
| 1-3 days/week | 10 | 14% | 16 | 23% | 5 | 7% | 6 | 8% | 19 | 27% |
| 1-4 days/month | 11 | 15% | 16 | 23% | 14 | 20% | 9 | 13% | 10 | 14% |
| 7+ times/year | 5 | 7% | 4 | 6% | 5 | 7% | 6 | 8% | 15 | 21% |
| 1-6 times/year | 3 | 4% | 6 | 8% | 5 | 7% | 10 | 14% | 13 | 18% |
| Rarely/never | 32 | 45% | 26 | 37% | 40 | 56% | 38 | 54% | 6 | 8% |

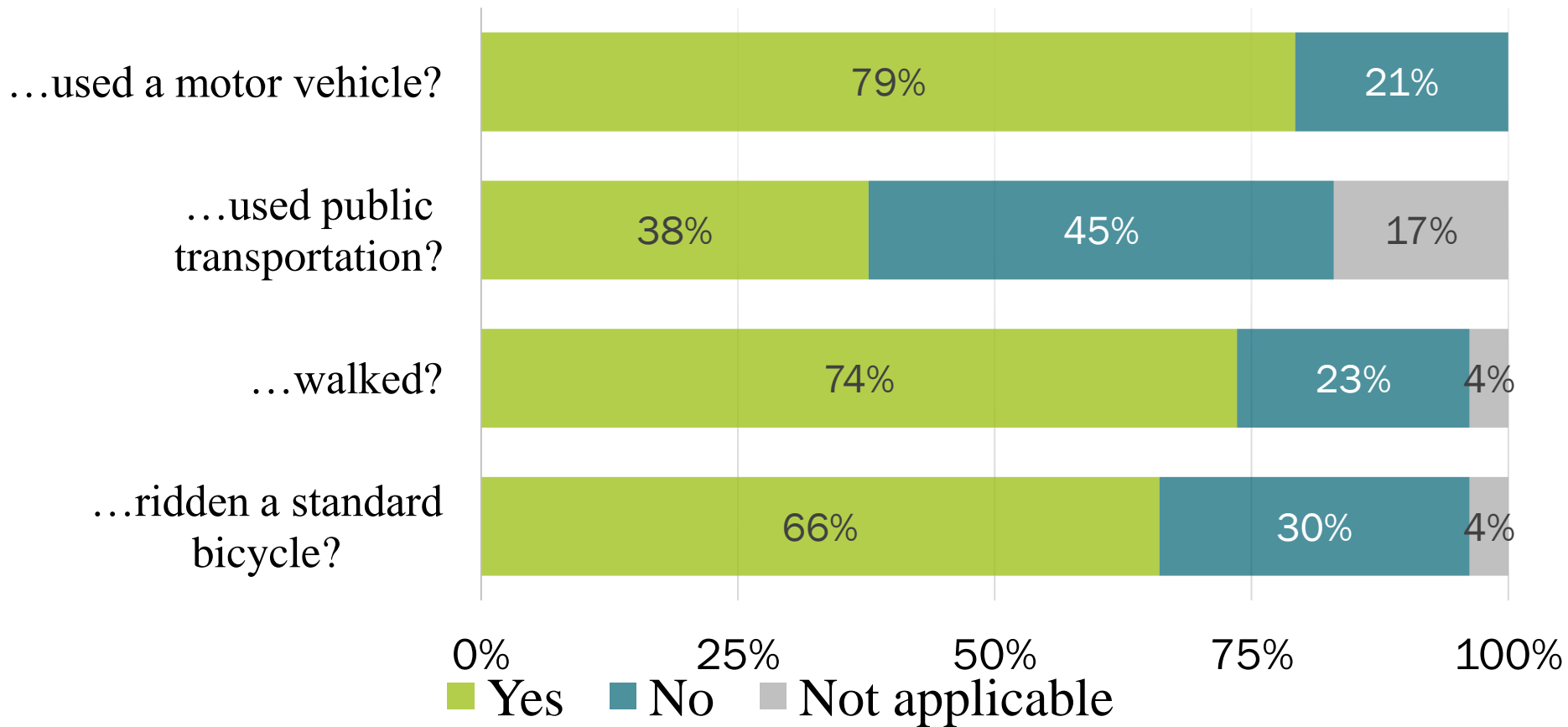
n = 71

How often participants e-bike commuted to work, disaggregated by employment campus

| | Central | | Westside | | Eastside | | Total | |
|---------------------------------|---------|-----|----------|-----|----------|-----|-------|-----|
| | # | % | # | % | # | % | # | % |
| Less than once per week | 5 | 29% | 4 | 27% | 8 | 40% | 18 | 34% |
| 1 - 2 times per week | 8 | 47% | 7 | 47% | 7 | 35% | 22 | 42% |
| 3 - 4 times per week | 4 | 24% | 4 | 27% | 3 | 15% | 11 | 21% |
| 5 or more times per week | 0 | 0% | 0 | 0% | 2 | 10% | 2 | 4% |

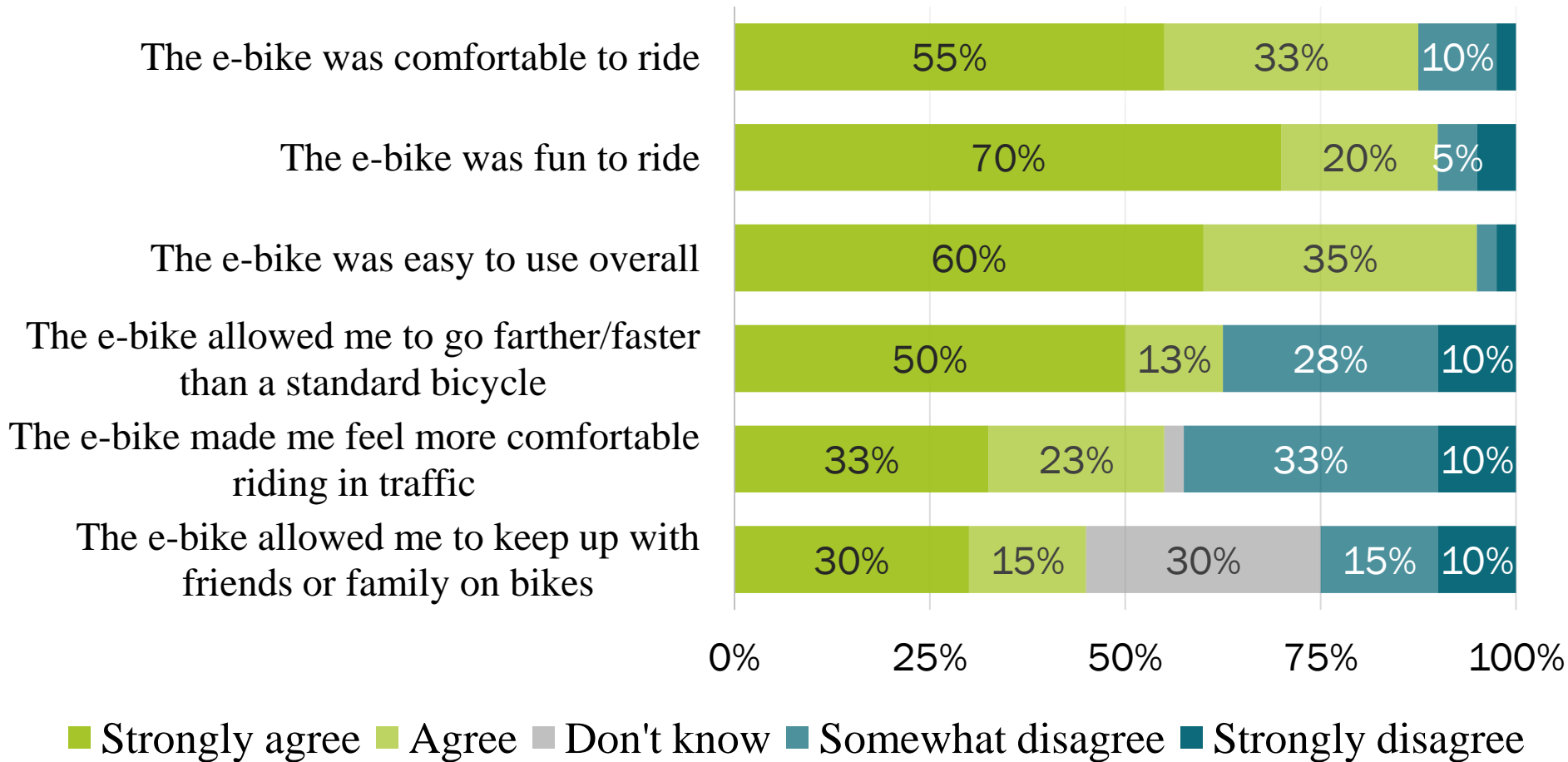
n = 53

Have you used an e-bike for travel where you had previously...



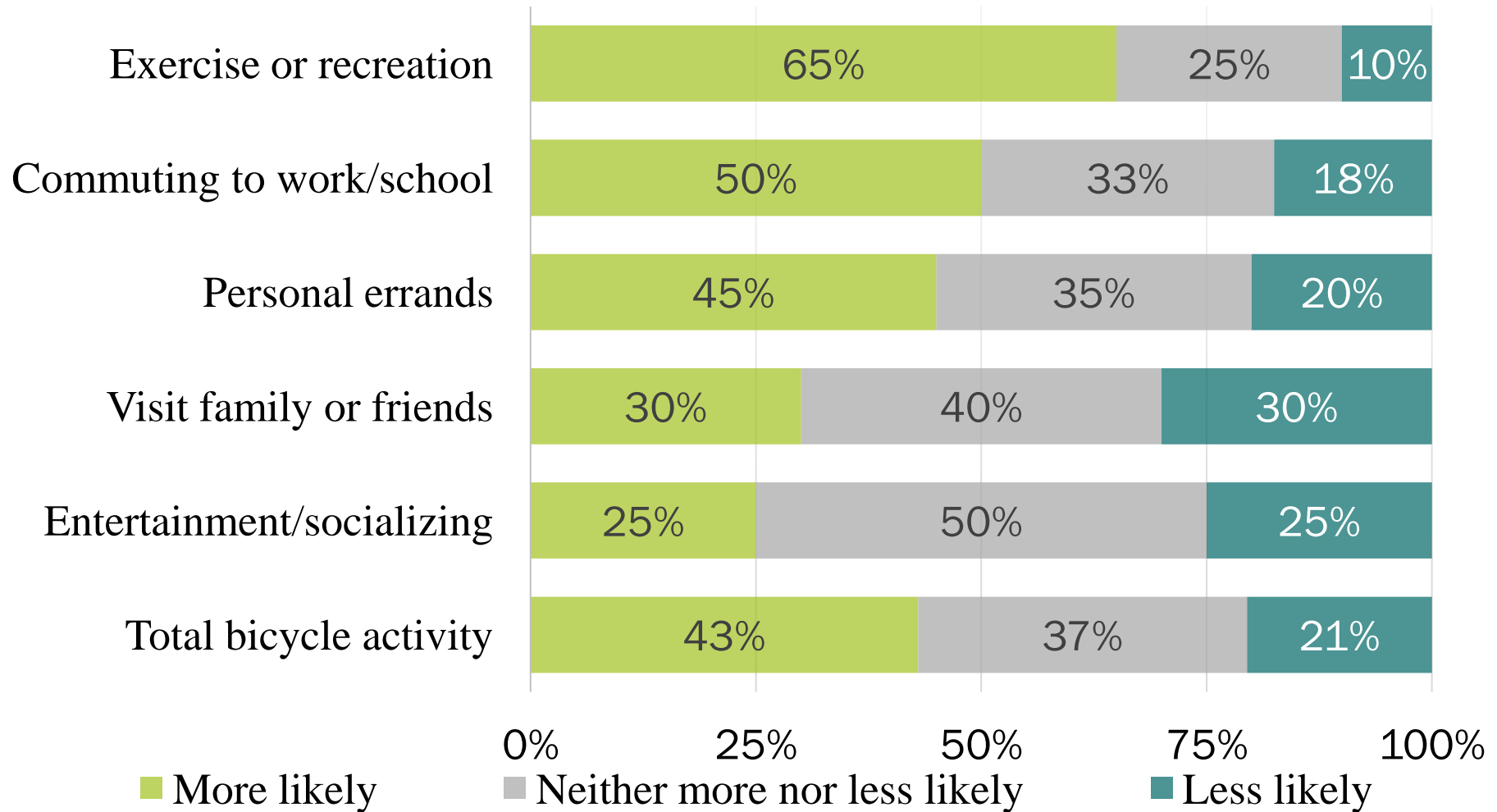
n = 53

Participants' overall experience with the e-bike



n = 40

How likely are you to ride a standard bicycle now



n = 40

U.S. REGULATIONS REVIEW

International Definitions Compared

| Region | Power Limit | Top Speed | PB allowed | PAB allowed | Other |
|--------------|---------------|---------------|------------|-------------|-------------------------------------|
| US | 750W | 20 mph | Yes | Yes | Has operating pedals |
| Canada | 500W | 20 mph | Yes | Yes | Has operating pedals, <265 lbs. |
| EU | 250W | 15.5 mph | No | Yes | Motor operates during pedaling only |
| China | No limit | 12.4 mph | Yes | Yes | Has operating pedals, < 88 lbs. |
| Rest of Asia | 250W | 15 mph | No | Yes | Has operating pedals |
| Australia | 200W/ 250W | Not specified | Yes | Yes | Has operating pedals |

State & local regulations

- States define the device & determine where it can be used
- Many states use regulations in place governing "moped", "motorcycle", "motorized bicycle", "motorscooter", "scooter", and/or "motor-driven cycle."
- Oregon - ORS 801.258 "Has a power output of not more than **1,000 watts**" but ORS 807.020(15) "A person may operate an electric assisted bicycle without a driver license or driver permit if the person is **16 years** of age or older."
- Many cities defer to the state regulation and classification
- Some cities are addressing e-bikes: Boulder, Eugene, Bloomfield (CO), Toronto, Chicago, Tucson, New York City

E-bike-specific definition



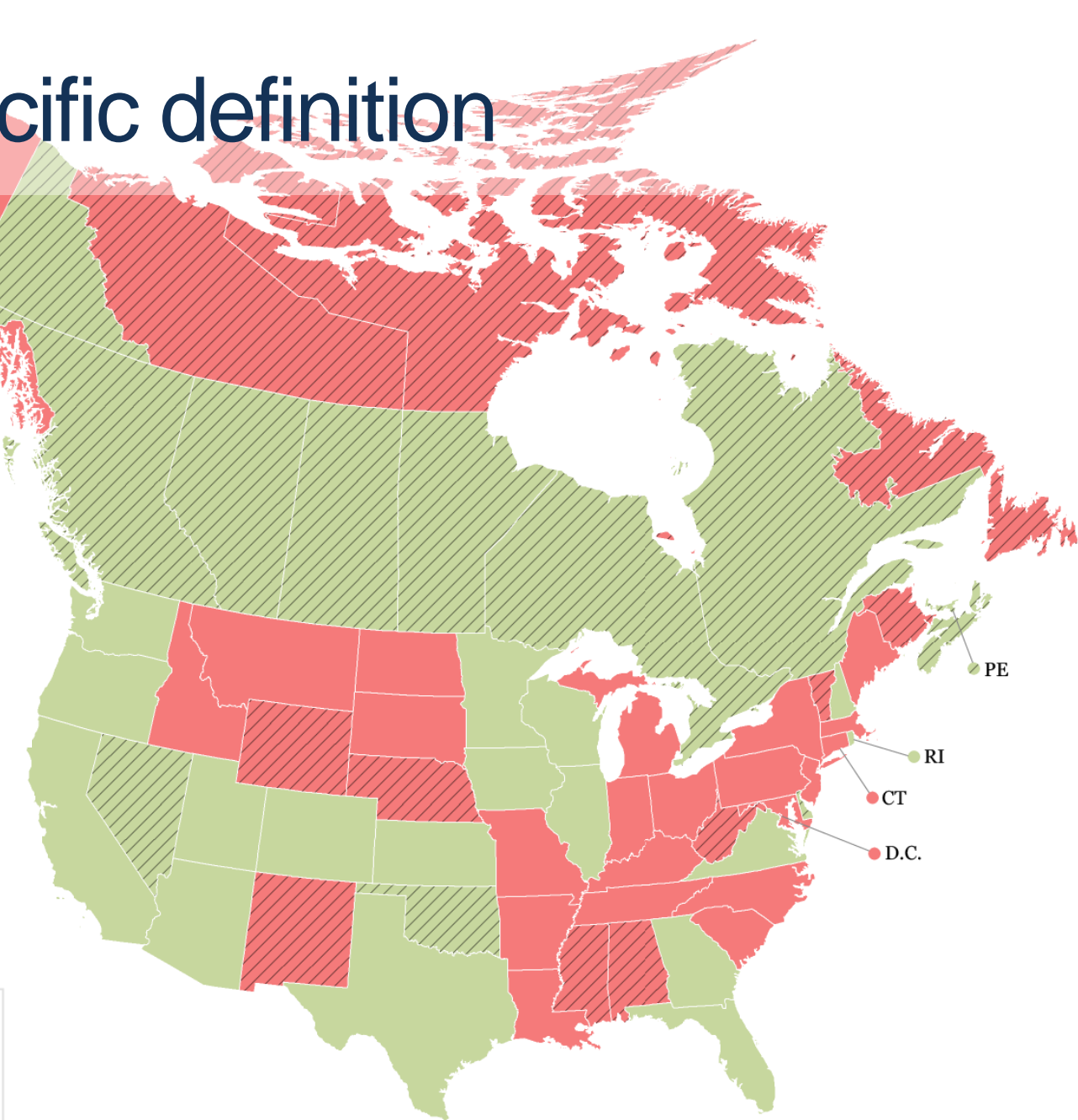
No



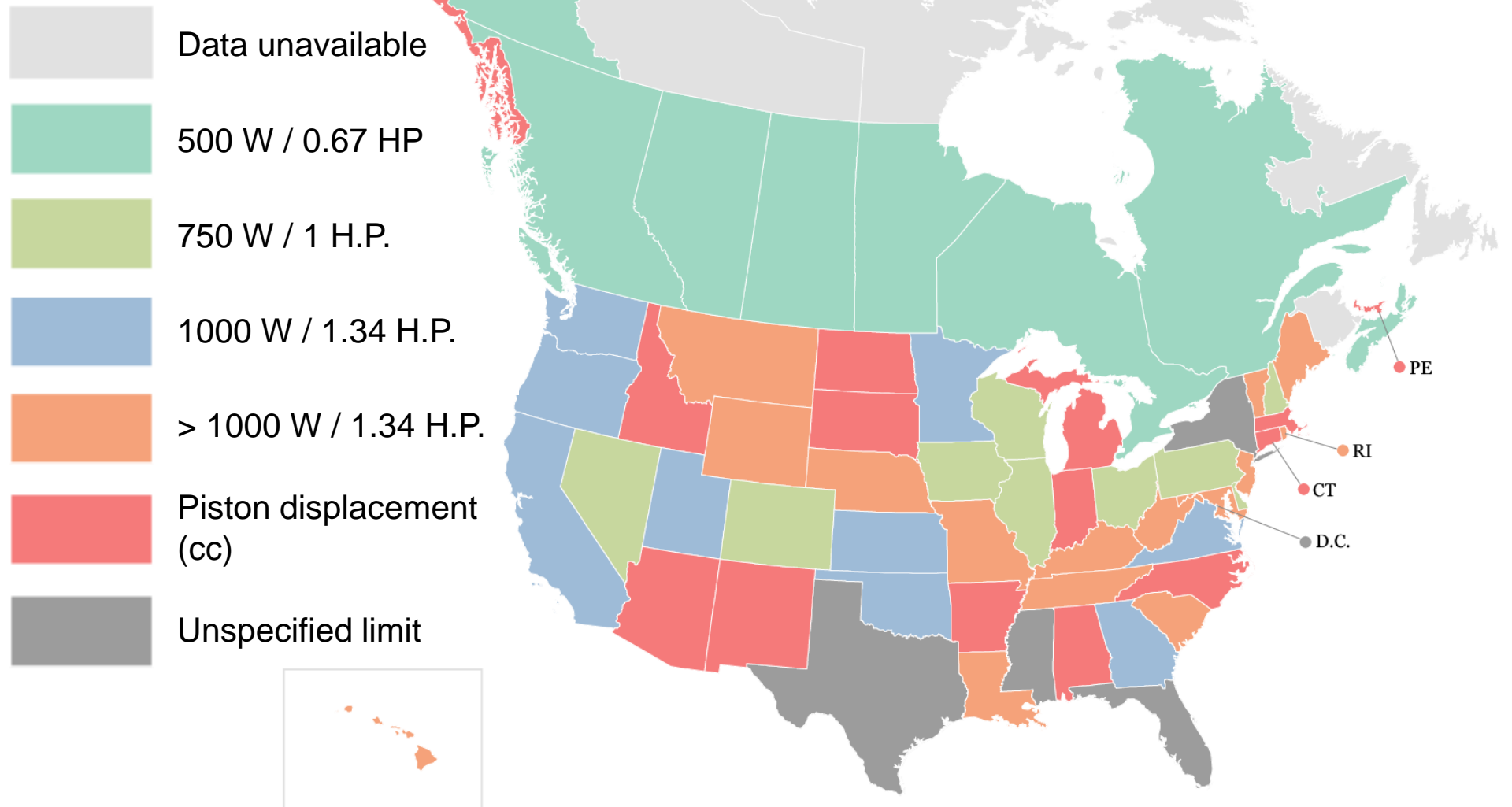
Yes



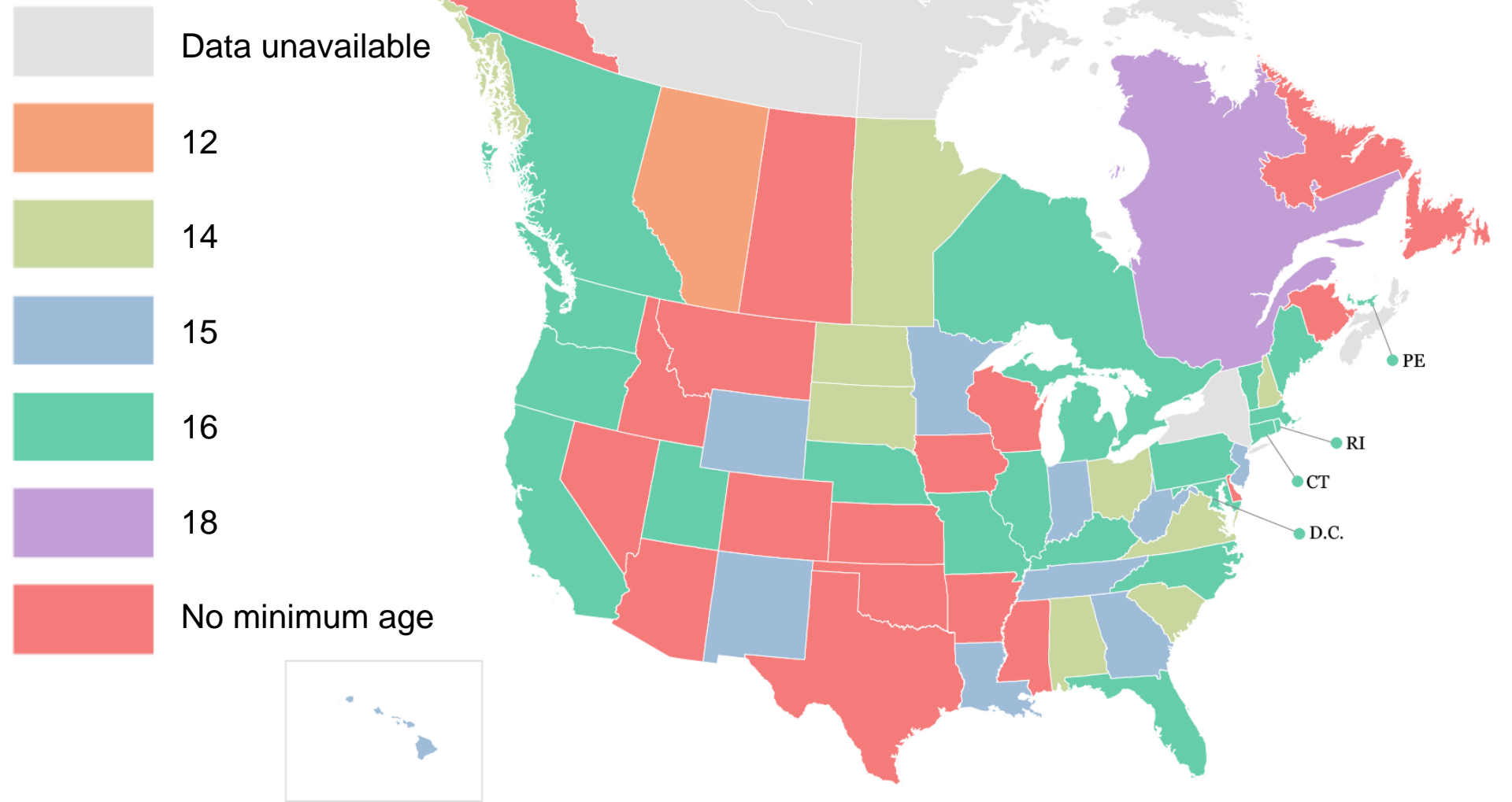
No "home rule"



Maximum power output specified



Minimum age



Policy Questions & Implications

- Technology

- Motor size; Speed; Weight; Dimensions; Pedals (Functional?)

- Rider/Passenger

- Age; Helmet; License; Registration

- Use

- Separated/protected bike path; Bike lane; Shared use path; Sidewalk & Trails

CONCLUSIONS

Conclusions

- Evidence suggests that e-bikes are becoming more prevalent in North America.
- E-bikes can help get more people biking and biking more often.
- The federal & state regulatory landscape needs to be standardized to decrease confusion and help the market grow.
- Transportation agencies need to be aware of emerging technologies and their implications for how the transportation system should be designed, regulated and operated.
- More research on the safety implications of these new emerging technologies is needed.

Contact Information

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For more information and reports: ebike.research.pdx.edu

For US E-bike Regulatory Review:
<http://nitc.us/research/project/564/>

Special thanks to Geoffrey Rose & Marilyn Johnson, Institute of Transport Studies at Monash University for the use of the survey instrument and Chris Cherry, University of Tennessee, for his assistance.

Questions

