

# EV Charging and the Vehicle Purchase Process: Lessons Learned from Rebated Consumers

22nd Annual Energy, Utility & Environment Conference

27 February 2019, San Diego CA

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*With thanks to:*

Brett Williams, John Anderson, Jamie Orose, and others at CSE



# Outline

## 1. Introduction & Context

- About the Clean Vehicle Rebate Program (CVRP)
- About the Data

## 2. EV & Charging Data

- EVs Purchased: BEVs, PHEVs, FCEVs
- Solar Power
- Charging at Home
- Charging at Work
- How Important is Charging?
- Is Charging a Concern at the Point of Purchase?
- Charging vs Other Factors that Enable EV Sales

## 3. Conclusion

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- Charging vs Other Factors that Enable EV Sales

## 3. Conclusion

A close-up photograph of a person's hand plugging a charging cable into a car's charging port. The scene is set outdoors during sunset, with a bright sun in the upper right corner creating a lens flare effect. The background shows a blurred city street with buildings and a bicycle rack. The overall color palette is warm, dominated by oranges, yellows, and soft blues.

# Introduction & Context

# Center for Sustainable Energy (CSE)



Building  
Performance



Clean  
Transportation



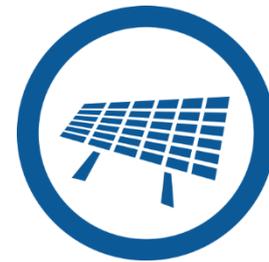
Distributed  
Generation



Energy  
Efficiency



Energy  
Storage



Renewable  
Energy

# CSE-Administered EV Rebate Programs

(as of Jan. 2019)



	CALIFORNIA CLEAN VEHICLE REBATE PROJECT™	MOR-EV Massachusetts Offers Rebates for Electric Vehicles	CHEAPR Connecticut Hydrogen and Electric Automobile Purchase Rebate	NEW YORK STATE
<b>Fuel-Cell EVs</b> 	\$5,000	\$1,500	\$5,000	<u>e-miles</u> ≥ 120    \$2,000 ≥ 40     \$1,700 ≥ 20     \$1,100 < 20     \$500
<b>All-Battery EVs</b> 	\$2,500	\$1,500	<u>e-miles</u> ≥ 200    \$2,000 ≥ 120    \$1,500 < 120    \$500	
<b>Plug-in Hybrid EVs</b> 	\$2,500 (i3 REx) \$1,500	BEVx only: \$1,500	≥ 45     \$1,000 < 45     \$500	
<b>Zero-Emission Motorcycles</b> 	\$900	\$450		
	e-miles ≥ 20 only; Consumer income cap and increased rebates for lower-income households	MSRP ≤ \$50k, no fleet rebates	MSRP ≤ \$60k FCEVs, ≤ \$50k BEVs, PHEVs; dealer assignment; \$150 dealer incentive	MSRP > \$60k = \$500 max.; point-of-sale via dealer

# CVRP has processed >285k rebates totaling >\$639M (Since 2010)



	CALIFORNIA CLEAN VEHICLE REBATE PROJECT	MOR-EV	CHEAPR	NEW YORK STATE
<b>Fuel-Cell EVs</b> 	\$5,000	\$1,500	\$5,000	<u>e-miles</u> ≥ 120 \$2,000
<b>All-Battery EVs</b> 	\$2,500	\$1,500	<u>e-miles</u> ≥ 200 \$2,000 ≥ 120 \$1,500 < 120 \$500	≥ 40 \$1,700 ≥ 20 \$1,100
<b>Plug-in Hybrid EVs</b> 	\$2,500 (i3 REx) \$1,500	BEVx only: \$1,500	≥ 45 \$1,000 < 45 \$500	< 20 \$500
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# Increased Rebates

*For Low-to-Moderate-Income (LMI) Consumers*

- Additional \$2,000 available to consumers with household incomes  $\leq 300\%$  of the federal poverty level (FPL)
- Prioritization of rebate payments to low income consumers

Persons in household	Max Income
1	\$36,420
2	\$49,380
3	\$62,340
4	\$75,300
5	\$88,260
6	\$101,220
7	\$114,180
8	\$127,140

# Timeframe

- June 2017 – January 2018
  - *Most recent data available*



# Weighting

- Responses are weighted to compensate for over- or under-representation among various groups
  - Weighting strata:
    - Technology type (BEV...PHEV...FCEV)
    - Vehicle model
    - Purchase vs. lease
    - County
  - Weights are created using iterative proportional fitting (raking)

# Populations of Interest

- CVRP Rebate Recipients
- CVRP Rebate Recipients

*who received an increased rebate*

*June 2017-January 2018*

All Rebate Recipients	Survey Respondents	Lower-Income Survey Respondents
26,148	4,080*	470*

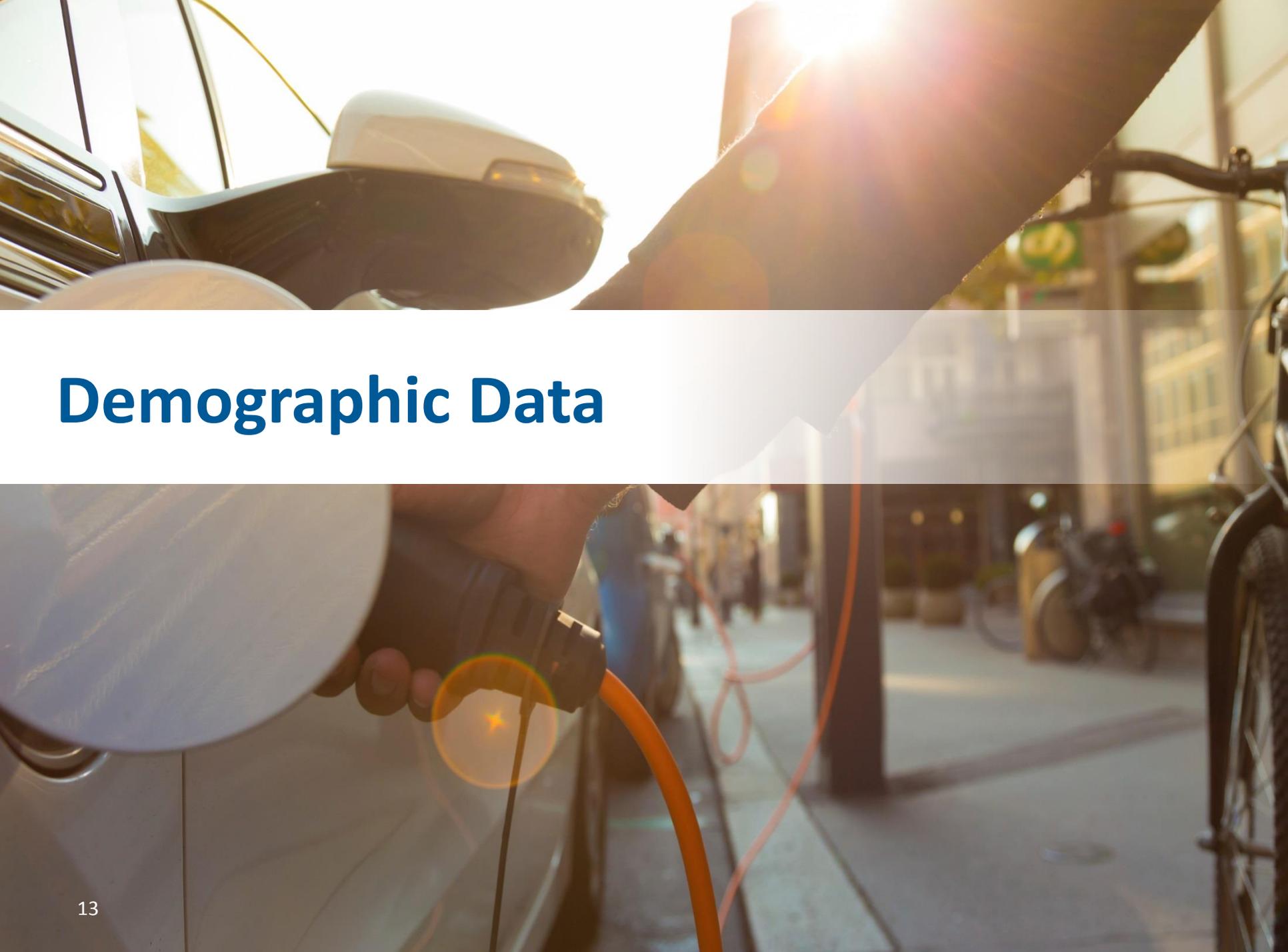
*\* Weighted*

# Caveats

This presentation examines:

- Seven months of data
- ...Data that's a year old
- Weighted to represent rebate recipients...
  - But rebate recipients ≠ EV buyers...
  - And EV buyers ≠ new car buyers...
  - And new car buyers ≠ the population at large\*

So: this presentation is exploratory

A close-up photograph of a person's hand holding a charging cable connected to an electric vehicle. The scene is set in a city street during sunset, with warm, golden light and lens flare effects. In the background, a bicycle is parked on the sidewalk, and a building is visible. The overall atmosphere is modern and urban.

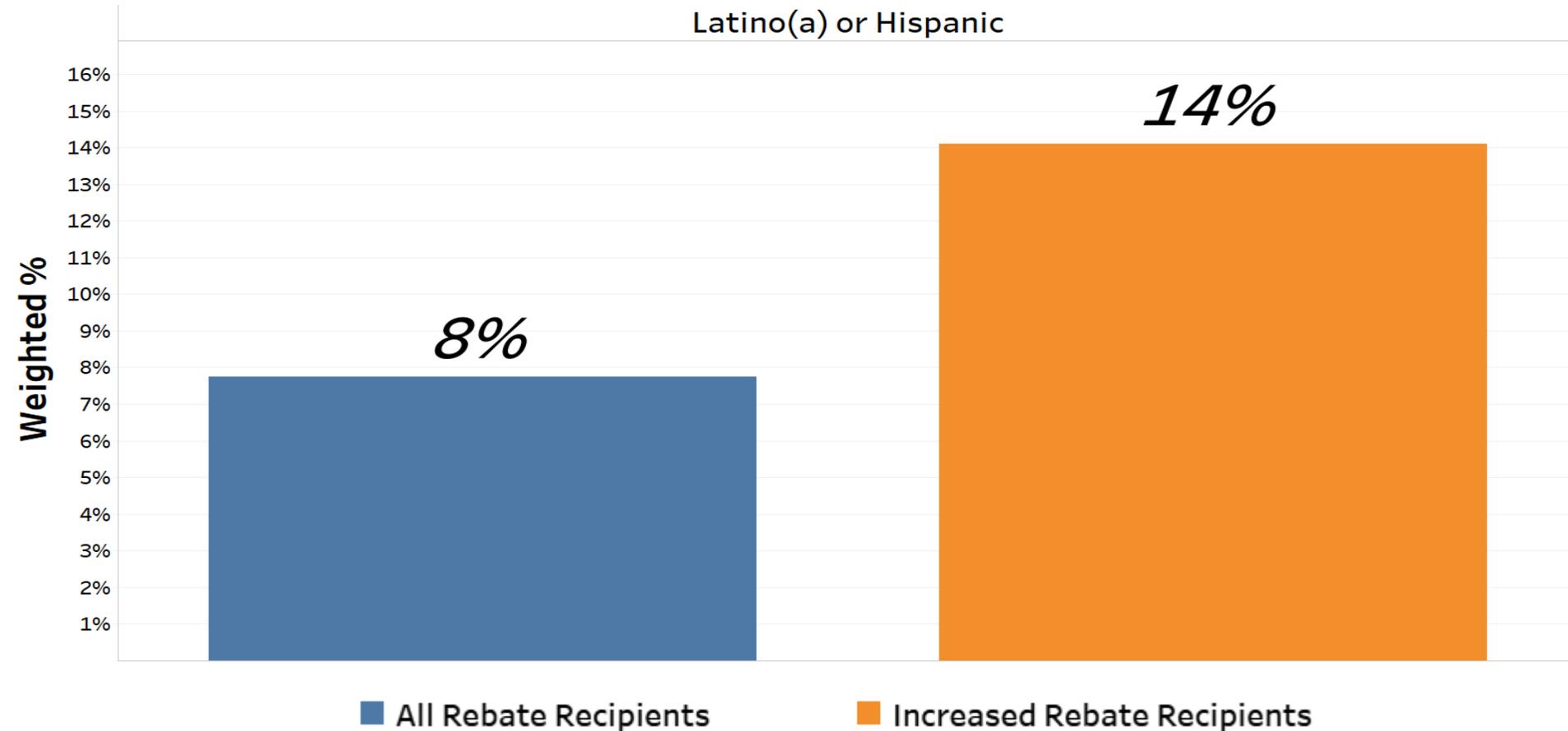
# Demographic Data

# Ethnicity

Increased rebate consumers are:

*disproportionately Latinx/Hispanic*

Latino(a) or Hispanic



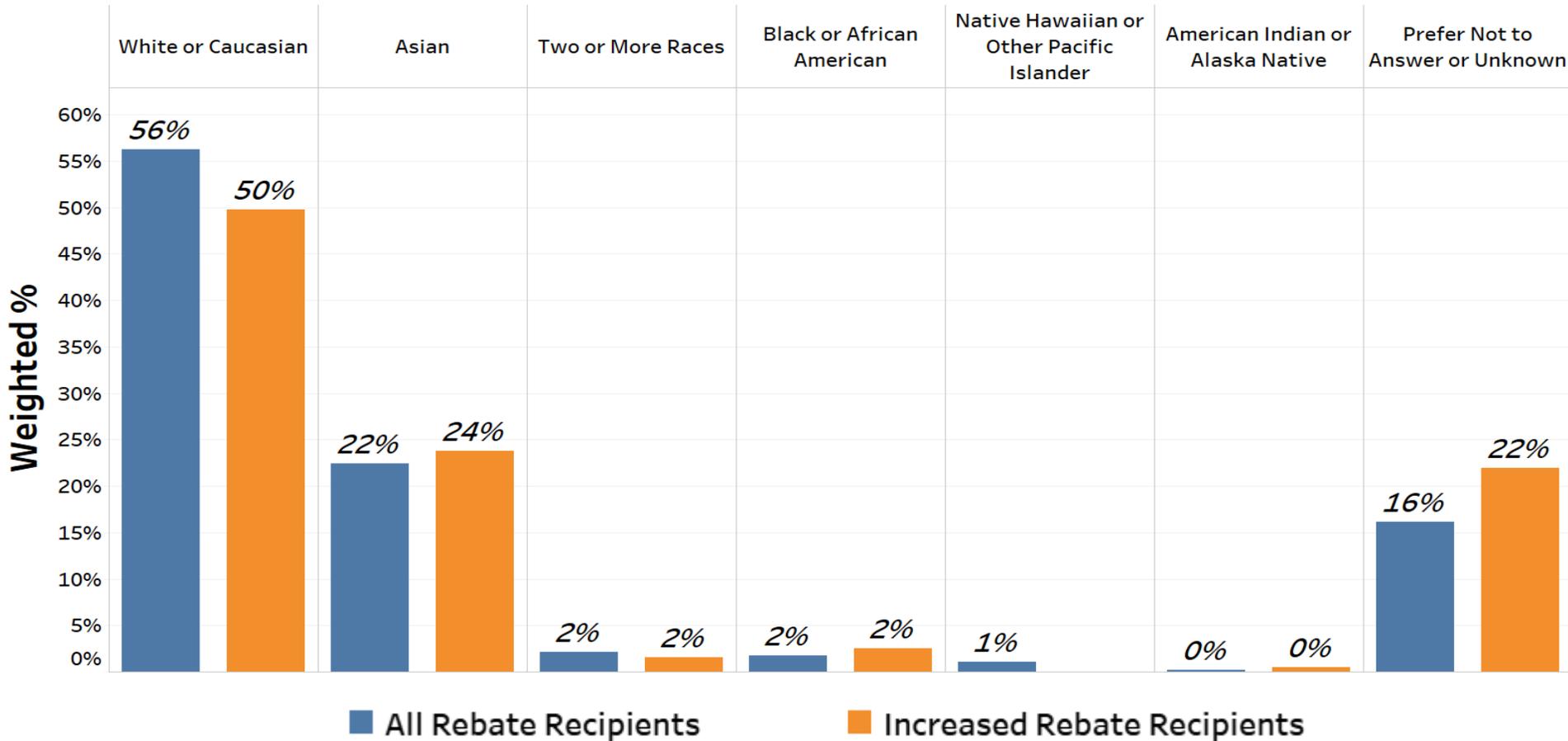
■ All Rebate Recipients

■ Increased Rebate Recipients

# Race

Increased rebate consumers are:

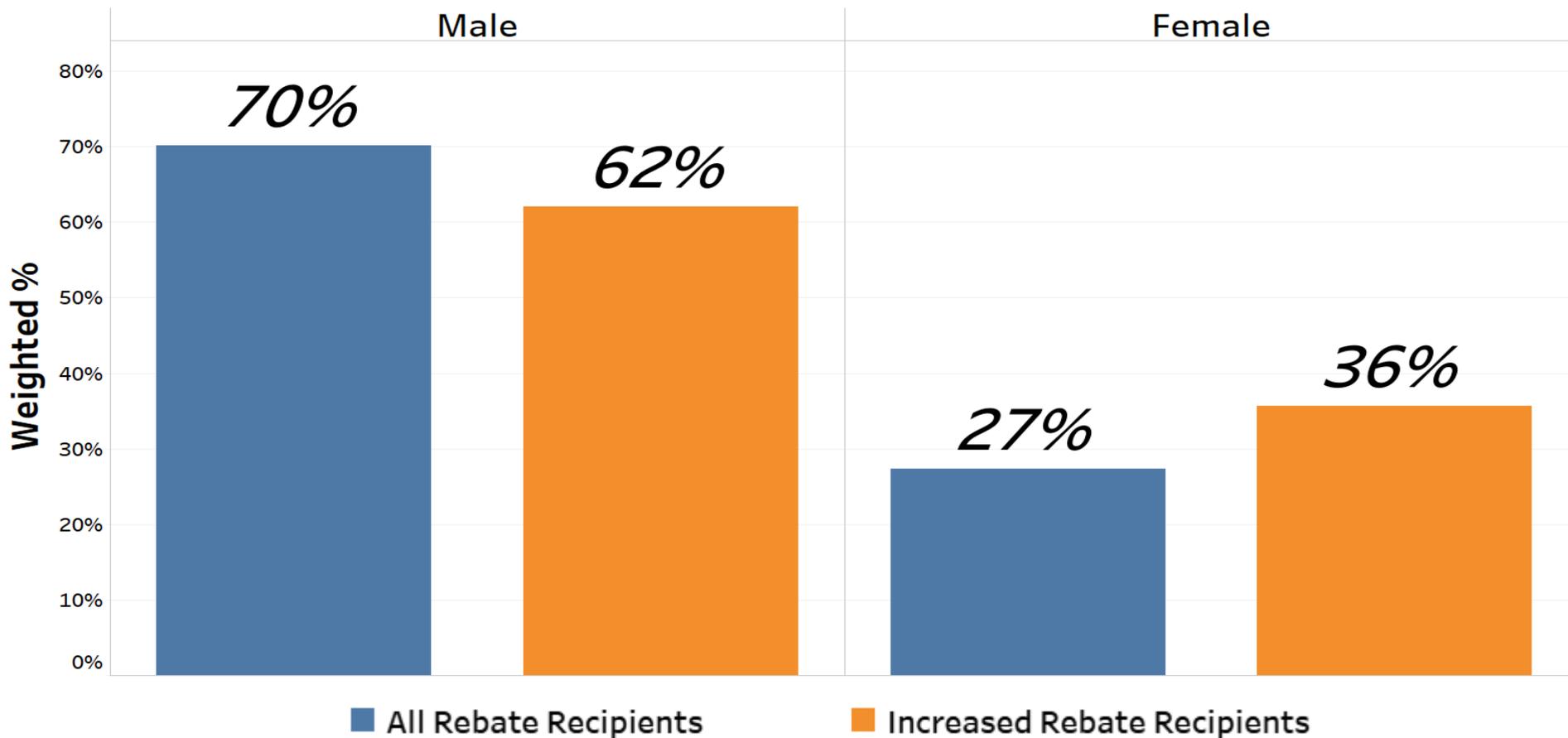
*disproportionately non-white*



Weighted n = **4,080** (All); **470** (IR Recipient)  
 Proportion that selected "Other" is not shown.

# Gender

Increased rebate consumers are:  
*disproportionately female*

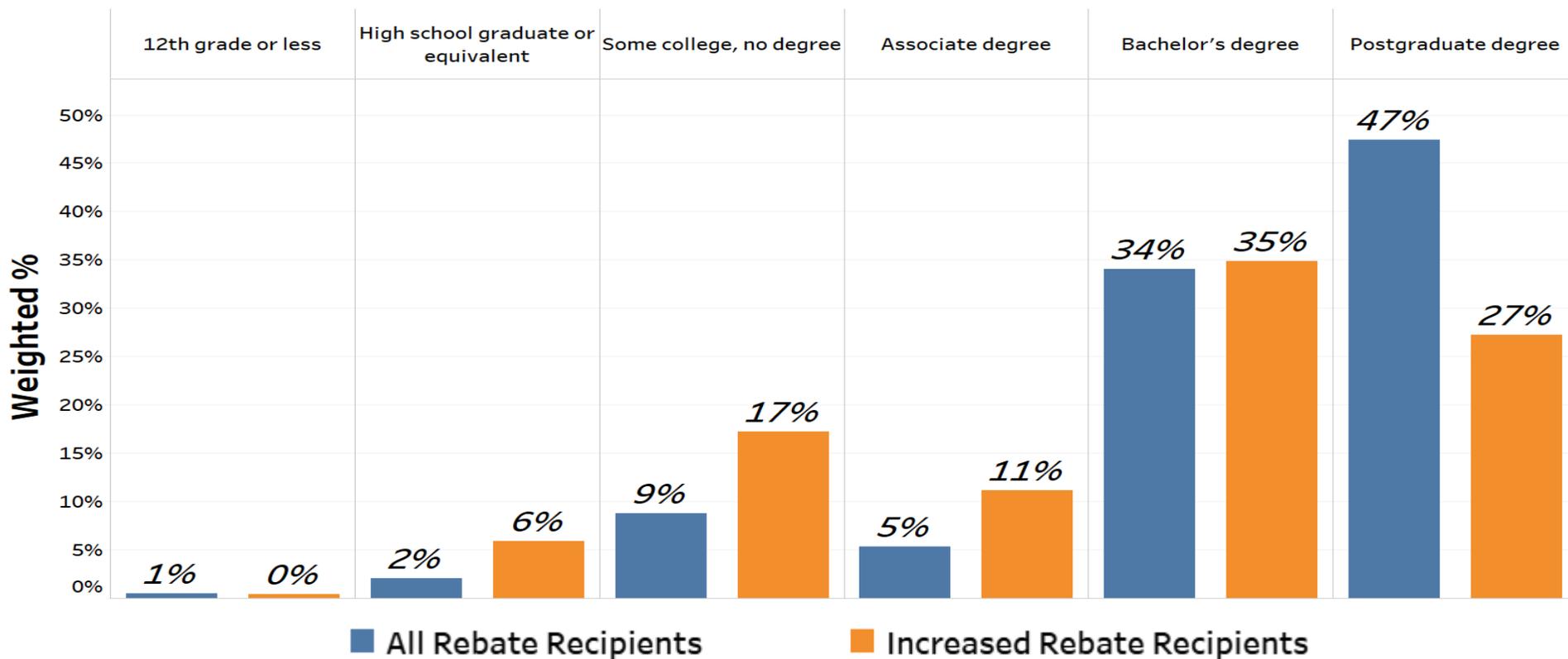


# Level of Education

Increased rebate consumers are:

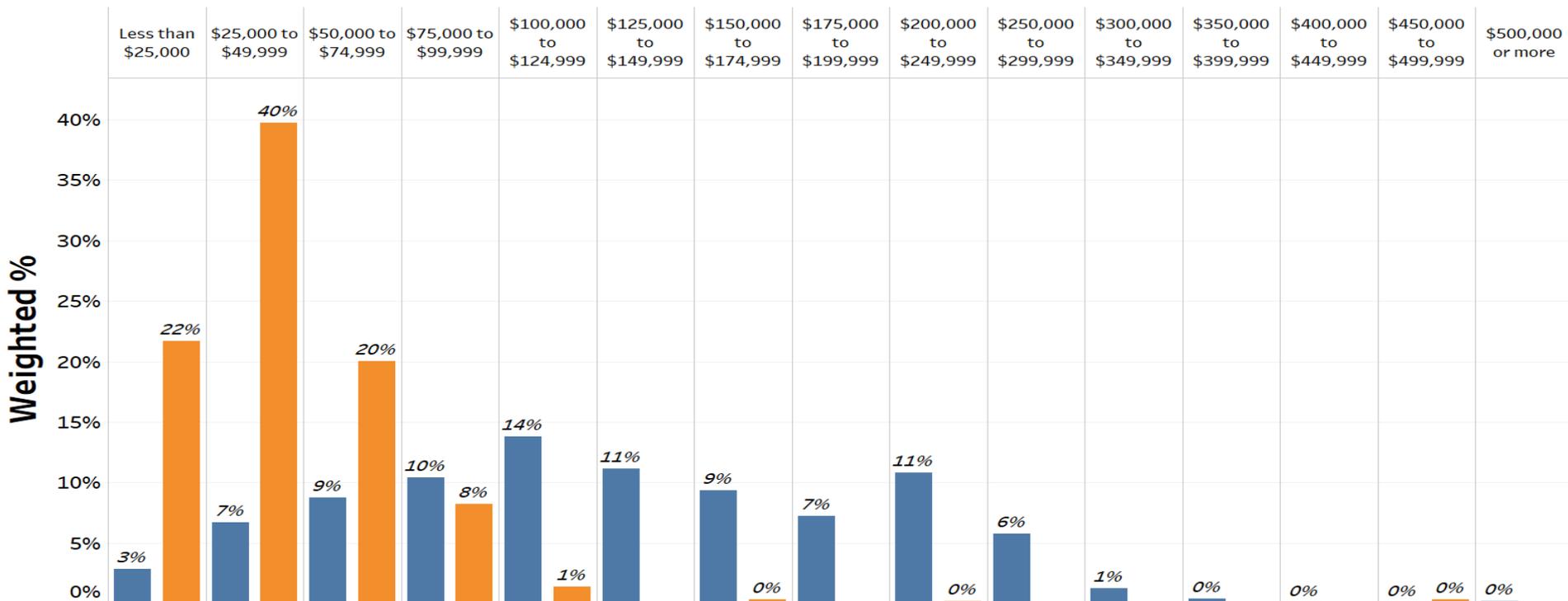
**less likely to have advanced degrees**

*“What is the highest level of education someone in your household has completed?”*



# Household Income

*“What is your current annual gross household income from all sources (i.e. before taxes)?”\**



*\*Note that increased rebates are only approved for applicants with household incomes  $\leq$  300% of the Federal Poverty Level, which varies by year and household size. Also note that California’s income cap is not based upon the household income data (shown here) but instead upon individual income data and tax filing status.*

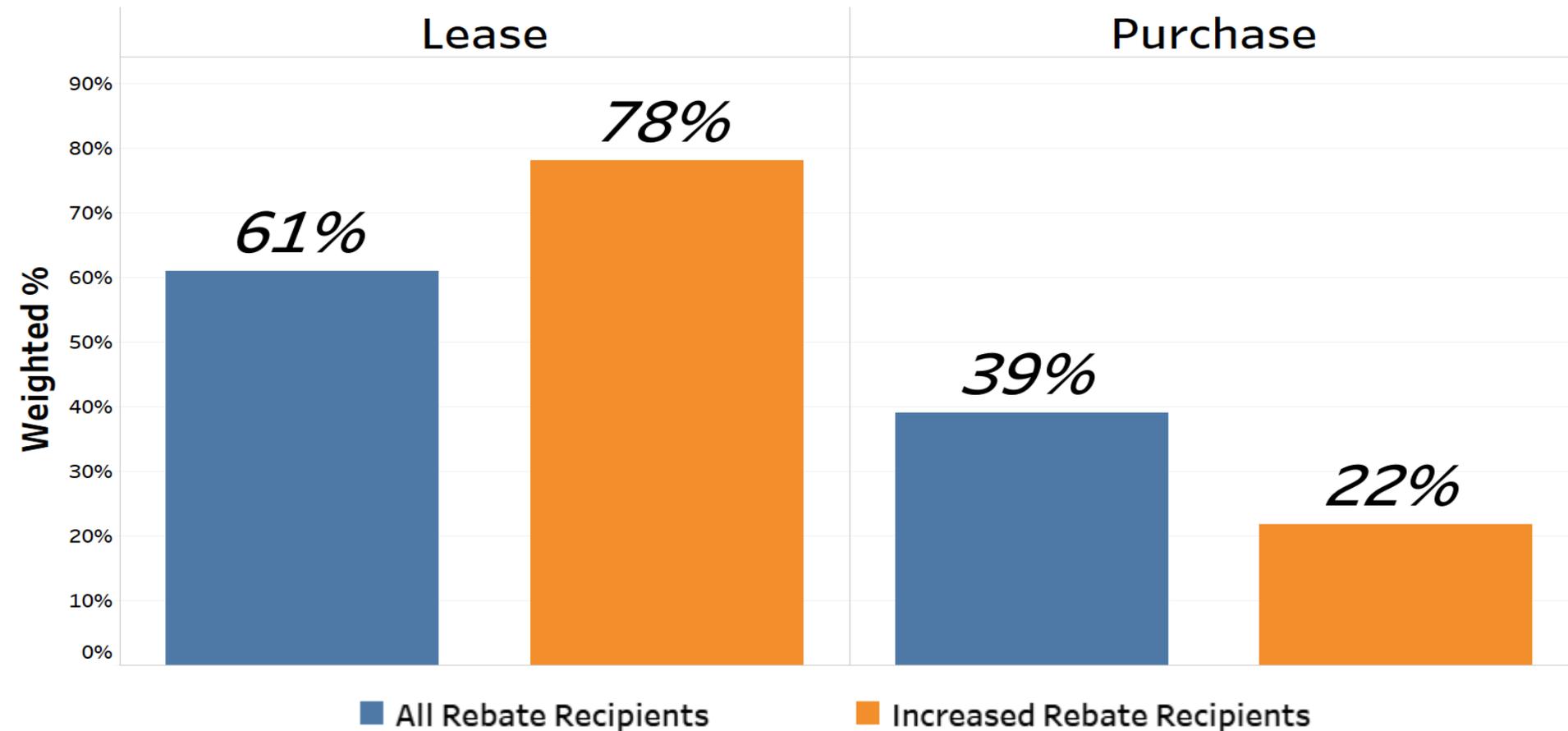
■ All Rebate Recipients

■ Increased Rebate Recipients

# Rebated Vehicle: Lease vs Purchase

Increased rebate consumers:

*disproportionately lease their rebated vehicles*

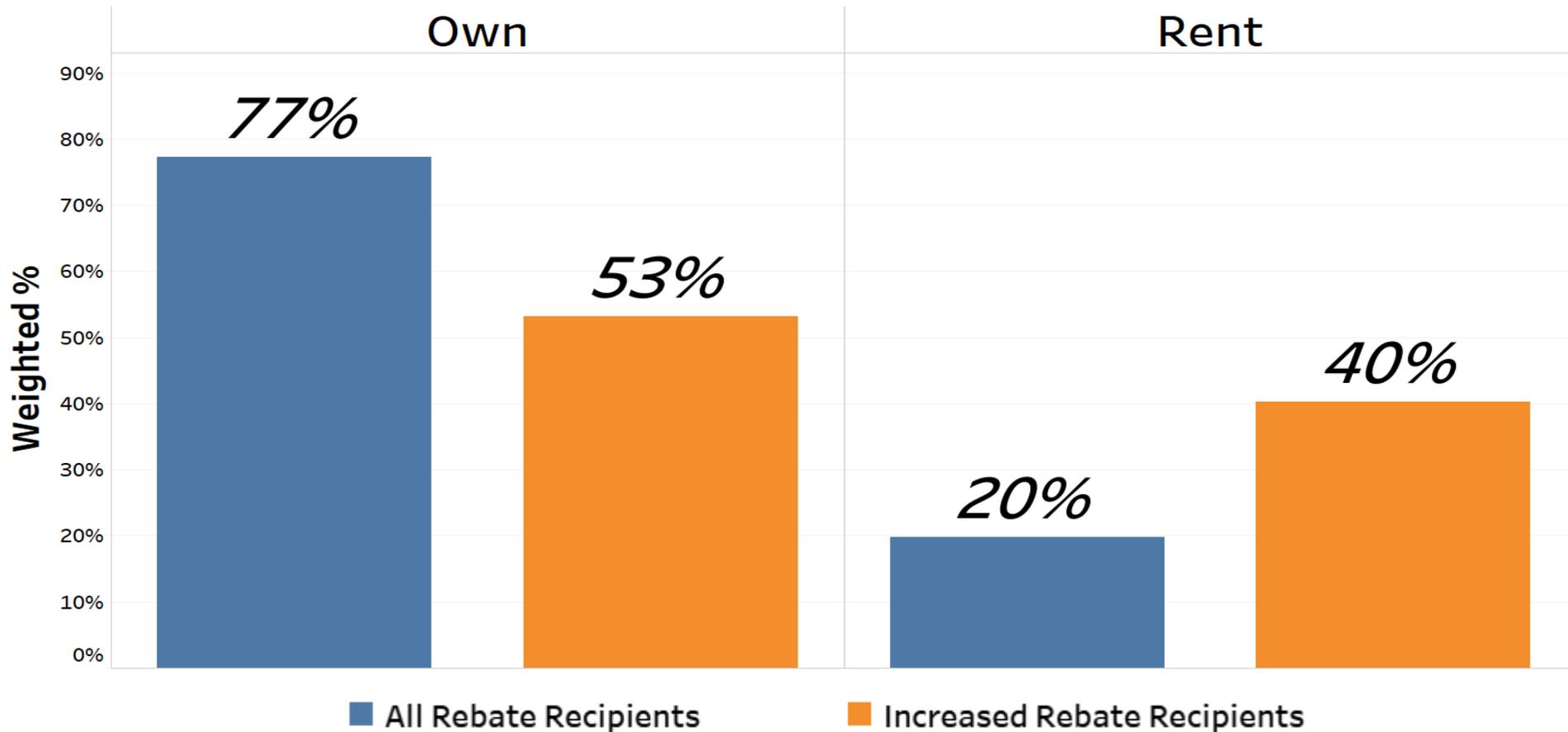


Weighted n = 4,080 (All); 470 (IR Recipient)

# Residence Ownership

Increased rebate consumers:

*disproportionately rent where they live*



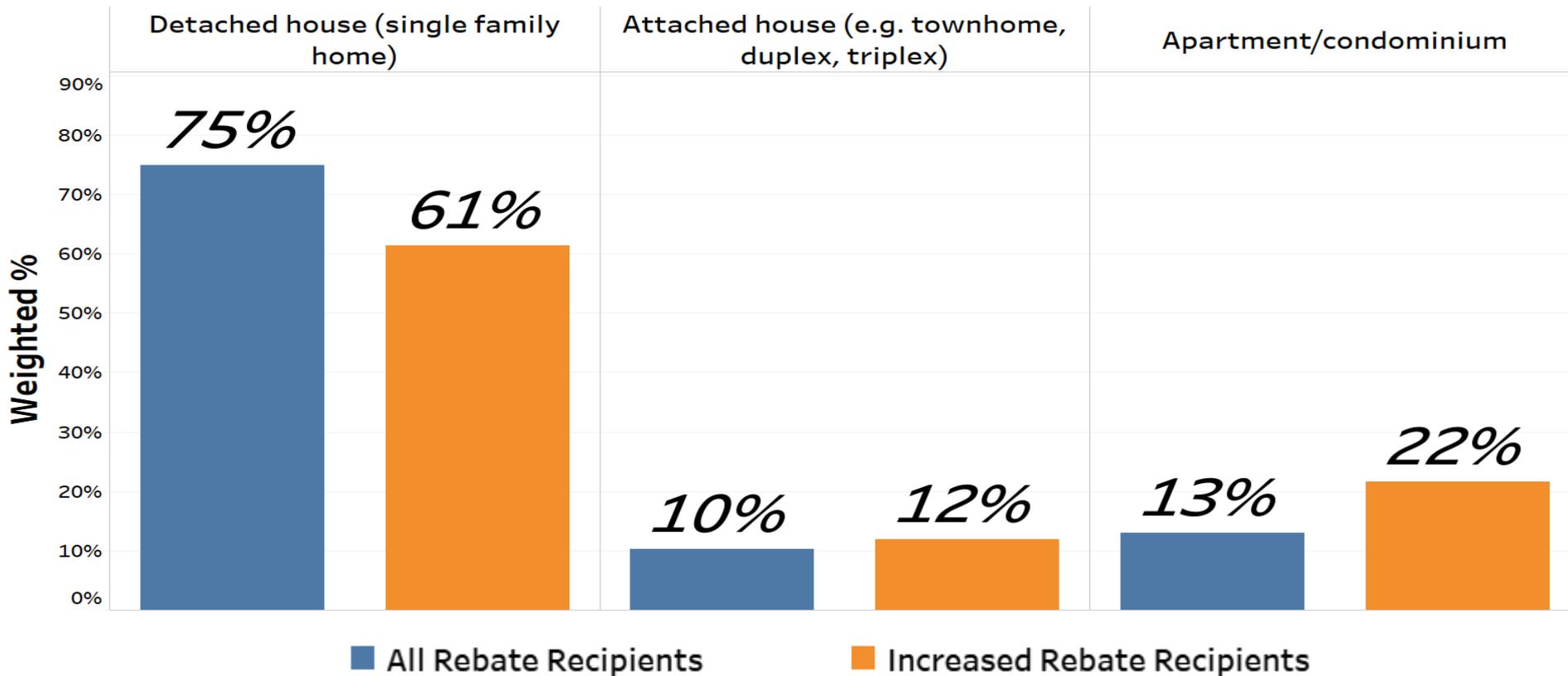
Weighted n = **4,080** (All); **470** (IR Recipient)  
Proportion that selected "Prefer not to answer" is not shown.

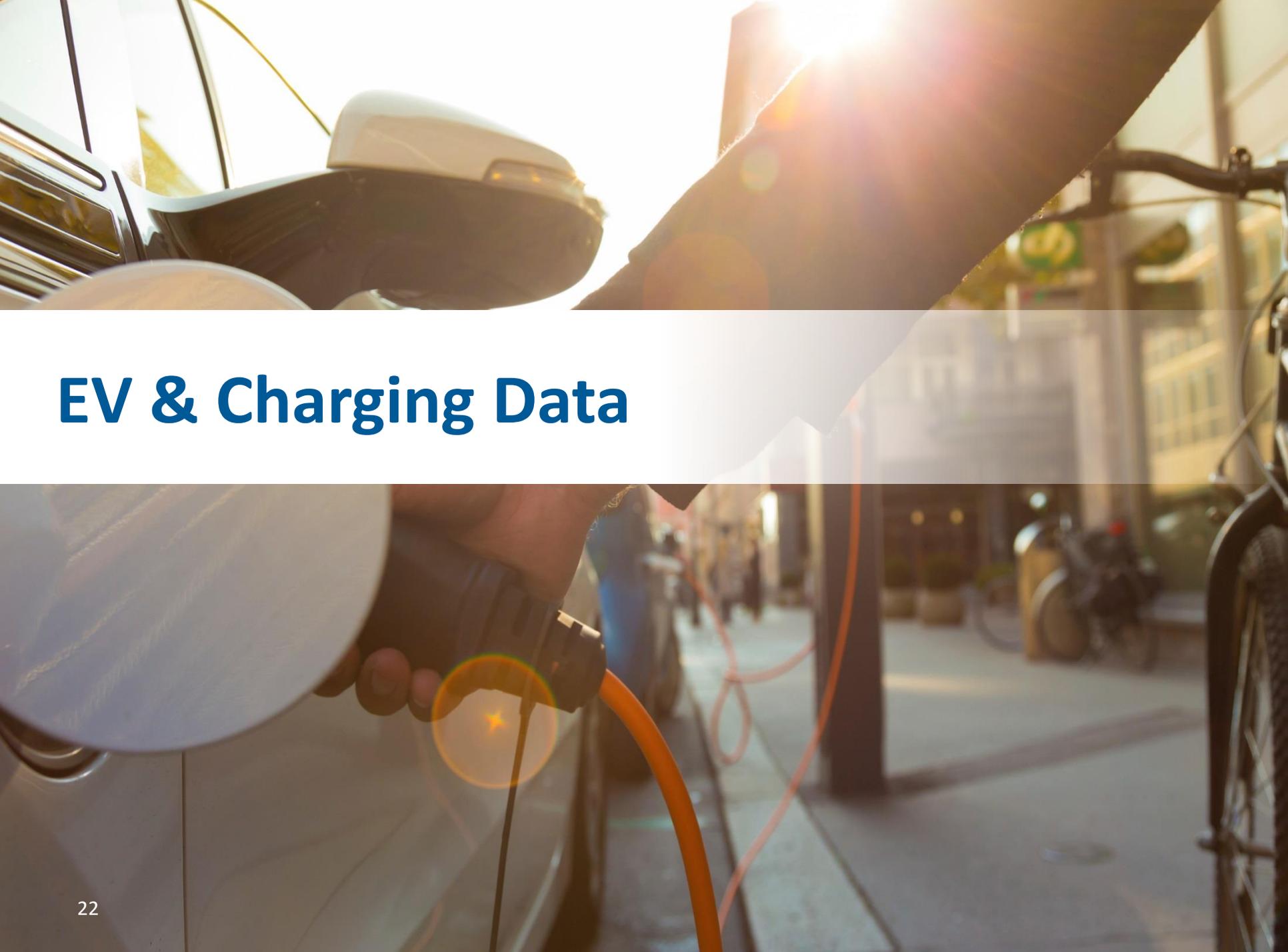
# Residence Type

Increased rebate consumers are:

**less likely to live in detached homes**

*“What type of residence do you live in?”*



A close-up photograph of a person's hand plugging a charging cable into the port of an electric vehicle. The scene is set outdoors at sunset, with a bright sun in the upper right corner creating a lens flare effect. The background shows a blurred city street with buildings and a bicycle rack. The overall color palette is warm, dominated by oranges, yellows, and soft blues.

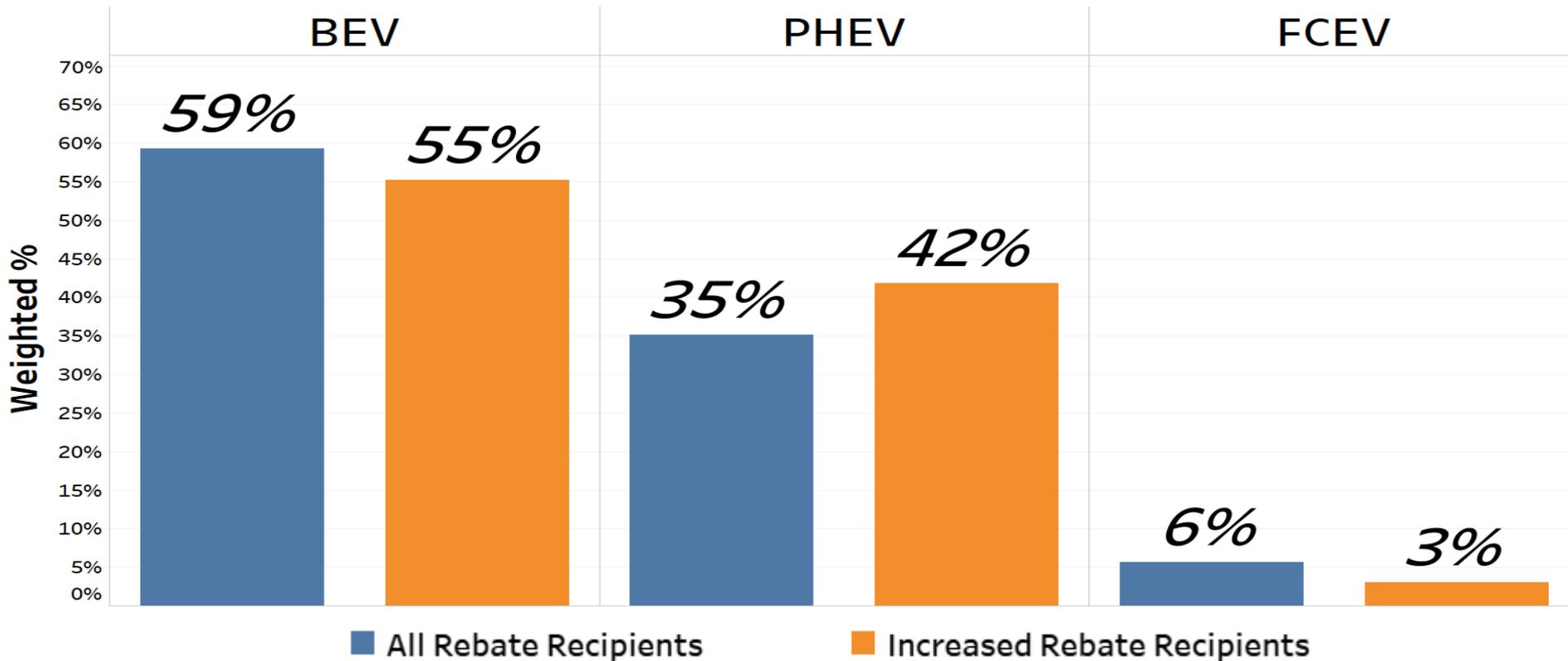
# EV & Charging Data

# Rebated Vehicle: Technology Type

Increased rebate consumers:

*disproportionately acquire PHEVs*

*“What type of vehicle did you receive your rebate for?”*

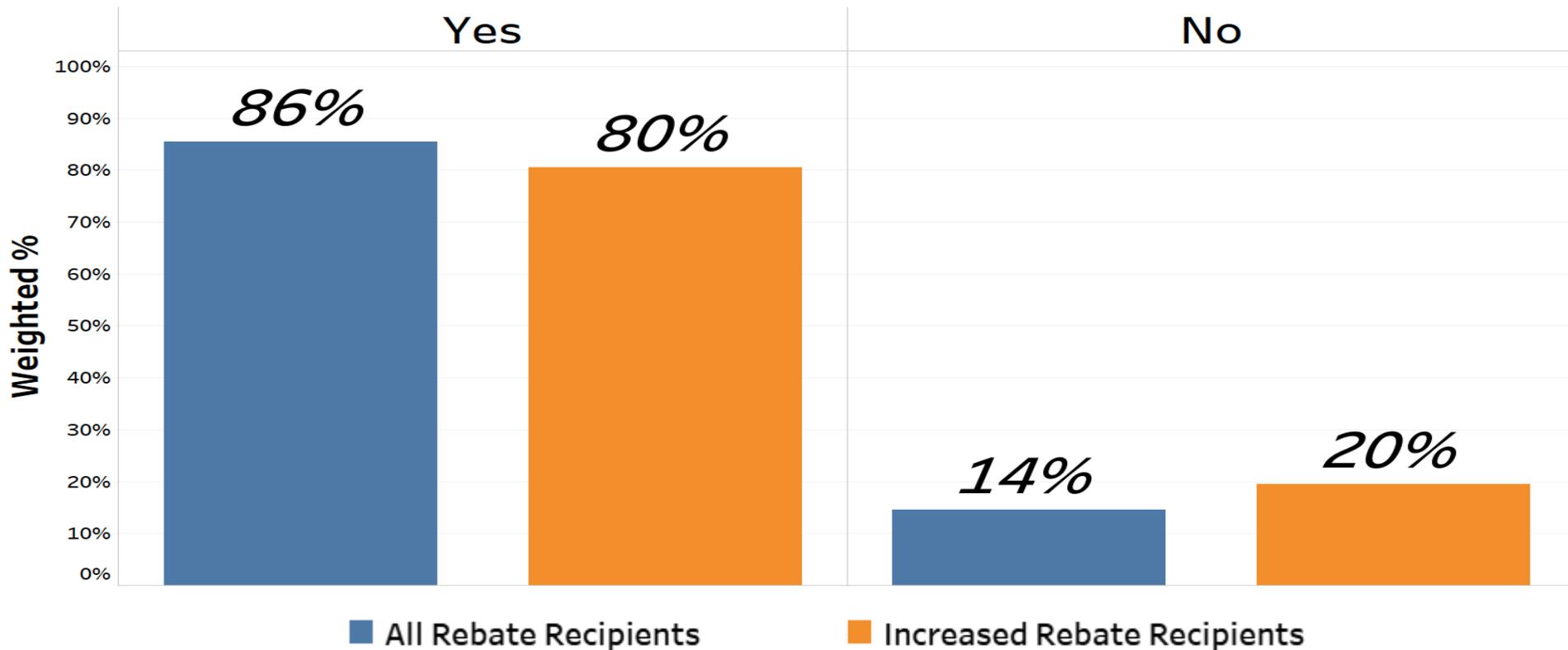


# Residence EV Charging

Increased rebate consumers are:

**somewhat less likely to charge at home**

*“Presently, do you charge your plug-in electric vehicle at home?”*



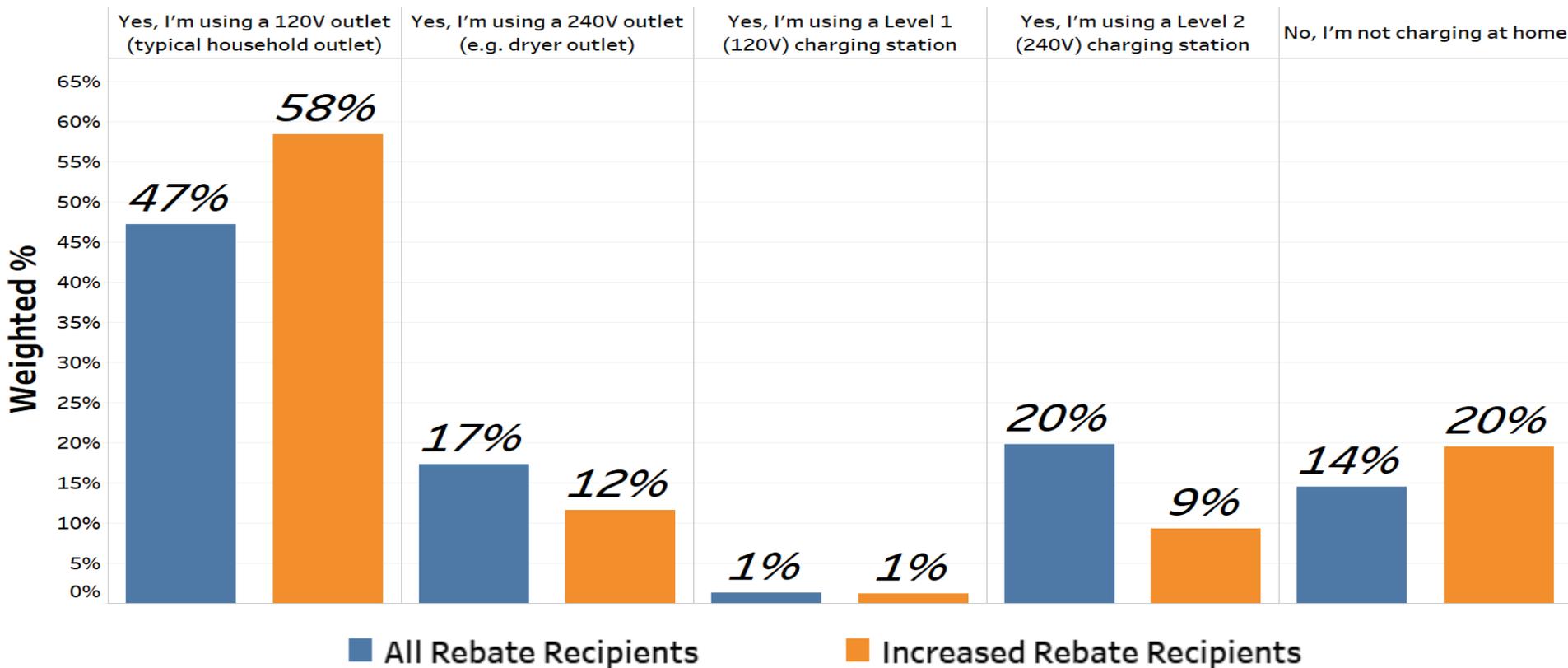
Weighted n = 3,851 (All); 456 (IR Recipient)

# Residence EV Charging

Increased rebate consumers are:

***much less likely to use a residential charging station***

*“Presently, do you charge your plug-in electric vehicle at home?”*



Weighted n = 3,851 (All); 456 (IR Recipient)

# Residence EV Charging: Why Not

Increased rebate consumers are:

***more likely to need alternatives to home charging***

*“Why won’t you be charging at home?”*

I rent or have a homeowners association and am not authorized to make changes at my residence



I can charge for free or at a lower cost somewhere else



Adding an outlet or charging station would be too expensive



Adding an outlet or charging station would be too complicated



My residence has no off-street parking



I never charge my vehicle (just use it as a hybrid)



0% 2% 4% 6% 8% 10% 12% 14% 16% 18% 20% 22% 24% 26% 28% 30% 32% 34% 36% 38% 40% 42% 44% 46% 48% 50% 52% 54%

**Weighted %**

■ All Rebate Recipients

■ Increased Rebate Recipients

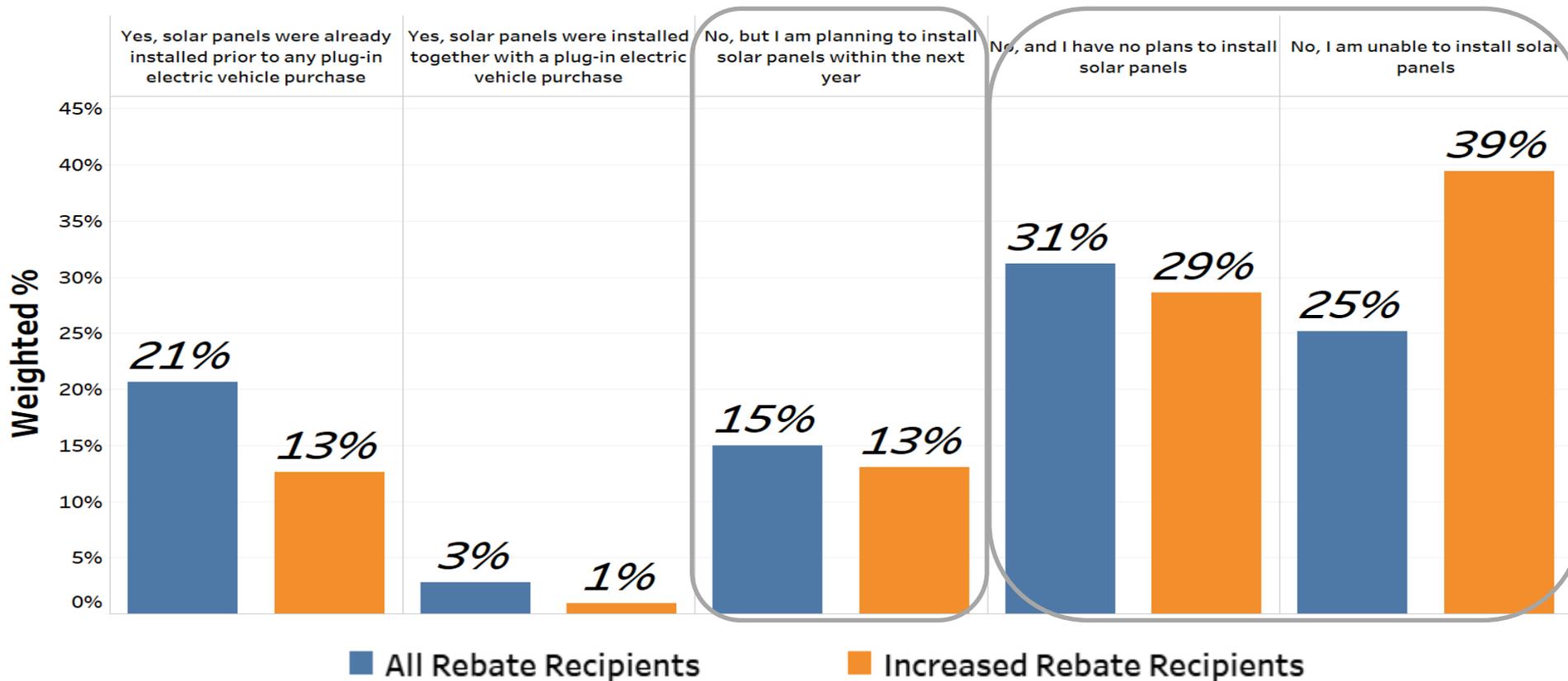
Weighted n = 343 (All); 62 (IR Recipient)

# Residence: Solar Power

Increased rebate consumers are:

**less likely to have installed solar**

*“Do you have solar panels that produce electricity at your residence?”*

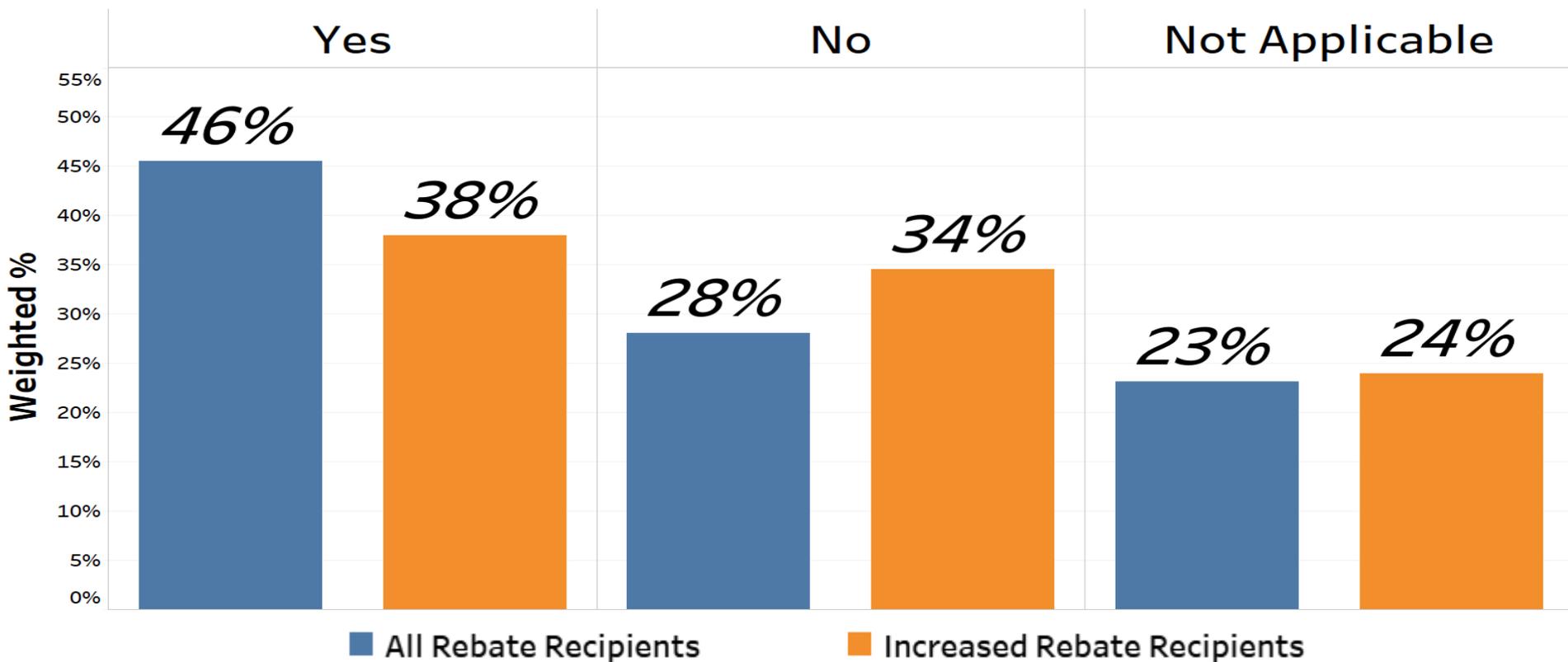


# Workplace Charging

Increased rebate consumers are:

*disproportionately unable to charge at work*

*“When you get to work is there somewhere you can charge your plug-in electric vehicle?”*

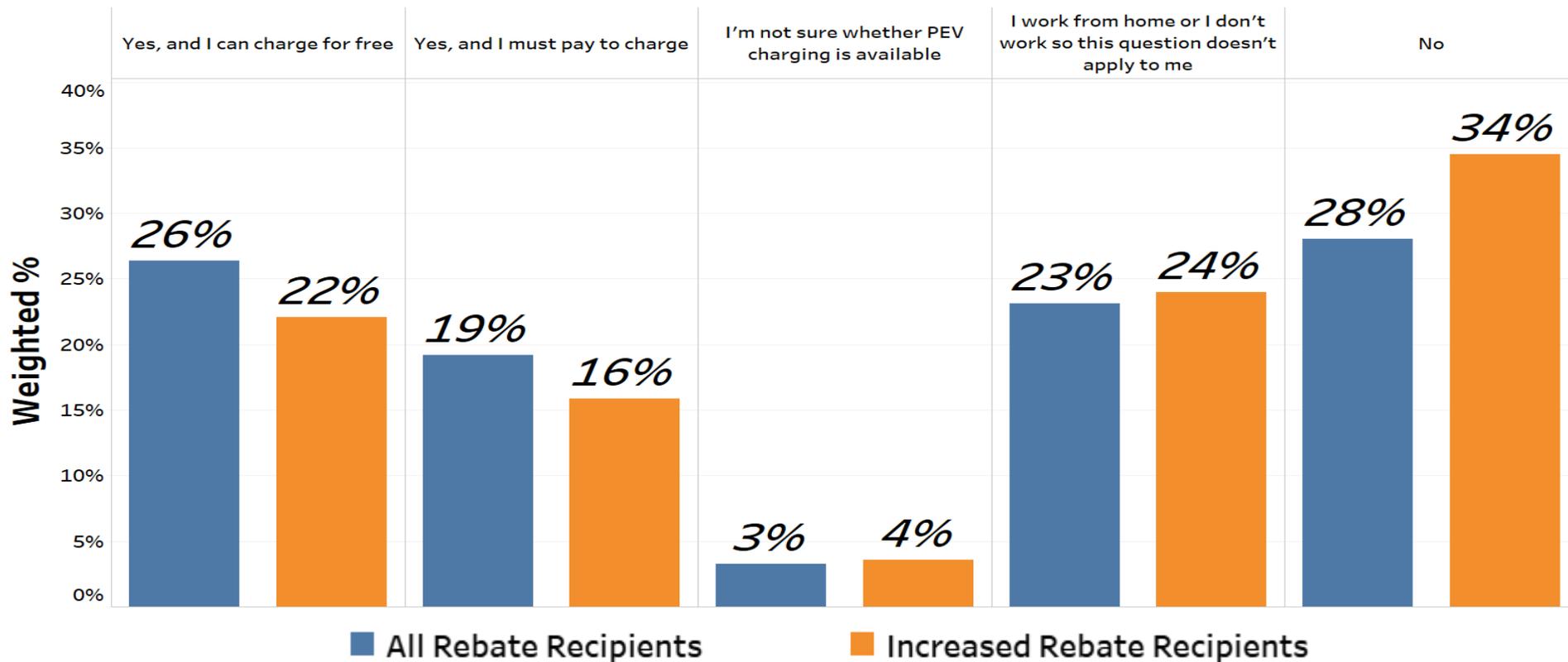


# Workplace Charging

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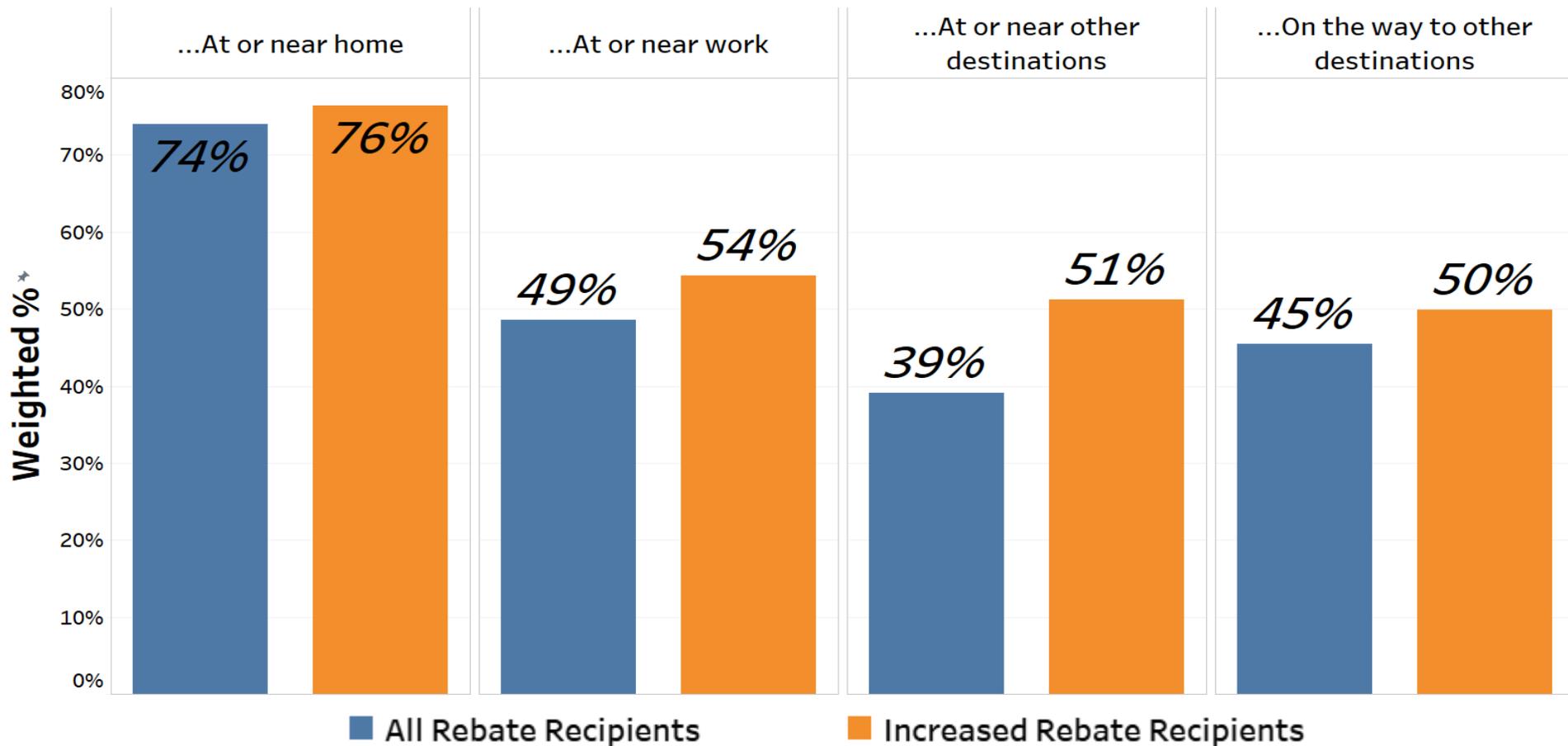
*“When you get to work is there somewhere you can charge your plug-in electric vehicle?”*



Weighted n = 3,812 (All); 452 (IR Recipient)

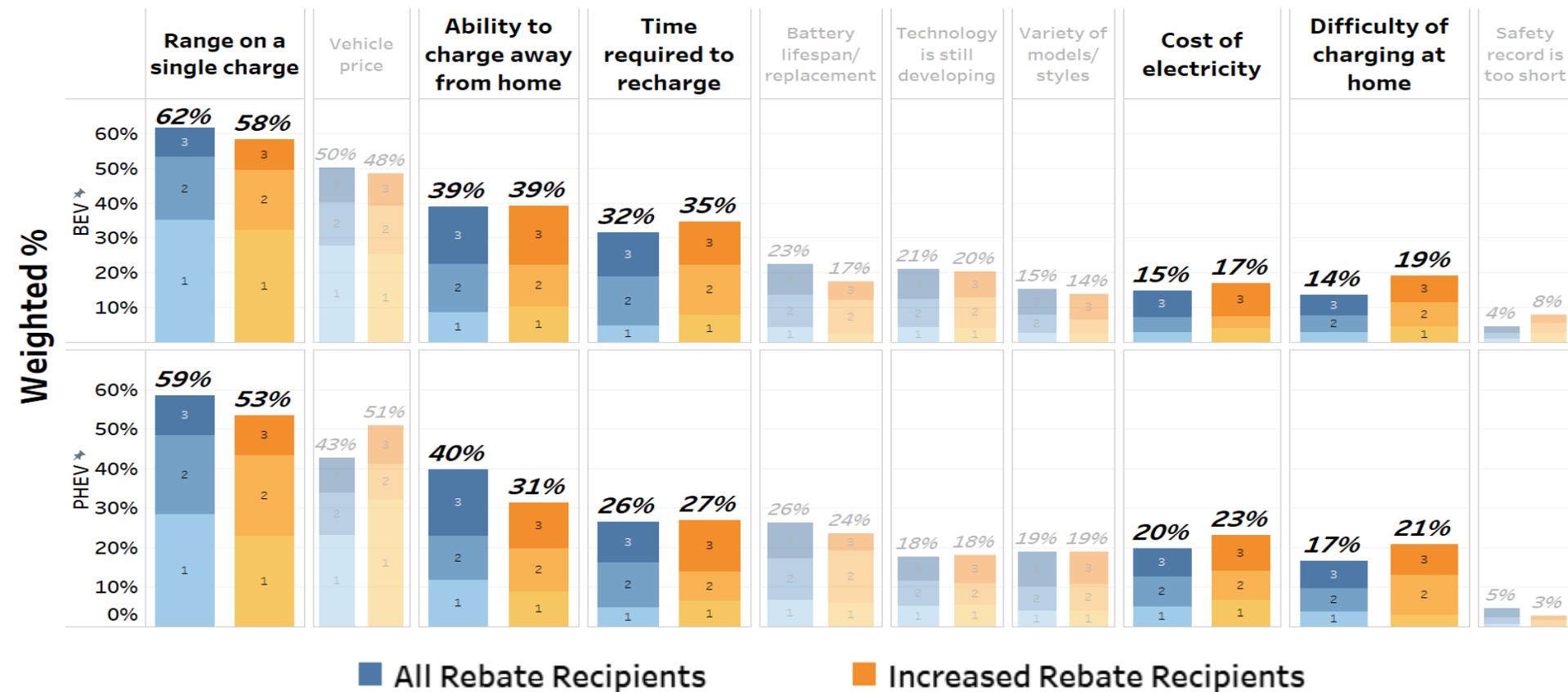
# Charging Access: Importance Near Locations

*“How important to your decision to acquire your plug-in electric vehicle was the availability of charging at each of the following locations?”*  
*Proportion that selected “Very” or “Extremely” important.*



# EV Purchasing: Concerns

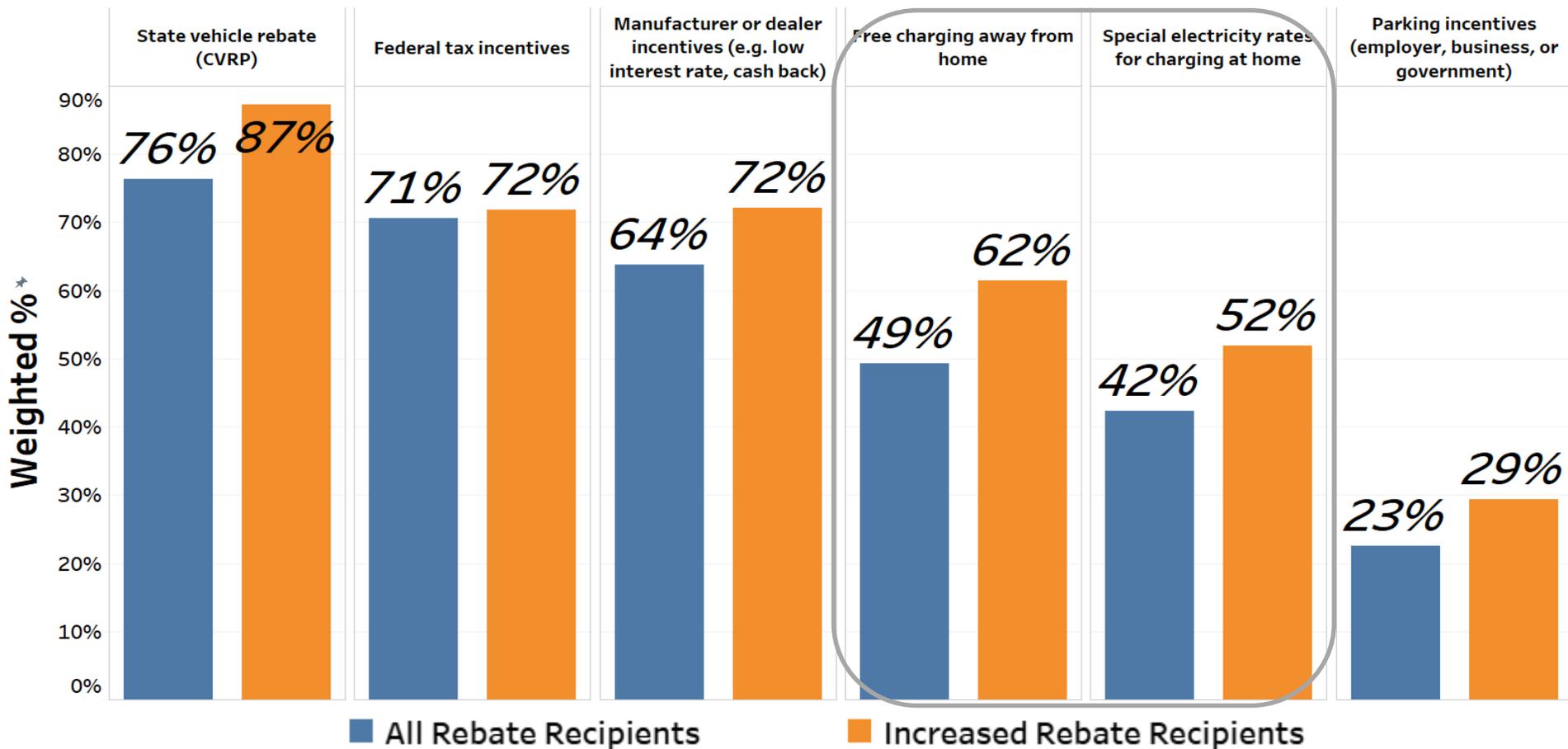
Regardless of what you think now, when you were shopping for your new vehicle, please rank the top three perceptions about [BEVs/PHEVs] that gave you the greatest concern about choosing one?



# EV Purchasing: Enabling Factors

“How important were each of the following factors in making it possible for you to acquire your clean vehicle?”

Proportion that selected “Very” or “Extremely” important.



A close-up photograph of a person's hand holding a charging cable connected to an electric vehicle. The scene is set in a city street during sunset, with a bright sun in the upper right corner creating a lens flare. In the background, a bicycle is parked on the sidewalk, and a building is visible. The overall atmosphere is warm and modern.

# Conclusion

*This analysis is exploratory*

*The data we've seen is  
indicative, but inconclusive*

# In Conclusion

- Most rebate recipients haven't purchased their new vehicles outright, but have leased them instead (~ 60%)
- Most rebate recipients have chosen BEVs (nearly 60%)
  - Lower-income consumers disproportionately purchase PHEVs (42% vs 35% overall)
- Range anxiety is the time-of-purchase concern most frequently cited by rebate recipients (~58%)
- And while charging incentives have been important, financial incentives have been still more important in making it possible for them to purchase an EV.

# In Conclusion

- The vast majority of rebate recipients **charge at home** (~85%)
  - Very few use a charging station to do so (~21%)
  - Nearly half simply plug their vehicle into a typical household outlet.
- ~15% of rebate recipients are looking to **install solar** within the next year
- Roughly half of rebate recipients can **charge at work**
  - Of those, a bit more than half are able to do so for free.

# In Conclusion

- Lower-income populations face disproportionate challenges in buying EVs:
  - Less likely to charge at home
    - *Less likely to do so via charging stations*
  - Less likely to charge at work
- Access to charging disproportionately important to lower-income populations

# *Thank You*

 [CleanVehicleRebate.org](https://CleanVehicleRebate.org)



# How can we help?

[ryan.bodanyi@energycenter.org](mailto:ryan.bodanyi@energycenter.org)

 [CleanVehicleRebate.org](https://CleanVehicleRebate.org)

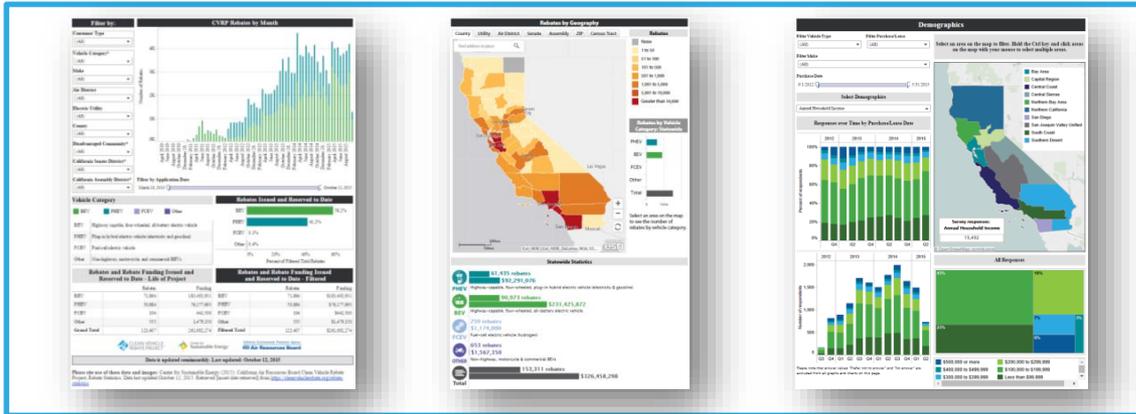


A close-up photograph of a person's hand holding a black charging cable connected to a white electric vehicle. The background shows a city street at sunset, with a bright sun creating a lens flare effect. A bicycle is visible on the right side of the frame.

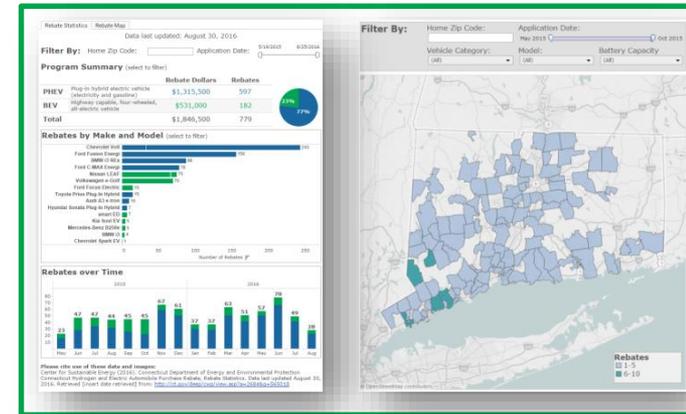
# Online Resources & Extra Slides

# Where can I get additional data?: CSE Transparency Tools

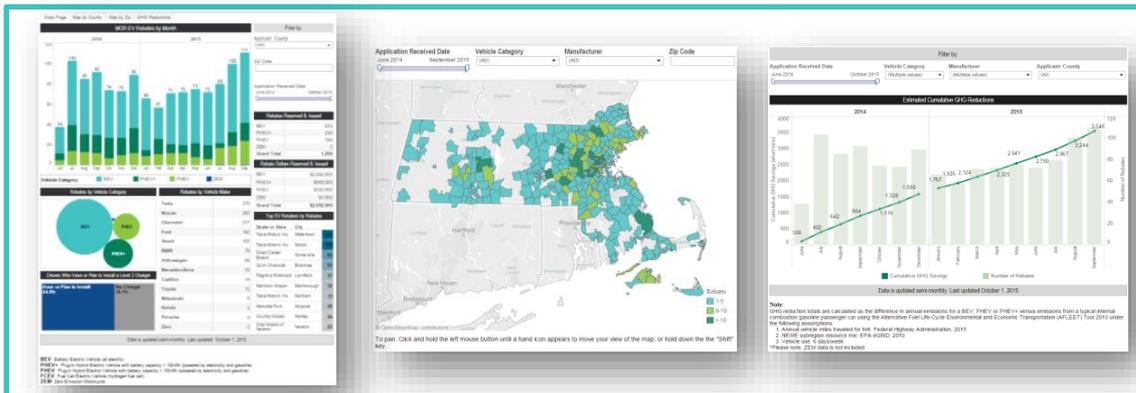
Public dashboards facilitate informed action across multiple U.S. states and regions



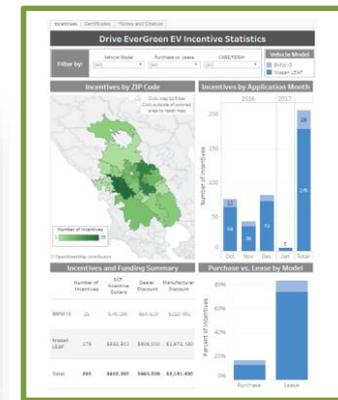
cleanvehiclerebate.org



ct.gov/deep



mor-ev.org



sonomacleanpower.org



zevfacts.com

# CVRP Eligibility Requirements (legislative)

	November 2016 – present
<b>Vehicle requirement:</b>	
Electric range	Must be $\geq$ 20 e-mi
<b>Consumer Income Cap*:</b>	
Single filers	\$150,000
Head-of-household filers	\$204,000
Joint filers	\$300,000

\*Income cap is deferred for consumers of fuel-cell electric vehicles