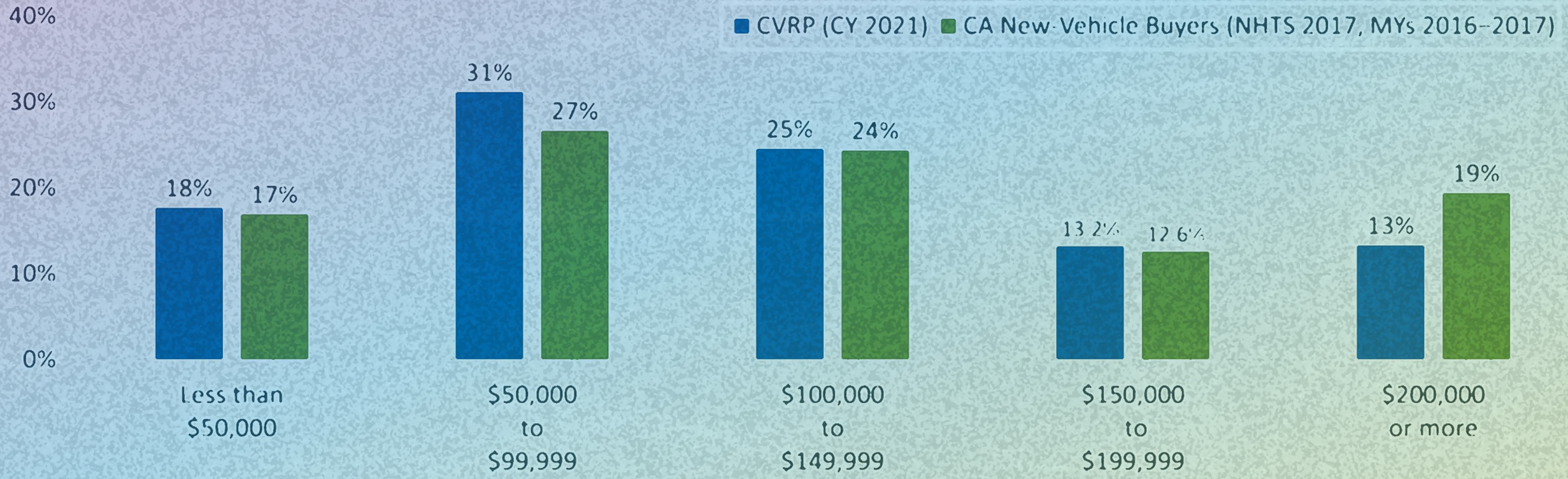
CVRP 2021 Data Brief: Consumer Characteristics



December 2023

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with thanks to L. Puckett, J. Bowers, and others at the Center for Sustainable Energy (CSE)

CALIFORNIA CLEAN VEHICLE REBATE PROJECT℠

Outline: Consumer Characteristics

I. Context: Consumer Eligibility Criteria
II. Where is the funding going?: Consumers Rebated
III. What is the path forward?: Strategic Segments
IV. Summary & Select Findings

Appendix: Additional Details & Resources

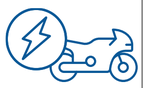
EVs = light-duty plug-in hybrid, battery, and fuel-cell electric vehicles (PHEVs, BEVx vehicles, BEVs, and FCEVs)
PEVs = PHEVs, BEVx vehicles, and BEVs

Context

Consumer Eligibility Criteria & Other Program Features

Base Rebate Amount for Most Individuals At or Near Lowest Levels

CALIFORNIA CLEAN VEHICLE REBATE PROJECT™

	as of Mar. 2010	as of Jun. 2011	as of Jul. 2013	as of Jun. 2014	as of Mar. 2016	as of Nov. 2016	as of Dec. 2019
Fuel-Cell EVs 	$3,000–$5,000 ‡	$1,500–$2,500 ‡	$2,500	$5,000	$5,000 *	$5,000**	$4,500***
Battery EVs † 	$3,000–$5,000 ‡	$1,500–$2,500 ‡	$2,500	$2,500	$2,500 *	$2,500**	$2,000***
Plug-in Hybrid EVs 	$3,000	$1,500	$1,500	$1,500	$1,500 *	$1,500**	$1,000***
Zero-Emission Motorcycles 	$1,500	$900	$900	$900	$900	$900	$750
Neighborhood EVs	$1,500	$900	$900	$900	$900	None eligible	None eligible
Commercial Zero-Emission Vehicles	$20,000						

† Includes range-extended battery electric vehicles.

‡ Amounts varied by ZEV type. For definitions, see CCR 1962.1.

** Income-qualified consumers eligible for an additional $1,500.*

*** Income-qualified consumers eligible for an additional $2,000.*

**** Income-qualified consumers eligible for an additional $2,500.*

Program Design Shapes Outcomes

= in effect during 2021, highlights

CALIFORNIA CLEAN VEHICLE REBATE PROJECT™

as of Mar. 2010	as of Dec. 2013	as of Dec. 2014 / Jan. 2015	as of Mar. 2016	as of Nov. 2016
• Incentive stacking permitted • 36-month ownership requirement • Rebates per year limit = 20	• Rebates per year limit = 2 **as of May 2014** • 18-month application window	• 30-month ownership requirement (retroactive) • Total rebate limit = 2	• $250k–$500k income cap (PEVs) • +$1,500 for income-qualified households (≤ 300% FPL), excluding ZEMs	• $150k–$300k income cap (PEVs) • ≥ 20 UDDS electric miles • +$2,000 for income-qualified households (≤ 300% FPL), excl. ZEMs

as of Jan. 2018	as of Jan. 2019	as of Dec. 2019	as of Apr. 2020	as of Apr. 2021
• $150k–$300k income cap on stacking HOV decal (only binding on FCEVs) • Rebate Now San Diego County preapproval pilot with point-of-sale option	• Stacking with CVAP grant not permitted (retroactive)	• Total rebates limit = 1 § • Base MSRP ≤ $60k (PEVs) • 3-month application window ‡ • ≥ 35 UDDS electric miles • +$2,500 † for income-qualified households (≤ 300% FPL), excl. ZEMs	• Stacking with CVAP grant permitted **as of Jan. 2021** • +$2,500 for income-qualified households, ≤ 400% FPL, excl. ZEMs	• ≥ 30 U.S. EPA electric miles (45 UDDS) • Rebate Now preapproval option limited to income-qualified households, expanded to include SJ Valley

PEVs = plug-in EVs. FPL = Federal Poverty Level. ZEMs = zero-emission motorcycles. UDDS = Urban Dynamometer Driving Schedule. HOV = high-occupancy-vehicle. FCEVs = fuel-cell EVs. CVAP = Clean Vehicle Assistance Program. MSRP = manufacturer suggested retail price.

§ A second rebate can be approved for a FCEV if the first rebate was for a PEV. ‡ COVID exemptions on application window effectively delayed implementation until 4/15/2021. † Change due to $500 decrease in standard rebate amounts (previous slide).

2021 Included CVRP's Longest Funding Disruption

Table 4: CVRP Waitlists

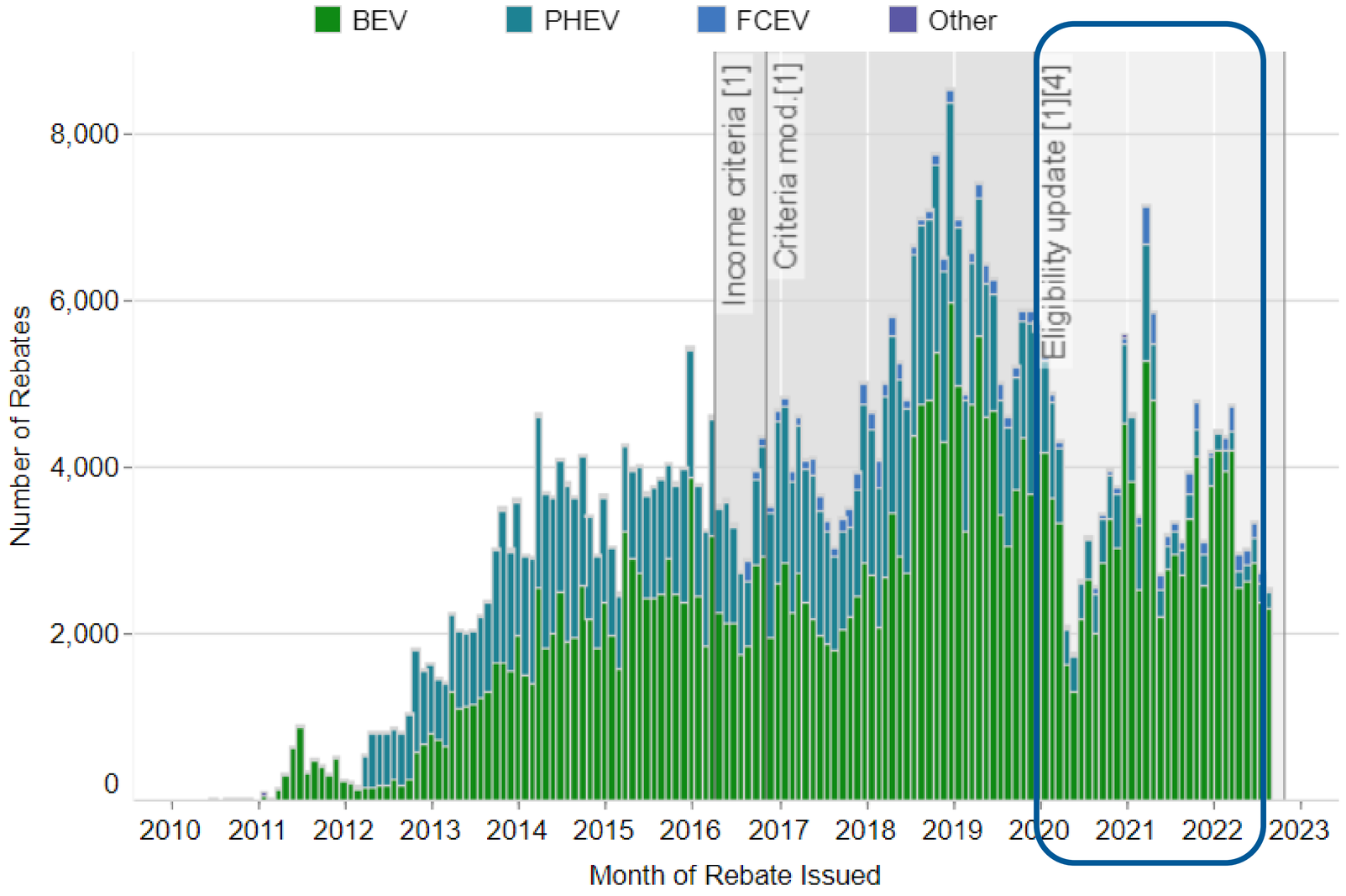
Waitlist Year	Start Date	End Date	Length in Days
2011*	Jun. 20	Sept. 30	102
2013*	May 1	Jun. 30	60
2014	Mar. 28	Jul. 22	116
2016	Jun. 11	Sept. 28	109
2017**	Jun. 30	Nov. 20	143
2019**	Jun. 5	Sept. 23	110
2021	Apr. 23	Sept. 15	145

** Dates approximate.*

*** For standard applications only; no waitlist for income-qualified increased rebates.*

Table adapted from https://cleanvehiclerebate.org/sites/default/files/attachments/Disruptions_Fact_Sheet_9_2021.pdf

2020–21 Results/Trends Should be Interpreted with Caution (COVID) Applications Saw Dramatic Decline But Some Recovery



Rebate applications for calendar year 2021 purchases/leases for individuals spanned 1/1/2021 – 7/1/2022*.

9% applied in 2022.

** Special waivers permitted ~20 applications beyond the 3-month application window. 1/5/23 image from https://cleanvehiclerebate.org/eng/rebate-statistics*

Program Outputs

Consumers Rebated

CVRP Program Application Data Used

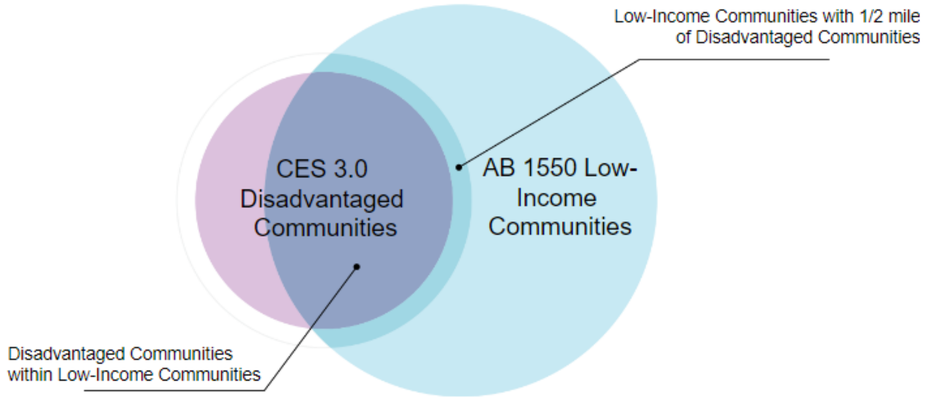
(Shows Rebates to Individuals for Plug-in EVs Only)

	2018 purchases/leases	2019 purchases/leases	2020 purchases/leases	2021 purchases/leases
Vehicle Purchase/ Lease Dates	Jan. 2018 – Dec. 2018	Jan. 2019 – Dec. 2019	Jan. 2020 – Dec. 2020	Jan. 2021 – Dec. 2021
Program Population (*N*)	78,611	61,422	36,481	45,288

Application Data: Rebate Statistics Dashboard Equity Tab

CALIFORNIA CLEAN VEHICLE REBATE PROJECT

Priority Communities (AB 1550) [2]



This is a Venn diagram describing the priority communities of California Assembly Bill (AB) 1550. The small circle on the left represents CalEnviroScreen 3.0 Disadvantaged Communities and the larger circle on the right represents AB 1500 Low-Income Communities. The larger overlapping area represents Disadvantaged Communities within Low-Income Communities. The smaller overlapping area represents Low-income Communities within one half mile of Disadvantaged Communities.

Rebates by Equity Group [2]

Timeframe: [1] Since Income Criteria (3/29/2016 – Present)

		Rebates	Funding	Percent of Funding
All Equity Groups		119,048	$351,794,104	39.6%
Geography	Disadvantaged Communities	37,917	$98,939,884	11.1%
	Low-Income Communities	80,747	$206,391,693	23.2%
	Disadvantaged Communities within Low-Income Communities	*26,435*	*$70,375,234*	*7.9%*
	Low-Income Communities within 1/2 mile of a Disadvantaged Community [2]	*16,213*	*$41,889,057*	*4.7%*
Rebate Type	Increased Rebates for Low-/Moderate-Income Consumers [1]	44,568	$192,934,883	21.7%

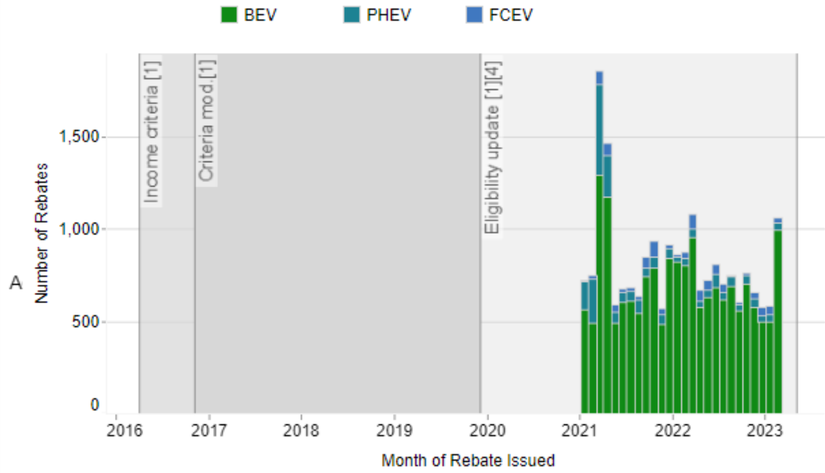
This chart summarizes the number of rebates, amount of funding, and the percent of funding by all equity groups, by geography, and by rebate type. Geography is broken down into two main categories: Disadvantaged Communities (DACs) and Low-Income Communities (LIC). LICs are further split into two subcategories based on distance to DACs.

Filter by:

- Consumer Type: (Low-/Moderate-Income Increas...)
- Purchase or Lease: (All)
- Rebate Type [1]: (None)
- Equity Communities [2]: (All)
- County: (None)
- Electric Utility: (None)
- Air District: (None)
- CA Senate District [3]: (None)
- CA Assembly District [3]: (None)
- Vehicle Category [4]: (None)
- Make: (All)
- Model: (None)
- Funding Source [5]: (None)
- Grant Number [6]: (None)

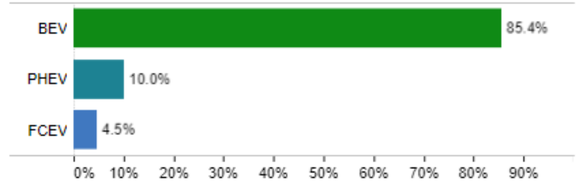
Rebates by Month (Filtered)

Filter by Application Date: [7] January 1, 2021 – February 28, 2023



This figure displays the total number of rebates by month from 2010 to 2021 as a stacked bar chart with each bar containing number of rebates per vehicle technology type. Plug-in Hybrid Electric Vehicles are represented in blue, Battery Electric Vehicles are represented in green, Fuel-cell Electric Vehicles are represented in light purple, Other vehicle categories are represented in dark purple. Additionally, it contains three date markers that represent program changes – the income criteria on 3/29/2016, the modified income criteria on 11/1/2016, and eligibility update on 12/3/2019.

Rebates Issued or Approved to Date [9] (Filtered)



This figure shows four horizontal bars each representing the percent of rebates issued or approved per vehicle technology type.

CALIFORNIA AIR RESOURCES BOARD

CALIFORNIA CLIMATE INVESTMENTS — Cap and Trade Dollars at Work

Center for Sustainable Energy

Last updated: 5/3/2023

[1–7] **Please select the Notes tab of this dashboard for additional details and links to related information.**

06/07/23 images from https://cleanvehiclerebate.org/eng/rebate-statistics

CVRP Consumer Survey Editions

(shows rebates to individuals for plug-in EVs* only)

	2013–2015 Edition	2015–2016 Edition	2016–2017 Edition	2017–2020 Edition	2020–2022 Interim Dataset	Total
Vehicle Purchase/ Lease Dates	Sep. 2012 – May 2015	April 2015 – May 2016	May 2016 – May 2017	June 2017 – Nov. 2020	Dec. 2020 – Sep. 2022	Sep. 2012 – Sep. 2022
Survey Responses (total *n*)**	19,460	11,611	8,957	32,524	13,997	86,549
Program Population (*N*)***	91,081	45,685	46,839	193,167	79,780	456,552

**Plug-in EVs (PEVs) include PHEVs and BEVs.*

*** Subsequently weighted to represent the program population, see "CVRP Consumer Survey: Weighting Detail" slide for further detail.*

**** Small numbers of rebated vehicles are not represented in the time frames due to application lags. Numbers may not be exactly comparable due to evolving weighting practices..*

CVRP Consumer Survey Data Used

(shows rebates to individuals for plug-in EVs only)

	2013–2015 Edition	2015–2016 Edition	2016–2017 Edition	2017–2020 Edition	2018 purchases/ leases subset	2019 purchases/ leases subset	"2020" purchases/ leases subset	2020–2022 Interim Dataset	2021 purchases/ leases subset	Total
Vehicle Purchase/ Lease Dates	Sep. 2012 – May 2015	April 2015 – May 2016	May 2016 – May 2017	June 2017 – Nov. 2020	Jan. 2018 – Dec. 2018	Jan. 2019 – Dec. 2019	Jan. 2020 – **Nov.*** 2020	Dec. 2020 – Sep. 2022	Jan. 2021– Dec. 2021	Sep. 2012 – Sep. 2022
Survey Responses (total *n*)	19,460**	11,611**	8,957**	32,524**	14,757	8,991	4,331**	13,997**	7,694**	86,549
Program Population (*N*)***	91,081	45,685	46,839	193,167	78,591 (filtered subset of weighted Edition)	61,277 (filtered subset of weighted Edition)	26,463	79,780	45,261	456,552

** ~8k 2020 purchases/leases were invited to respond to the successive survey edition and are not represented in these data.*

*** Subsequently weighted to represent the program population, see "CVRP Consumer Survey: Weighting Detail" slide for further detail.*

**** Small numbers of vehicles are not represented in the time frames due to application lags. Numbers may not be exactly comparable due to evolving weighting practices.*

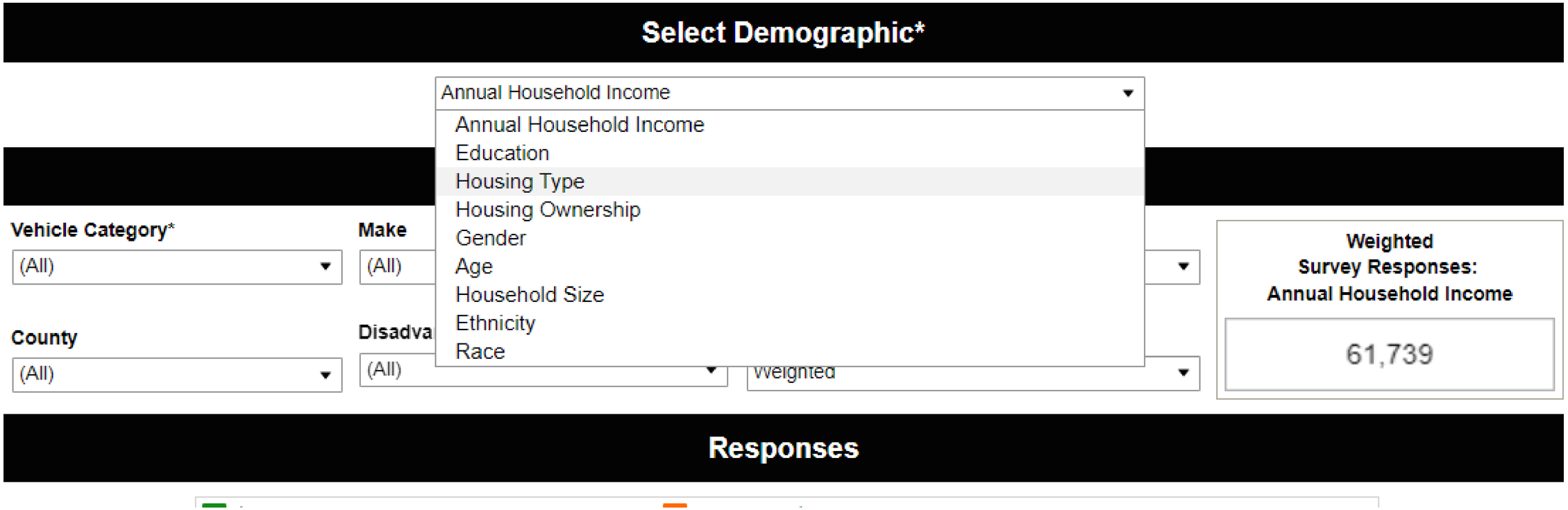
CVRP Consumer Survey: Weighting Detail

- Each survey edition is individually weighted to represent the program population along the dimensions of vehicle category, vehicle model, buy vs. lease, and county.
  - Weighting for the 2017–20 Edition & 2020–22 Interim Dataset also included year of purchase/lease.
- The 2020 & 2021 purchase/lease subsets were also independently weighted
  - This produced only minor differences compared to the filtered approach used for the 2018 & 2019 subsets.
  - Weighting for the 2021 subset also includes rebate type (Standard Rebate vs. Increased Rebate).
- Summary of weights, 2021 purchases/leases:

Min	Median	Mean	Max
0.29	0.999	1	2.72

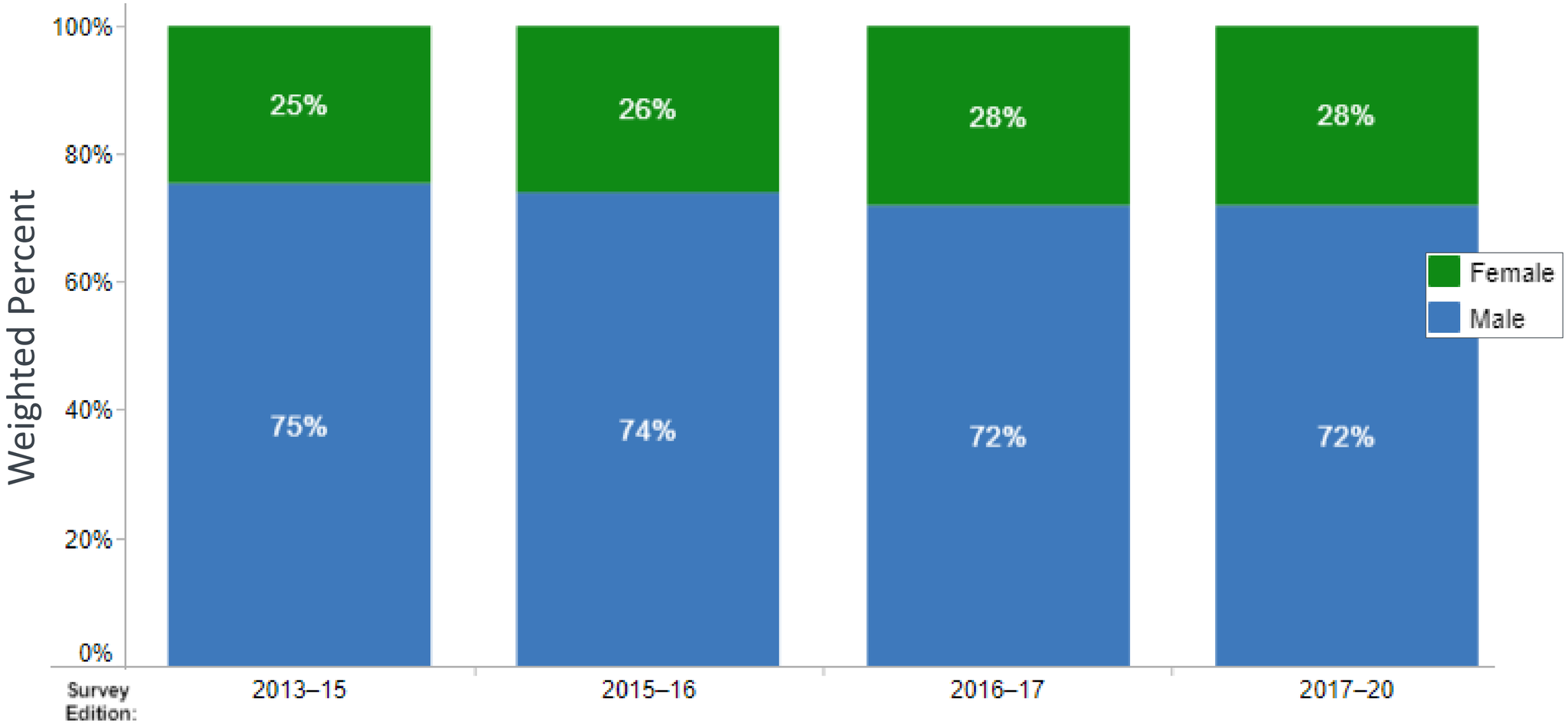
Consumer Survey Dashboard: Demographics

Data from four survey editions (2013–15, ‘15–16, ‘16–17 and ‘17-’20) online…



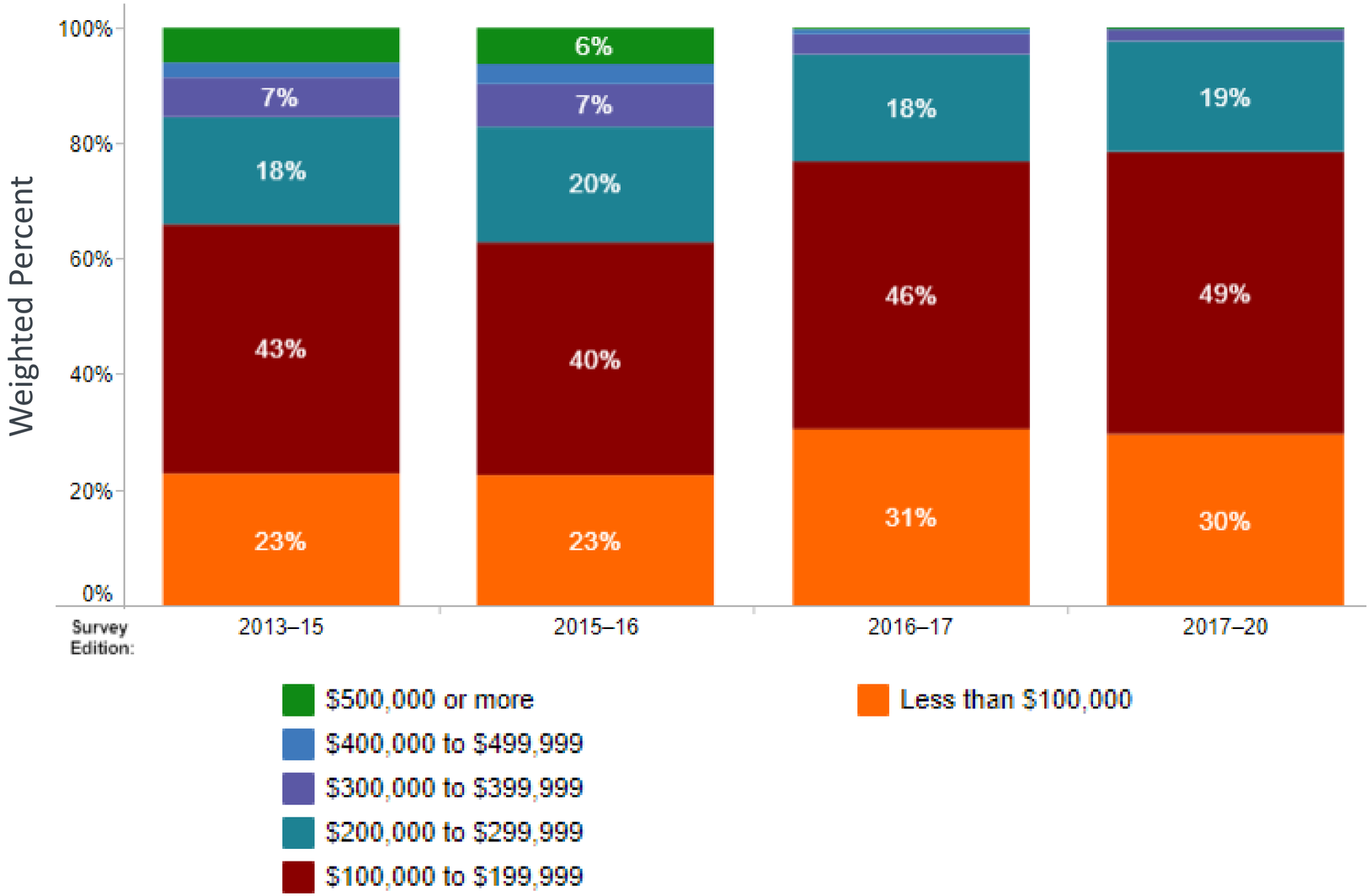
3/6/2023 images excerpted from https://cleanvehiclerebate.org/en/rebate-survey-dashboard

Consumer Survey Dashboard Demographics: Sex/Gender



3/2023 images excerpted from https://cleanvehiclerebate.org/en/rebate-survey-dashboard

Consumer Survey Dashboard Demographics: Household Income



6/2023 images excerpted from https://cleanvehiclerebate.org/en/rebate-survey-dashboard

Consumer Characteristics: Select Publications

Center for Sustainable Energy™

- ❖ B.D.H. Williams (2023, Apr.), Assessing progress and equity in the distribution of electric vehicle rebates using appropriate comparisons, *Transport Policy*, *137*, 141–151. DOI: 10.1016/J.TRANPOL.2023.04.009. Paper. CVRP posting. CSE posting. Precursor video. Slides.
- ❖ B.D.H. Williams and N. Pallonetti (2023, Mar.), New York State's Drive Clean Rebate for Electric Vehicles: Measures of Impact, *36th International Electric Vehicle Symposium (EVS36)*, EDTA, Sacramento CA, USA. Paper. Slides. CSE posting.
- B.D.H Williams and J.B. Anderson (2022, Sep.), From Low Initial Interest to Electric Vehicle Adoption: "EV Converts" in New York State's Rebate Program, *Transportation Research Record: Journal of the Transportation Research Board*. Includes open-access data-summary appendix. DOI: 10.1177/03611981221118537
- B.D.H. Williams (2022, Jun.), Targeting Incentives Cost Effectively: "Rebate Essential" Consumers in the New York State Electric Vehicle Rebate Program, Procs. *35th International Electric Vehicle Symposium (EVS35)*, Session A3, AVERE. Paper. Slides.
- ❖ B.D.H. Williams, J.B. Anderson (2022, Jun.), Lessons Learned About Electric Vehicle Consumers Who Found the U.S. Federal Tax Credit Extremely Important in Enabling Their Purchase, Procs. *35th International Electric Vehicle Symposium (EVS35),* Session H3*,* AVERE. Paper. Slides.
- ❖ B.D.H. Williams (2021, Oct.), *An Electric-Vehicle Consumer Segmentation Roadmap: Strategically Amplifying Participation in the New York Drive Clean Rebate Program*, Report 21-30, *Clean Transportation Reports*, NYSERDA.
- B.D.H. Williams and J. B. Anderson (2021, Mar.), "Strategically Targeting Plug-In Electric Vehicle Rebates and Outreach Using 'EV Convert' Characteristics," *Energies*, vol. 14, no. 7, p. 1899. DOI: 10.3390/en14071899.
- ❖ B.D. Williams, J. Orose, M. Jones, J.B. Anderson (2018, Oct.), Summary of Disadvantaged Community Responses to the Electric Vehicle Consumer Survey, 2013–2015 Edition, Clean Vehicle Rebate Project, San Diego CA. DOI: 10.13140/RG.2.2.36500.58243
- B.D. Williams, J.B. Anderson (2018, Sep.), Strategically Targeting Plug-in Electric Vehicle Rebates and Outreach Using Characteristics of 'Rebate-Essential" Consumers in 2016–2017, in: 31st Int. Electr. Veh. Symp. (EVS31), Society of Automotive Engineers of Japan, Inc., Kobe, Japan.
- ❖ C. Johnson, B.D. Williams, C. Hsu, J.B. Anderson, Summary Documentation of the Electric Vehicle Consumer Survey, 2013–2015 Edition, Clean Vehicle Rebate Project, San Diego CA, 2017.

Reverse chronological as of 10/2023; key sources marked with a diamond bullet.

Consumer Characteristics: Select Presentations, Panels & Video

- ❖ B.D.H. Williams (2023, Oct. 25), Panel: “E-Mobility Research and Data Analytics,” National E-Mobility Diversity, Equity, & Inclusion Conference 2023, EV Noire, Washington DC, USA.
- ❖ NY Drive Clean Rebates: Select Impacts Through 2021, EVS36, DOI: 10.13140/RG.2.2.19062.16966. Paper. CSE posting. (2023, Jun. 12)
- • Lessons Learned About Electric Vehicle Consumers Who Rated the U.S. Federal Tax Credit ‘Extremely Important’ in Enabling Their Purchase, EVS35, DOI: 10.13140/RG.2.2.32943.61602. Paper. (2022, Jun. 15)
- • Targeting Incentives Cost Effectively: ‘Rebate Essential’ Consumers in the New York State Electric Vehicle Rebate Program, EVS35, DOI: 10.13140/RG.2.2.22877.28640. Paper. (2022, Jun. 13)
- ❖ Video: “HEC 2022 Panel - Electrification and Transportation,” opening presentation minutes 2–10; 40-minute panel total. Slides. (2022, May)
- ❖ CARB Video: “CVRP 2020 Data Brief: Consumer Characteristics,” time 1:05:43–1:26:09. Slides. DOI: 10.13140/RG.2.2.19493.58089. Paper. (2022, Mar.)
- • Data from Statewide Electric Vehicle Rebate Programs: Vehicles, Consumers, Impacts, and Effectiveness (2021, Jul.)
- • EV Purchase Incentives: Program Design, Outputs, and Outcomes of Four Statewide Programs with a Focus on Massachusetts DOI: 10.13140/RG.2.2.13166.08001. (2020, Dec.)
- • Electric Vehicle Incentives and Policies DOI: 10.13140/RG.2.2.34976.46089. (2019, Nov.)
- • CVRP: Data and Analysis Update DOI: 10.13140/RG.2.2.12750.33609. (2018, Dec.)
- • Electric Vehicle Rebates: Exploring Indicators of Impact in Four States DOI: 10.13140/RG.2.2.21138.94404. (2018, Jun.)
- • Yale Webinar: “Supporting EV Commercialization with Rebates: Statewide Programs, Vehicle & Consumer Data, and Findings,” 58 minutes. Slides. (2017, Apr.)
- ❖ Electric Vehicle Rebates in Disadvantaged Communities: Evaluating Progress with Appropriate Comparisons (2016, Oct.)
- • Implementation Status Update (2015, Dec.)

Reverse chronological as of 6/2023; key sources marked with a diamond bullet.

Racial Identification [check all that apply]: 2021

Racial Identity [check all that apply]	CVRP Plug-in EV Rebates All application data *n* = 39,464	Difference	CVRP Plug-in EV Rebates Weighted subset of Application data* *n* = 6,869
American Indian or Alaskan Native	1%	← 0.1% →	1%
Black or African American	4%	← –0.4% →	4%
East Asian	18%	← 3% →	15%
Middle Eastern or North African	3%	← 1% →	2%
Native Hawaiian or other Pacific Islander	2%	← –0.1% →	3%
South Asian	7%	← 1% →	5%
Southeast Asian	14%	← –1% →	15%
white or Caucasian	43%	← –5% →	49%
"Other"	12%	← 1% →	11%

Will be used in some slides below and indicated with shading

** CVRP results are created with weighted data from the application using the subset of program participants that responded to the survey.*

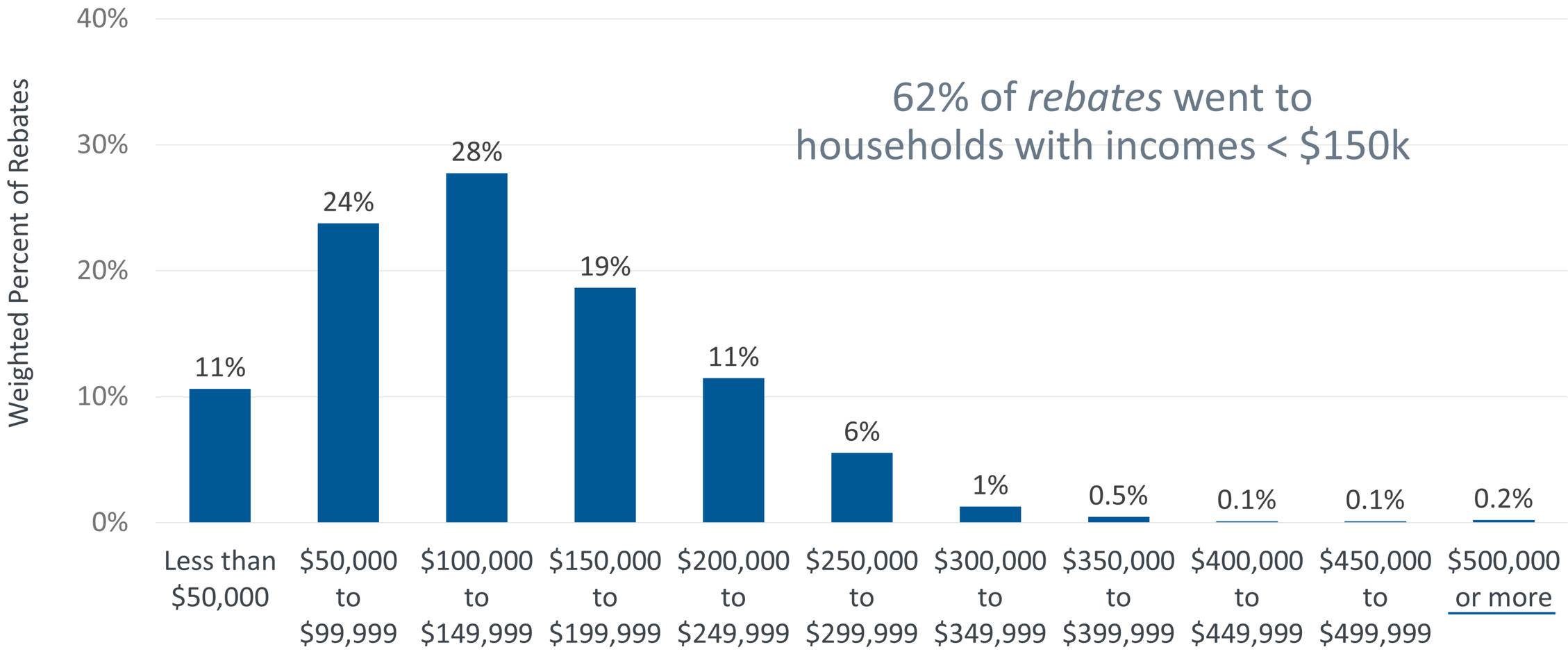
In a separate question, 16% self-identified as Hispanic or Latino (n = 42,928). "Prefer not to answer," "I don't know," and similar responses are excluded throughout.

Ethnicity-Question Identification: 2021

Ethnicity-Question Identification	CVRP Plug-in EV Rebates All application data *n* = 42,928	Difference	CVRP Plug-in EV Rebates Weighted subset of Application data* *n* = 7,379
Identifies as Hispanic or Latino(a)	16%	← –0.1% →	16%

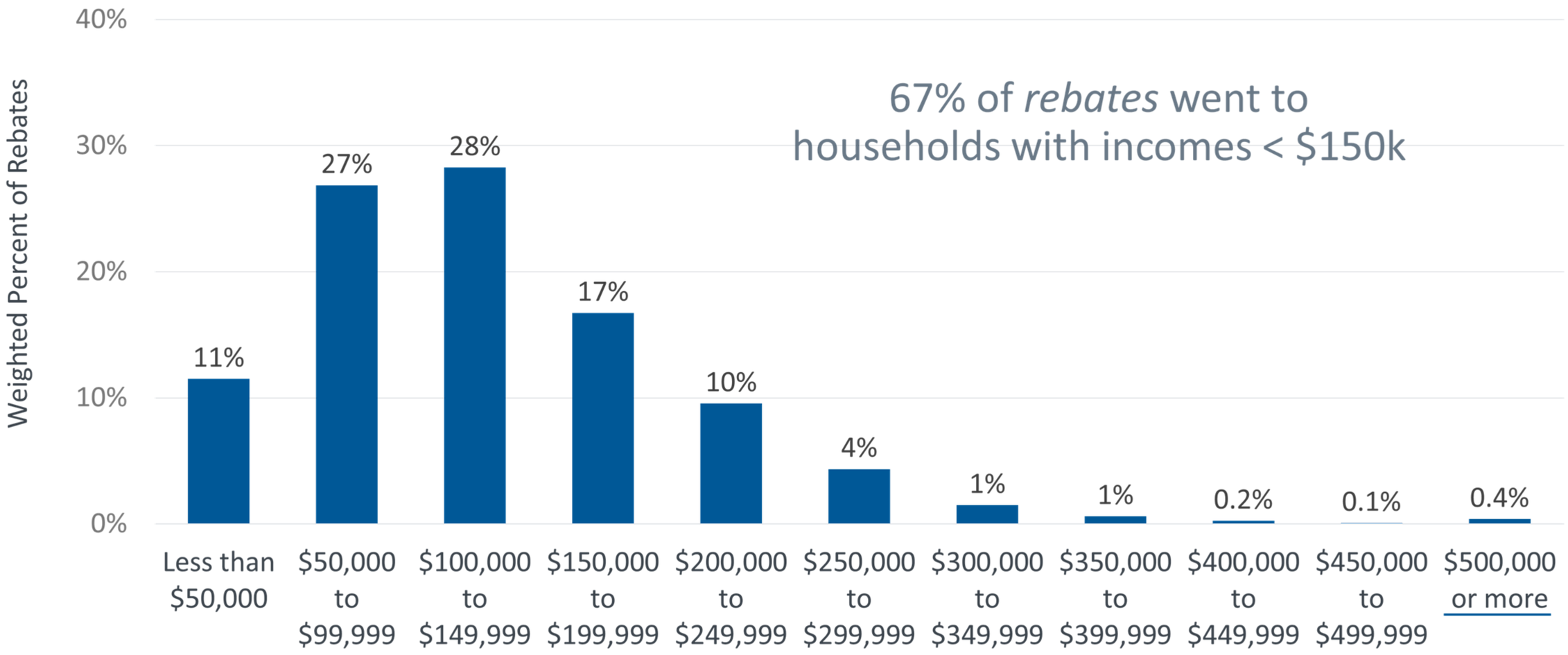
** Results are created with weighted data from the application using the subset of program participants that responded to the survey.*
Hispanic/ Latino(a) identification is asked in a different question and may include identification with one or more races. "Prefer not to answer," "I don't know," and similar responses are excluded throughout.

Distribution of Plug-in EV *Rebates* by Household Income:
Calendar Year (CY) 2020 Purchases/Leases



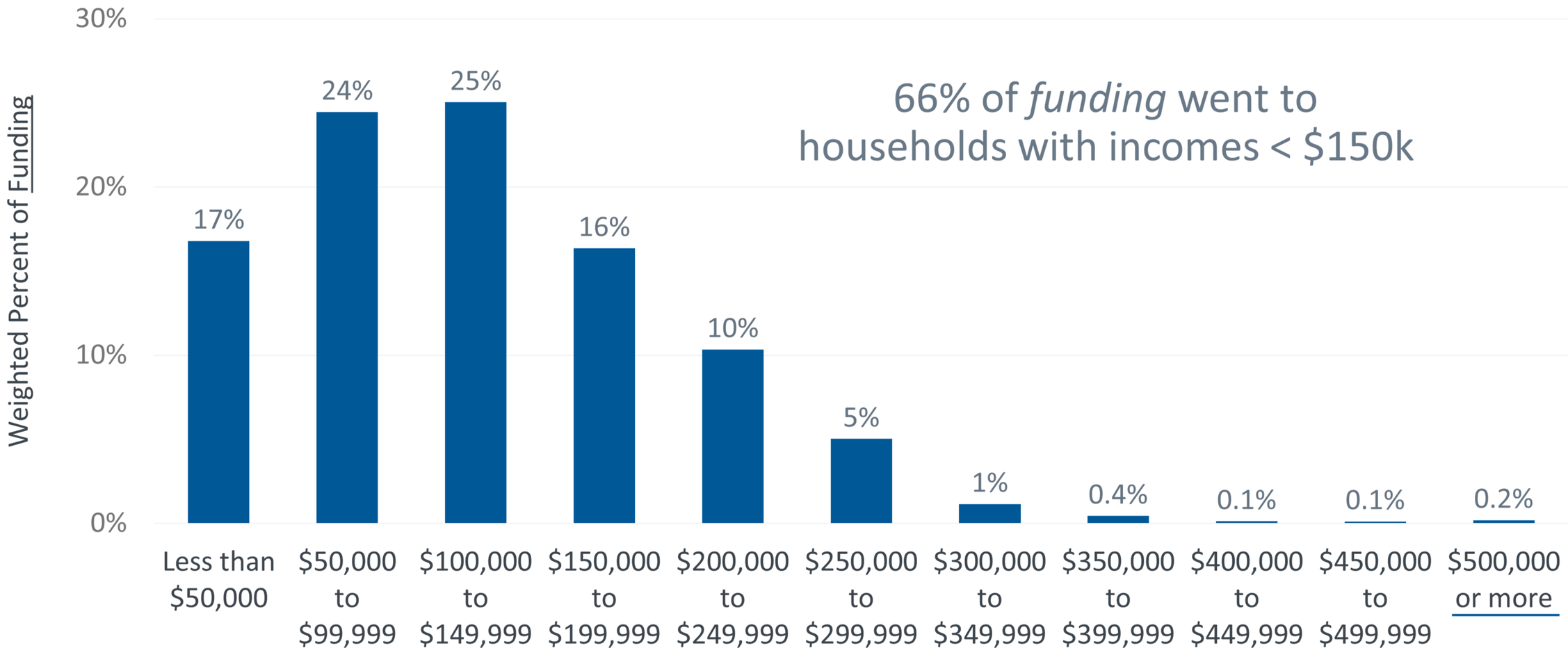
CVRP Consumer Survey, 2017–2020 Edition.
Filtered, question-specific n = 3,831.

Distribution of Plug-in EV *Rebates* by Household Income:
Calendar Year (CY) 2021 Purchases/Leases



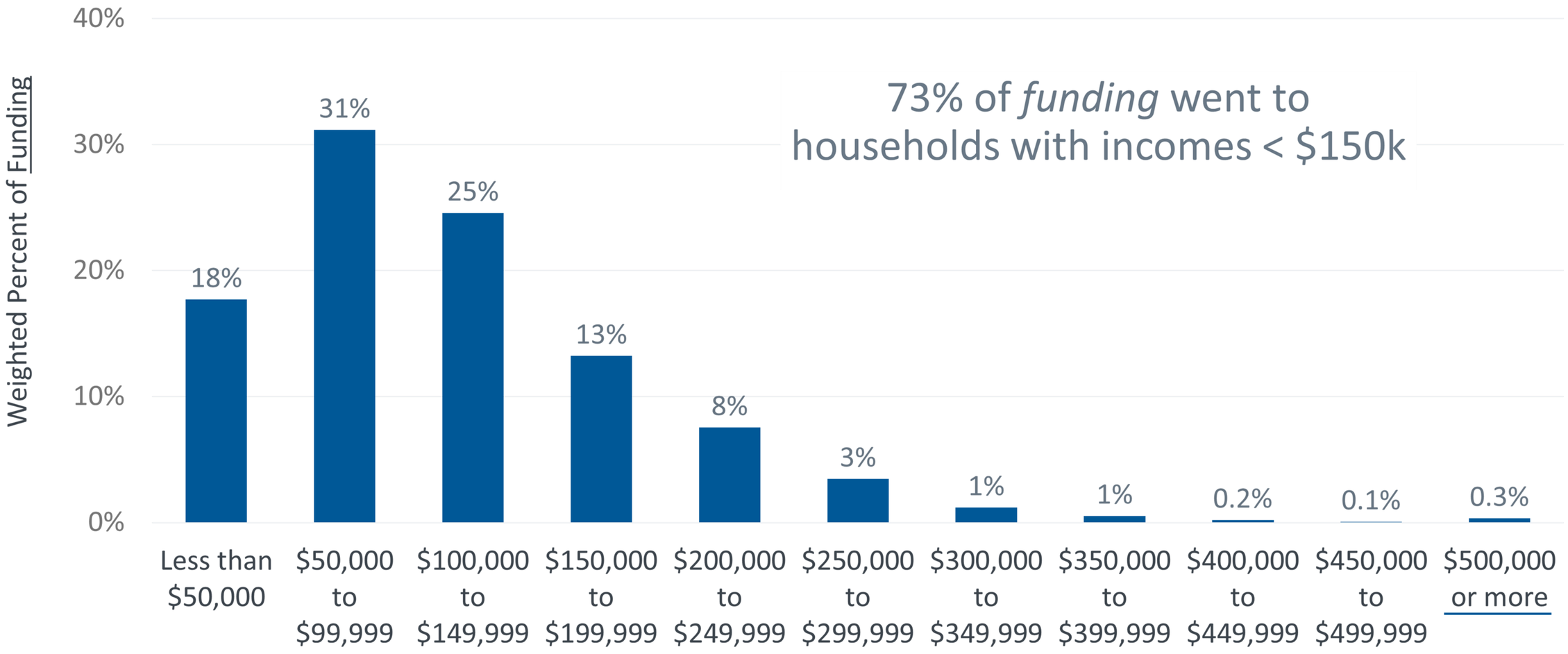
CVRP Consumer Survey, 2020–2022 Interim Dataset.
Filtered, question-specific n = 6,874.

Distribution of Plug-in EV *Funding* by Household Income:
Calendar Year (CY) 2020 Purchases/Leases



CVRP Consumer Survey, 2017–2020 Edition.
Filtered, question-specific n = 3,831.

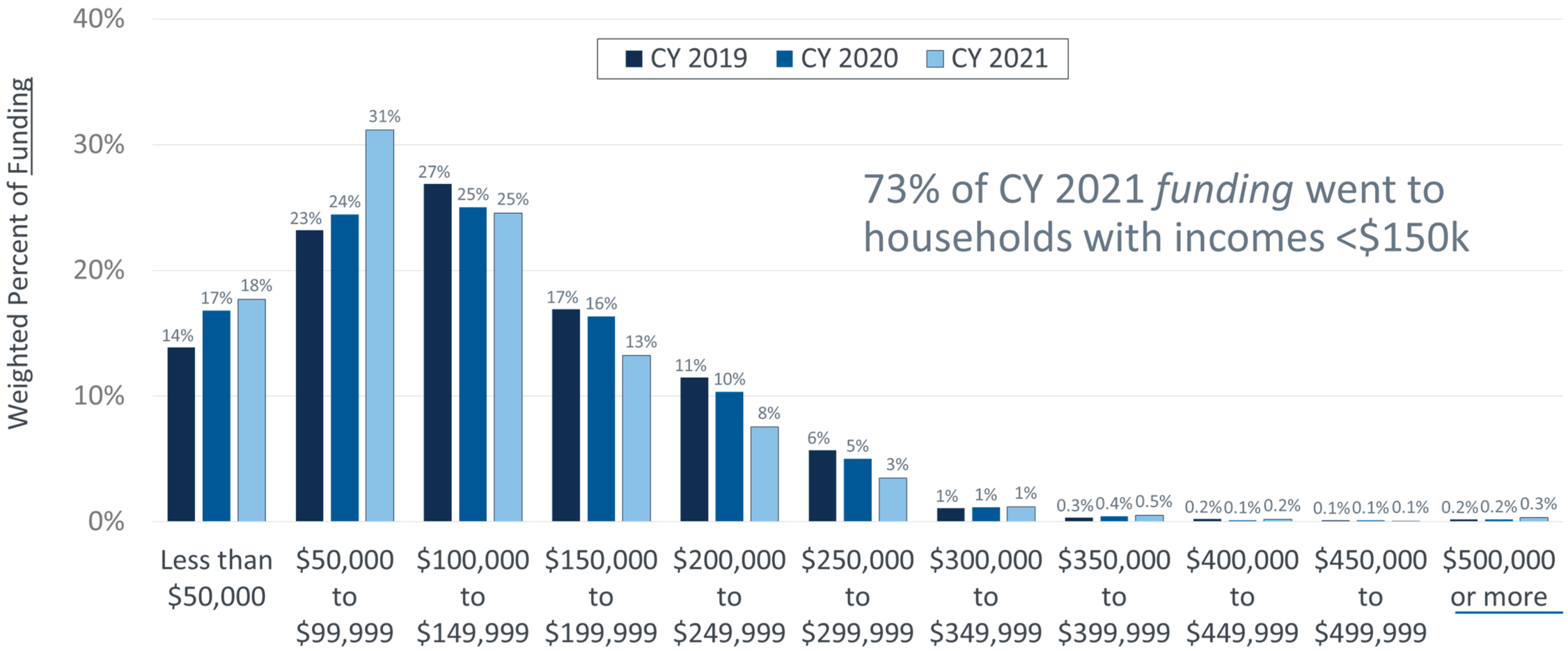
Distribution of Plug-in EV *Funding* by Household Income:
Calendar Year (CY) 2021 Purchases/Leases



CVRP Consumer Survey, 2020–2022 Interim Dataset.
Filtered, question-specific n = 6,874.

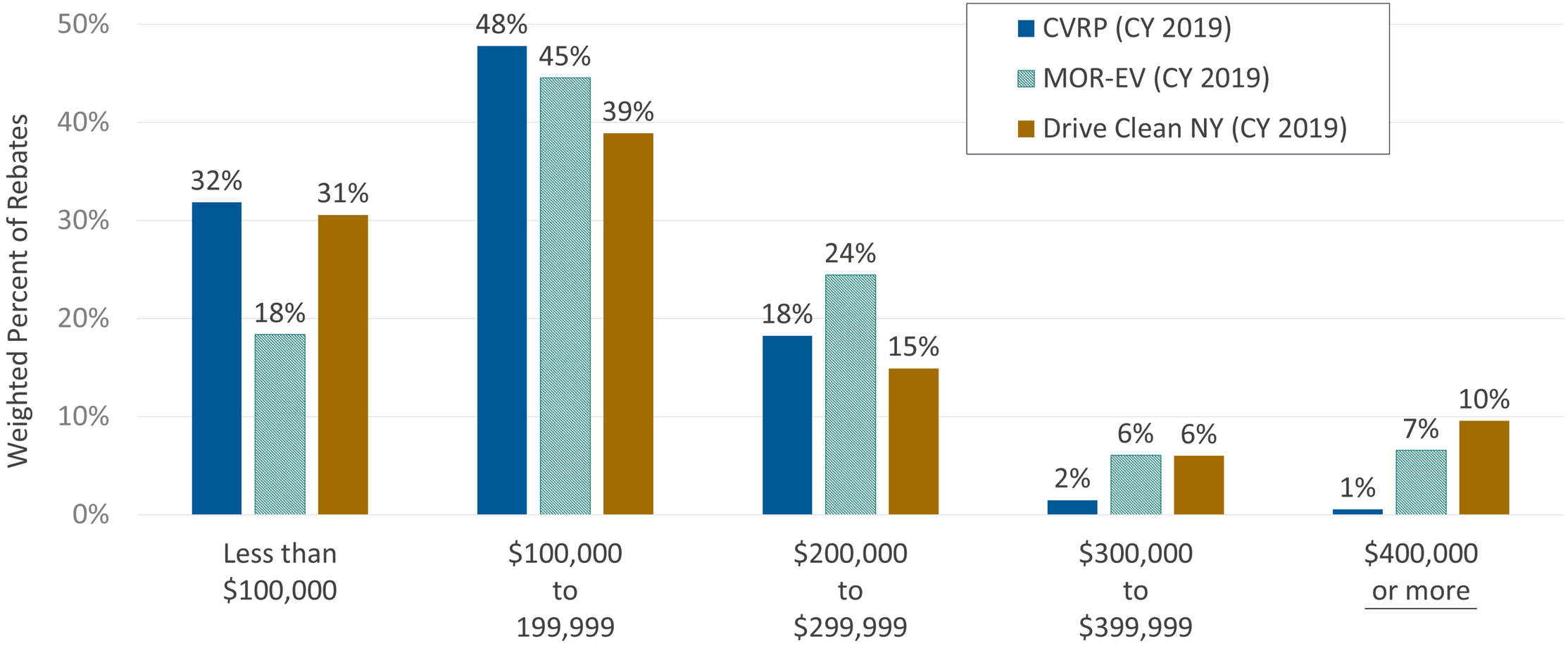
Funding Continues to Shift Toward Lower-Income Households

CY 2019 thru 2021 Plug-in EV Purchases/Leases



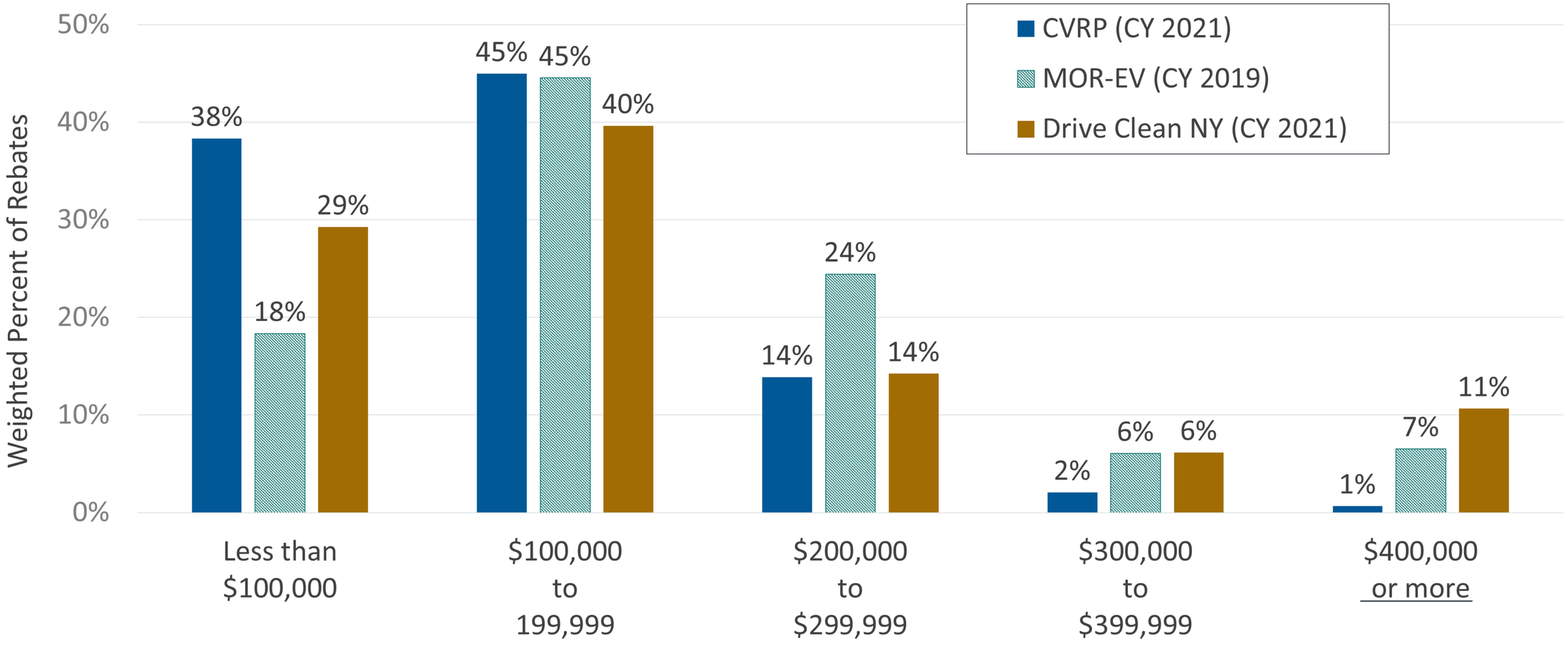
CVRP Consumer Survey, 2017–2020 Edition: 2019 n = 7,992; 2020 n = 3,831. 2020–2022 Interim Dataset: 2021 n = 6,874.
n-values are filtered and question-specific.

Household Income Distribution:
CA, MA, and NY Plug-in EV Rebates (pre-COVID)



CVRP Consumer Survey: 2017–2020 Edition. Filtered, question-specific n = 7,992.
MOR-EV Consumer Survey: 2014–2020 Edition. Filtered, question-specific n = 508.
Drive Clean NY Consumer Survey: 2017–2019 Edition. Filtered, question-specific n = 1,817

Household Income Distribution:
CA, MA, and NY Plug-in EV Rebates (most recent year available)



CVRP Consumer Survey: 2020–2022 Interim Dataset. Filtered, question-specific n = 6,874.
MOR-EV Consumer Survey: 2014–2020 Edition. Filtered, question-specific n = 508.
Drive Clean NY Adoption Survey. Filtered, question-specific n = 4,237.

Setting an Appropriate Baseline:
U.S. Car Buyers Are Different Than the Population

	 **U.S. Population** 2015–2019 (Census 2019)	**U.S. New-Vehicle Buyers** MYs 2016–17 (2017 NHTS)
Selected solely white/Caucasian	61% <<	74%
≥ 50 Years Old	35% <<	51%
≥ Bachelor's Degree	24% <<<<	57%
≥ $75k HH Income*	42% <<<	62%
Own Residence*	64% <<	77%
Selected Male	49% ≈	51%

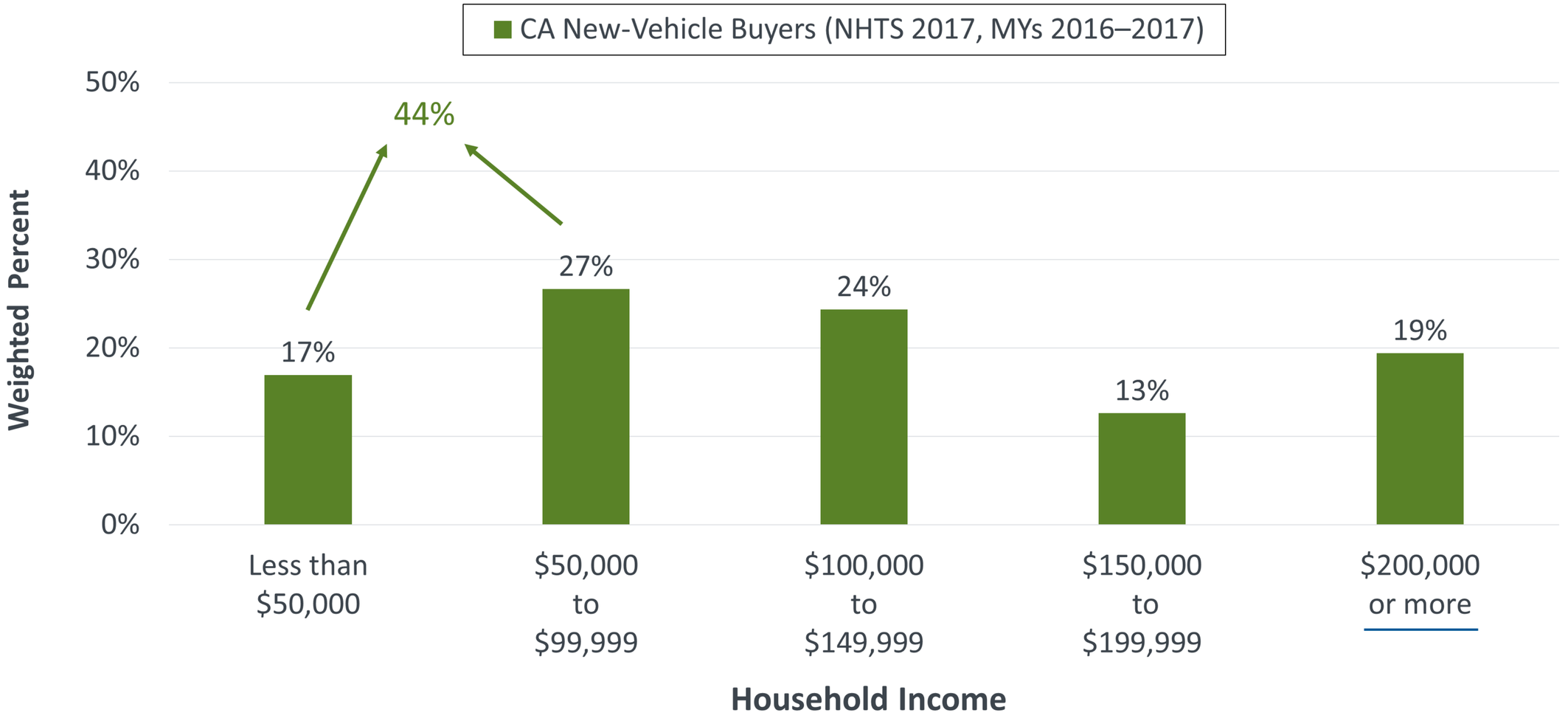
New-car buyers are different on almost every dimension.

- More frequently:
  - White
  - Older
  - Degree holders
  - Higher income
  - Residence owners
- *Some* of the difference explained by driving or buying age
- The rest may be due in part to ***social inequities***

** Based upon household level data.*

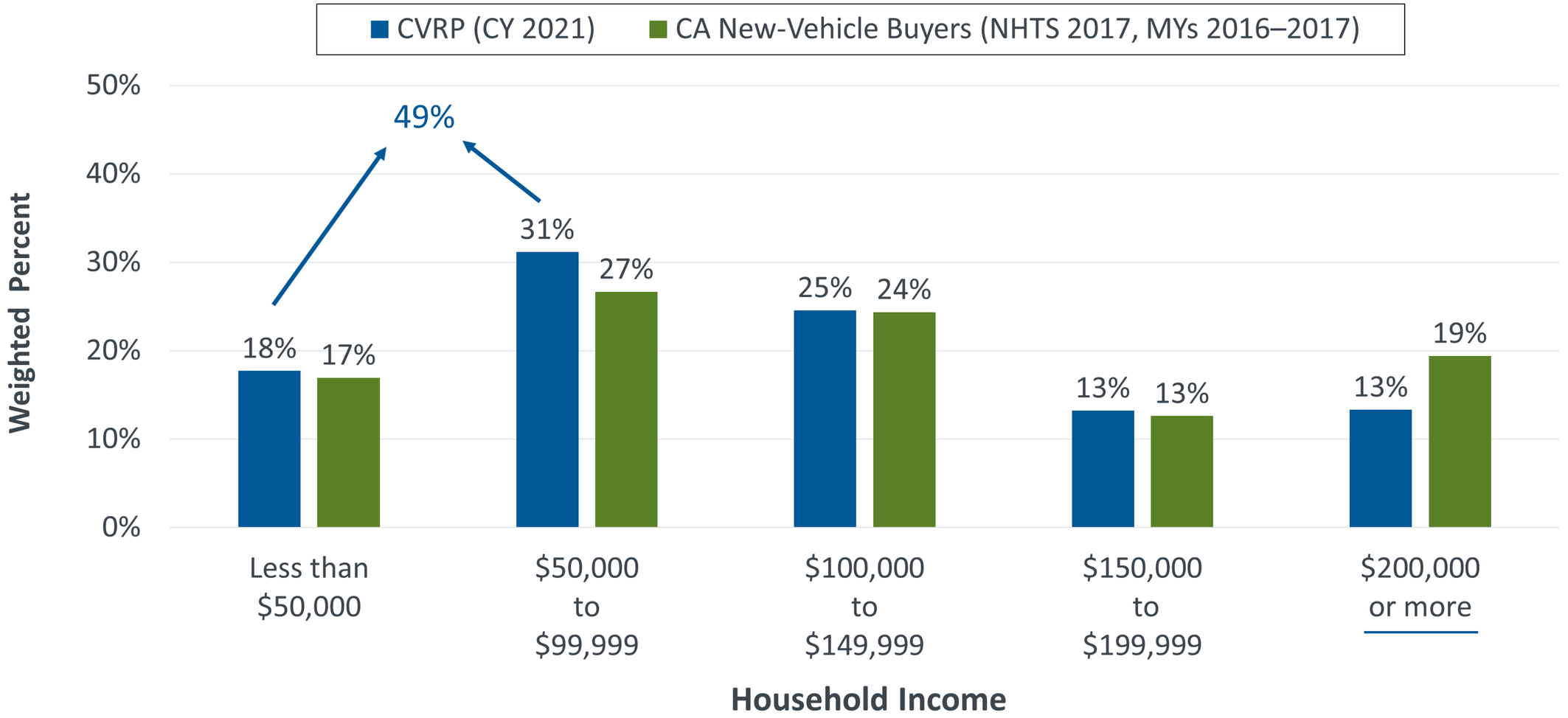
Census 2019: 2015–2019 American Community Survey, PUMS. NHTS 2017 is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned. "Prefer not to answer," "I don't know," and similar responses are excluded throughout.

Households with income < $100k are just 44% of new-vehicle buyers



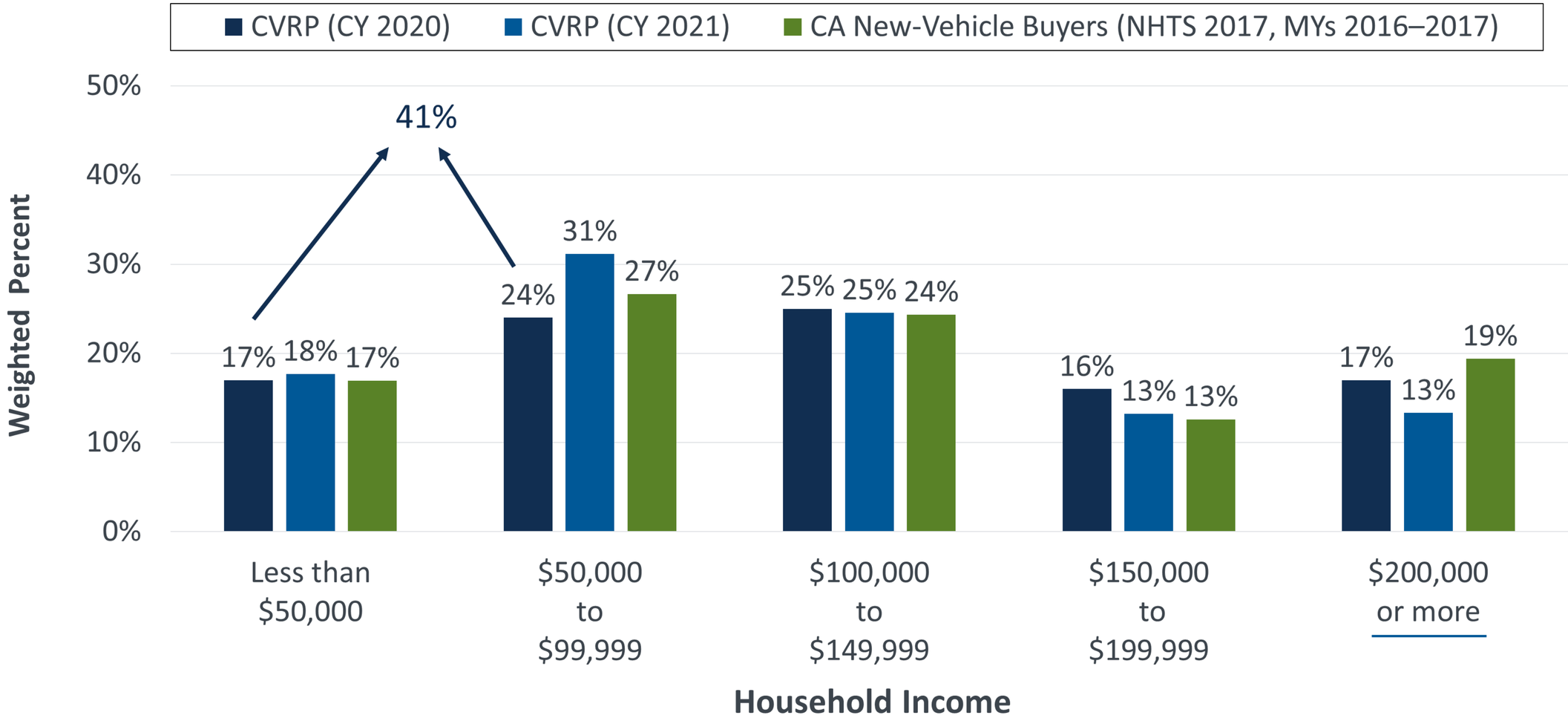
NHTS 2017 (CA add-on) is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

Households with income < $100k are just 44% of new-vehicle buyers, but received 49% of funding



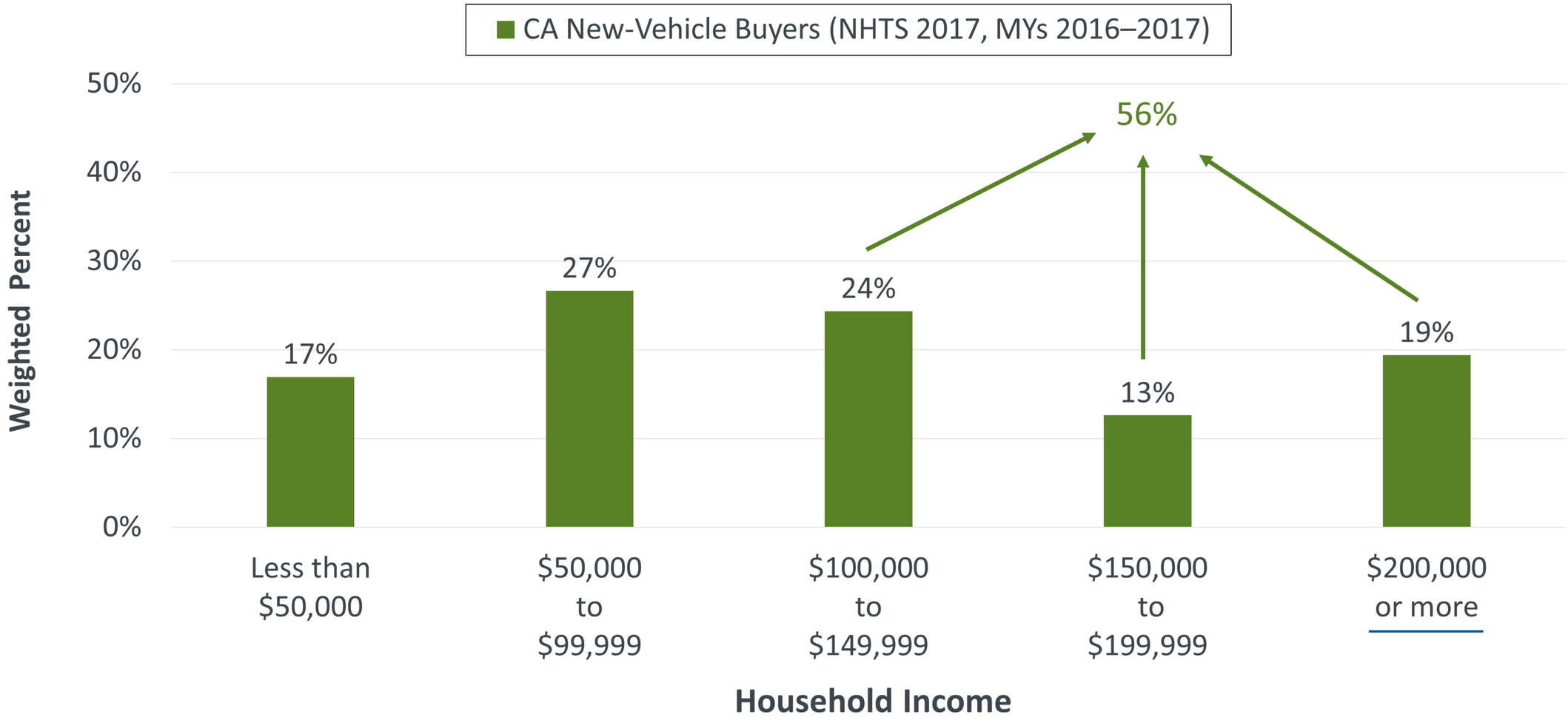
CVRP Consumer Survey, 2020–2022 Interim Dataset. Filtered, question-specific n = 6,874.
NHTS 2017 (CA add-on) is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

…and that is up from 41% for 2020 purchases/leases



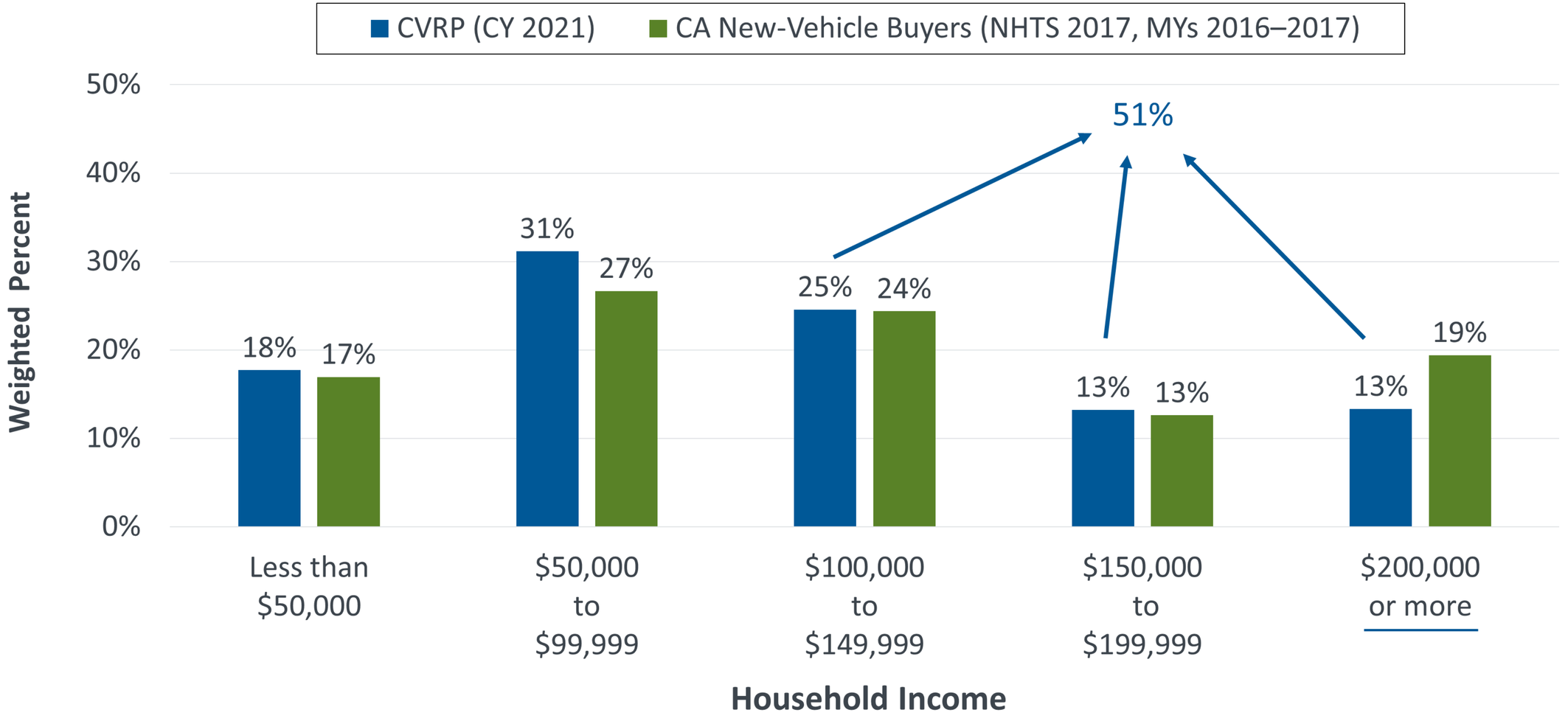
CVRP Consumer Survey, 2017–2020 Edition, 2020 n = 3,831. 2020–2022 Interim Dataset, 2021 n = 6,874. n-values are filtered and question-specific. NHTS 2017 (CA add-on) is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

Households with income > $100k are the majority: 56% of new-vehicle buyers



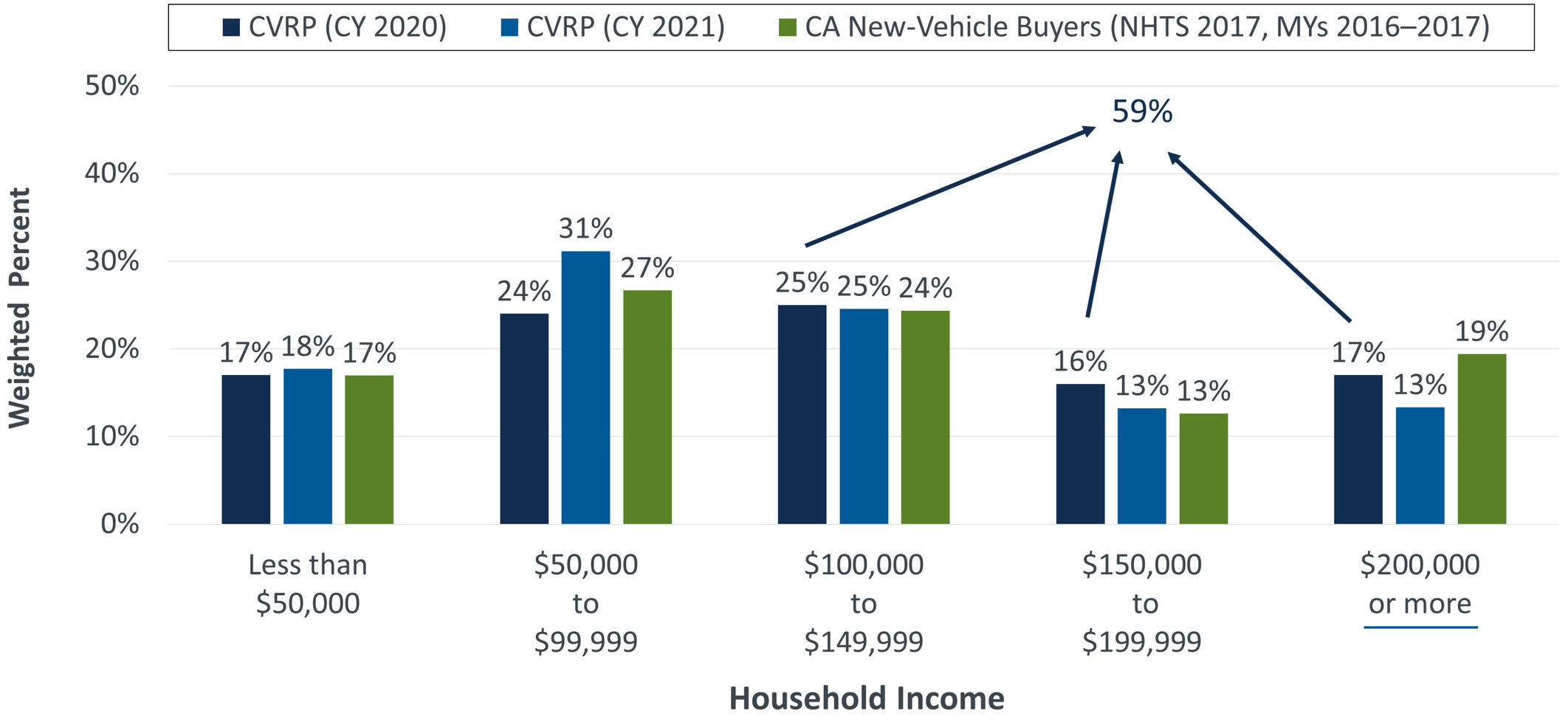
NHTS 2017 (CA add-on) is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

Households with income > $100k are the majority: 56% of new-vehicle buyers, but received 51% of funding



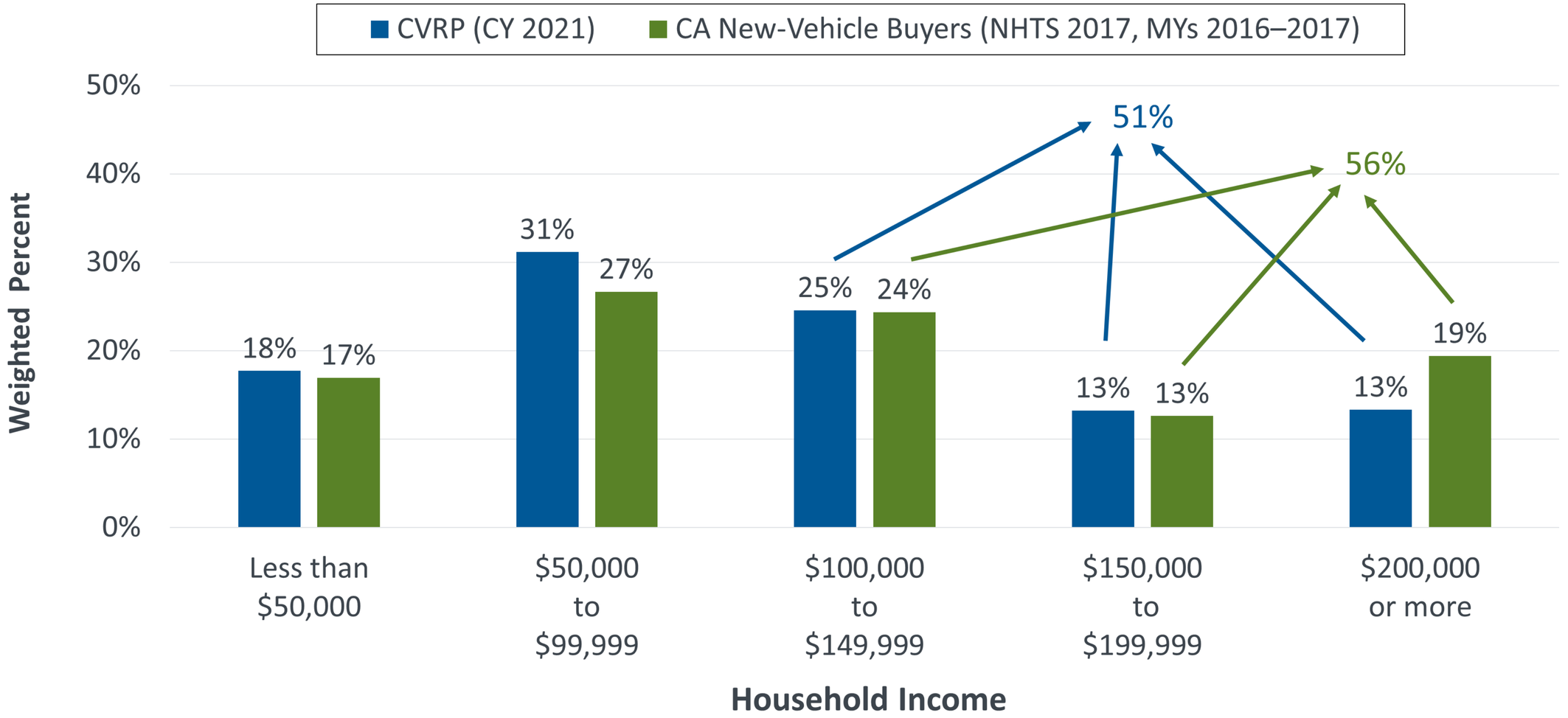
CVRP Consumer Survey, 2020–2022 Interim Dataset. Filtered, question-specific n = 6,874.
NHTS 2017 (CA add-on) is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

…and that is down from 59% for 2020 purchases/leases



CVRP Consumer Survey, 2017–2020 Edition, 2020 n = 3,831. 2020–2022 Interim Dataset, 2021 n = 6,874. n-values are filtered and question-specific. NHTS 2017 (CA add-on) is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

Households with income > $100k are the majority: 56% of new-vehicle buyers, but received 51% of funding



CVRP Consumer Survey, 2020–2022 Interim Dataset. Filtered, question-specific n = 6,874.
NHTS 2017 (CA add-on) is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

2021 Household Income Metric with an Appropriate Program-Evaluation Comparison

The majority of new-car buyers	CVRP Plug-in EV Rebate Funding 2021 *n* = 7,694 Weighted results	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	CA Population 2017–2021 (Census 2021)
≥ $100k household income	51%	56% §	42% §

§ Based upon household-level data.

"Prefer not to answer," "I don't know," and similar responses are excluded throughout. Census 2021: 2017–2021 American Community Survey, PUMS.

NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

2021 Household Income Metric with Comparisons

The majority of new-car buyers	CVRP Plug-in EV Rebate Funding 2021 *n* = 7,694 Weighted results	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	CA Population 2017–2021 (Census 2021)
≥ $100k household income	51%	56% §	42% §

§ Based upon household-level data.

"Prefer not to answer," "I don't know," and similar responses are excluded throughout. Census 2021: 2017–2021 American Community Survey, PUMS.

NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Decomposing Household Income Differences: 2021

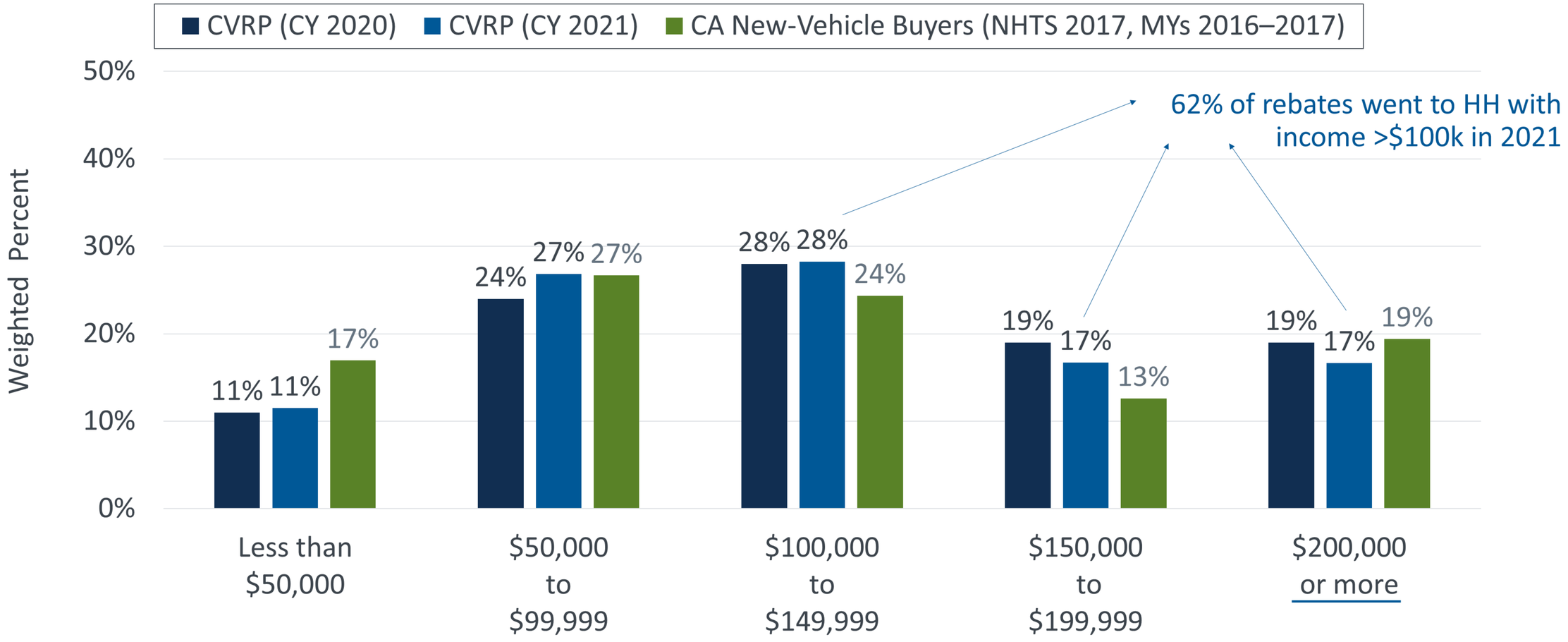
The majority of new-car buyers	**CVRP Plug-in EV Rebate Funding 2021** *n* = 7,694 **Weighted results**	Portion of total difference attributable to EVs	**CA New-Vehicle Buyers MYs 2016–17** (2017 NHTS CA add-on)	Portion of total difference explained by car buying	CA Population 2017–2021 (Census 2021)
≥ $100k household income	51%	← –56% →	56% §	← 156% →	42% §

§ Based upon household-level data.

"Prefer not to answer," "I don't know," and similar responses are excluded throughout. Census 2021: 2017–2021 American Community Survey, PUMS.

NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Household Income Distribution:
CVRP Plug-in EV *Rebates* and CA New-Vehicle Buyers



CVRP Consumer Survey, 2017–2020 Edition, 2020 n = 3,831. 2020–2022 Interim Dataset, 2021 n = 6,874. n-values are filtered and question-specific. NHTS 2017 (CA add-on) is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

Latest Characteristics with Appropriate Program-Evaluation Comparisons

2021 CVRP Consumer Survey data & weighted application data subset*

The majority of new-car buyers	CVRP Plug-in EV Rebates 2021 *n* = 7,694 Weighted results*	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	CA Population 2017–2021 (Census 2021)
Selected solely white/Caucasian	40%	51%	36%
≥ 40 years old	67%	68%	46%
≥ Bachelor's degree	72%	58%	26%
≥ $100k household income	62%	56% §	42% §
Own residence	76%	63% §	55% §
Selected male	66%¶	50%	50%

** Shaded CVRP cells are created with weighted data from the application using the subset of program participants that responded to the survey. § Based upon household-level data. ¶ 100% includes non-binary options.*

"Prefer not to answer," "I don't know," and similar responses are excluded throughout. Census 2021: 2017–2021 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Latest Characteristics with Comparisons

2021 CVRP Consumer Survey data & weighted application data subset*

The majority of new-car buyers	CVRP Plug-in EV Rebates 2021 *n* = 7,694 Weighted results*	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	CA Population 2017–2021 (Census 2021)
Selected solely white/Caucasian	40%	51%	36%
≥ 40 years old	67%	68%	46%
≥ Bachelor's degree	72%	58%	26%
≥ $100k household income	62%	56% §	42% §
Own residence	76%	63% §	55% §
Selected male	66%¶	50%	50%

** Shaded CVRP cells are created with weighted data from the application using the subset of program participants that responded to the survey. § Based upon household-level data. ¶ 100% includes non-binary options.*

"Prefer not to answer," "I don't know," and similar responses are excluded throughout. Census 2021: 2017–2021 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Explaining Differences

CVRP Consumer Survey data & weighted application data subset*

The majority of new-car buyers	**CVRP Plug-in EV Rebates 2021** *n* = 7,694 **Weighted results***	Portion of total difference attributable to EVs	**CA New-Vehicle Buyers MYs 2016–17** (2017 NHTS CA add-on)	Portion of total difference explained by car buying	CA Population 2017–2021 (Census 2021)
Selected solely white/Caucasian	40%	← –275% →	51%	← 375% →	36%
≥ 40 years old	67%	← –5% →	68%	← 105% →	46%
≥ Bachelor's degree	72%	← 30% →	58%	← 70% →	26%
≥ $100k household income	62%	← 30% →	56% §	← 70% →	42% §
Own residence	76%	← 62% →	63% §	← 38% →	55% §
Selected male	66%¶	← 100% →	50%	← 0% →	50%

** Shaded CVRP cells are created with weighted data from the application using the subset of program participants that responded to the survey. § Based upon household-level data. ¶ 100% includes non-binary options.*

"Prefer not to answer," "I don't know," and similar responses are excluded throughout. Census 2021: 2017–2021 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Racial Identification with Comparisons

2021

Racial Identity	CVRP Plug-in EV Rebates Application data *n* = 39,048	Portion of total difference attributable to EVs	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	Portion of total difference explained by car buying	CA Population 2017–2021 (Census 2021)
Selected solely white or Caucasian	34%	← 850% →	51%	← –750% →	36%
Selected solely Black or African American	3%	← "100%" →	5%	← "0%" →	5%

Quotes around results indicate uncertainty in smaller-sample results.

In a separate question, 16% self-identified as Hispanic or Latino (n = 42,928). "Prefer not to answer," "I don't know," and similar responses are excluded throughout.

Census 2021: 2017–2021 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Quantifying the Road that Remains: Rebates (2020)

Percentage-Point Differences from the New-Vehicle-Buyer Baseline

The majority of new-car buyers	All CVRP		CA New-Vehicle Buyers
Selected solely white/Caucasian	-1		0
≥ 40 years old	7		0
≥ $100k HH income	10		0
Own residence	17		0
Selected male	21		0
Total points:	**54**		**0**

Rebate data filtered by purchase/lease date. "Prefer not to answer," "I don't know," and similar responses are excluded throughout.
CA New-Vehicle Buyers (2017 NHTS) weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned, using most-recent model years available (2016–17).

Quantifying the Road that Remains: Rebates (2021)

Percentage-Point Differences from the New-Vehicle-Buyer Baseline

The majority of new-car buyers	All CVRP	CA New-Vehicle Buyers
≥ Bachelor's degree	14	0
≥ $100k HH income	6	0
Own residence	13	0
Total points:	**33**	**0**

Rebate data filtered by purchase/lease date. "Prefer not to answer," "I don't know," and similar responses are excluded throughout.
CA New-Vehicle Buyers (2017 NHTS) weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned, using most-recent model years available (2016–17).

Assessing Progress: Rebates

CVRP Consumer Survey data & weighted application data subset*

The majority of new-car buyers	CVRP Plug-in EV Rebates — Purchase/Lease Dates: CY 2018 *n* = 14,757 Weighted results	CY 2019 *n* = 8,991 Weighted results	CY 2020 *n* = 4,331 Weighted results	CY 2021 *n* = 7,694 Weighted results*	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	CA Population 2017–2021 (Census 2021)
Selected solely white/Caucasian	52%	50%	50%	40%	51%	36%
≥ 40 years old	76%	73%	75%	67%	68%	46%
≥ Bachelor's degree	84% ‡	83% ‡	79% ‡	72%	58%	26%
≥ $100k household income	73%	68%	66%	62%	56% §	42% §
Own residence	83%	79%	80%	76% †	63% §	55% §
Selected male	73%¶	71% ¶	71% ¶	66%¶	50%	50%

* Shaded CVRP cells are created with data from the application using the subset of program participants that responded to the survey. ‡ Based upon highest household attainment, whereas CY 2021, NHTS & Census characterize individual educational attainment. † A "Neither rent nor own" response option was added, see Appendix for further detail. § Based upon household-level data. ¶ 100% includes non-binary options. Census 2021: 2017–2021 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Assessing Progress: Funding

CVRP Consumer Survey data

The majority of new-car buyers	CVRP Plug-in EV Rebate Funding Purchase/Lease Dates: CY 2019 *n* = 8,991 Weighted results	CY 2020 *n* = 4,331 Weighted results	CY 2021 *n* = 7,694 Weighted results	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	CA Population 2017–2021 (Census 2021)
≥ $100k household income	63%	59%	51%	56% §	42% §

§ Based upon household-level data "Prefer not to answer," "I don't know," and similar responses are excluded throughout.

Census 2021: 2017–2021 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Characteristics by Vehicle Type: Rebates

2020

The majority of new-car buyers	CVRP Plug-in EV Rebates — Vehicle Type: CY 2020 BEVs *n* = 3,464 Weighted results	CVRP Plug-in EV Rebates — Vehicle Type: CY 2020 PHEVs *n* = 867 Weighted results	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	CA Population 2015–2019 (Census 2019)
Selected solely white/Caucasian	50%	49%	51%	37%
≥ 40 years old	74%	76%	68%	45%
≥ Bachelor's degree in HH	80%	77%	‡	‡
≥ $100k household income	69%	52%	< 56% §	38% §
Own residence	81%	75%	63% §	54% §
Selected male	72% ¶	66% ¶	50%	50%

‡ Census & NHTS data characterize individual educational attainment, whereas rebate data characterize highest household attainment. § Based upon household-level data. ¶ 100% includes non-binary options. "Prefer not to answer," "I don't know," and similar responses are excluded throughout. Census 2019: 2015–2019 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Latest Characteristics by Vehicle Type: Rebates

2021 CVRP Consumer Survey data & weighted application data subset*

The majority of new-car buyers	CVRP Plug-in EV Rebates — Vehicle Type: CY 2021 BEVs *n* = 6,733 Weighted results*	CVRP Plug-in EV Rebates — Vehicle Type: CY 2021 PHEVs *n* = 961 Weighted results*	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	CA Population 2017–2021 (Census 2021)
Selected solely white/Caucasian	39%	47%	51%	36%
≥ 40 years old	67%	74%	68%	46%
≥ Bachelor's degree	72%	76%	58%	26%
≥ $100k household income	62%	57%	56% §	42% §
Own residence	76%	77%	63% §	55% §
Selected male	66%¶	67%¶	50%	50%

* Shaded CVRP cells are created with weighted data from the application using the subset of program participants that responded to the survey. § Based upon household-level data. ¶ 100% includes non-binary options.

"Prefer not to answer," "I don't know," and similar responses are excluded throughout. Census 2021: 2017–2021 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Paths Forward

Strategic EV Market Segments

What is the Path Forward?
Expanding Market Frontiers Through Strategic Segmentation

Existing Adopters: Market Acceleration

Characterize existing, generally enthusiastic and pre-adapted consumers, to target similar consumers who have the highest likelihood of adoption and maximize scale

"Rebate Essential" Consumers: Minimizing Free Ridership

Characterize adopters most highly influenced by supportive resources to join the EV market, to improve the cost-effectiveness of outreach and program design

"EV Converts": Moving Mainstream

Characterize EV consumers with low initial interest in EVs, to look for additional opportunities to expand into the mainstream

Priority Populations: Increasing Equity

1. Characterize adoption by priority populations, to understand & reinforce adoption that is successfully overcoming hurdles
2. Identify and break down barriers, to further diversity and expand access

Starting Point: CA Plug-in Vehicle Rebates

The majority of new-car buyers	Low-Hanging Fruit (Existing Adopters) CY 2021 *n* = 7,694 **Weighted results***	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS)
Selected solely white/Caucasian	40%	51%
≥ 40 years old	67%	68%
≥ Bachelor's degree	72%	58%
≥ $100k HH income	62%	56% †
Own residence	76%	63% †
Selected male	66%‡	50%

** Shaded CVRP cells are created with weighted data from the application using the subset of program participants that responded to the survey. † Based upon household-level data. ‡ 100% includes non-binary options.*

Rebate data filtered by purchase/lease date. "Prefer not to answer," "I don't know," and similar responses are excluded throughout. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

Paths Forward: CA Plug-in Vehicle Rebates

CVRP Consumer Survey data & weighted application data subset*

The majority of new-car buyers	Low-Hanging Fruit (Existing Adopters) CY 2021 *n* = 7,694 **Weighted results***	*"Rebate Essentials"* CY 2021 *n* = 2,734 **Weighted results**	*"EV Converts"* CY 2021 *n* = 1,636 **Weighted results**	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS)	Increased Rebate Recipients Low-/Moderate-Income CY 2021, *n* = 1,922 **Weighted results***
Selected solely white/Caucasian	40%	TBD	TBD	51%	28%
≥ 40 years old	67%	TBD	TBD	68%	61%
≥ Bachelor's degree	72%	72%	67%	58%	59%
≥ $100k HH income	62%	53%	57%	56% †	16%
Own residence	76%	72%	73%	63% †	61%
Selected male	66%‡	TBD	TBD	50%	64%‡

** Shaded CVRP cells are created with weighted data from the application using the subset of program participants that responded to the survey. † Based upon household-level data. ‡ 100% includes non-binary options.*

Rebate data filtered by purchase/lease date. "Prefer not to answer," "I don't know," and similar responses are excluded throughout. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

Quantifying the Path Forward (CY 2021):

Percentage-Point Differences from the New-Vehicle-Buyer Baseline

The majority of new-car buyers	All CVRP	*Rebate Essentials*	*EV Converts*	CA New-Vehicle Buyers	Increased Rebate Recipients
≥ Bachelor's degree	14	14	9	0	1
≥ $100k HH income	6	-3	1	0	-40
Own residence	13	9	10	0	-2
Total points:	**33**	**20**	**20**	**0**	**-41**
Percent of journey from segment to segment:		39%	0%	61%	124%
Percent of journey from start:		39%	39%	100%	224%

Rebate data filtered by purchase/lease date. "Prefer not to answer," "I don't know," and similar responses are excluded throughout.
CA New-Vehicle Buyers (2017 NHTS) weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned, using most-recent model years available (2016–17).

Quantifying the Path Forward (CY 2020):

Percentage-Point Differences from the New-Vehicle-Buyer Baseline

The majority of new-car buyers	All CVRP	*Rebate Essentials*	*EV Converts*	CA New-Vehicle Buyers	Increased Rebate Recipients
Selected solely white/Caucasian	-1	-9	-15	0	-17
≥ 40 years old	7	3	1	0	-1
≥ $100k HH income	10	1	2	0	-47
Own residence	17	13	11	0	-3
Selected male	21	21	20	0	16
Total points:	**54**	**29**	**19**	**0**	**-52**
Percent of journey from segment to segment:		46%	19%	35%	96%
Percent of journey from start:		46%	65%	100%	196%

Rebate data filtered by purchase/lease date. "Prefer not to answer," "I don't know," and similar responses are excluded throughout.
CA New-Vehicle Buyers (2017 NHTS) weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned, using most-recent model years available (2016–17).

Summary & Select Findings

Summary & Select Findings: 2021 Consumer Characteristics

Context:

- Program design shapes impacts
- 2021 included some COVID recovery and CVRP's longest funding disruption

Rebated Consumer Characteristics vs. CA New-Vehicle Buyers:

- Different picture than painted by population stats
  - Depending on the characteristic, all of the difference between rebate recipients and the population can be explained by new-vehicle buying (e.g., 70% of the income difference is not particular to EVs)
- Metric of ***race/ethnicity more diverse***
- Metric of ***age comparable***
- ***Income:***
  - metric ***trending toward*** new-vehicle buyers (within 6 percentage points, PHEV participants even closer)
  - ***Lower income consumers receiving more than proportionate share of funding, higher income consumers receiving less:***
    - 73% of funding went to households < $150k, who are 68% of new-vehicle buyers
    - Households with income > $100k are the market majority: 56% of new-vehicle buyers, but received 51% of funding
- ***Home ownership*** and ***male gender*** are ***much more frequent,*** but have progressed toward mainstream
- Metrics can help ***quantify "length of road ahead"***

Paths Forward:

- ***Strategic consumer segments*** present possible steppingstones on a path toward the mainstream and beyond to increased access (see related work)

Appendix:
Additional Details & Resources

Program Design Shapes Outcomes

= in effect during 2020

CALIFORNIA CLEAN VEHICLE REBATE PROJECT™

as of Mar. 2010	as of Dec. 2013	as of Dec. 2014 / Jan. 2015	as of Mar. 2016	as of Nov. 2016
• Incentive stacking permitted • 36-month ownership requirement • Rebates per year limit = 20	• Rebates per year limit = 2 **as of May 2014** • 18-month application window	• 30-month ownership requirement (retroactive) • Total rebate limit = 2	• $250k–$500k income cap (PEVs) • +$1,500 for income-qualified households (≤ 300% FPL), excluding ZEMs	• $150k–$300k income cap (PEVs) • +$2,000 for income-qualified households (≤ 300% FPL), excl. ZEMs • ≥ 20 UDDS electric miles

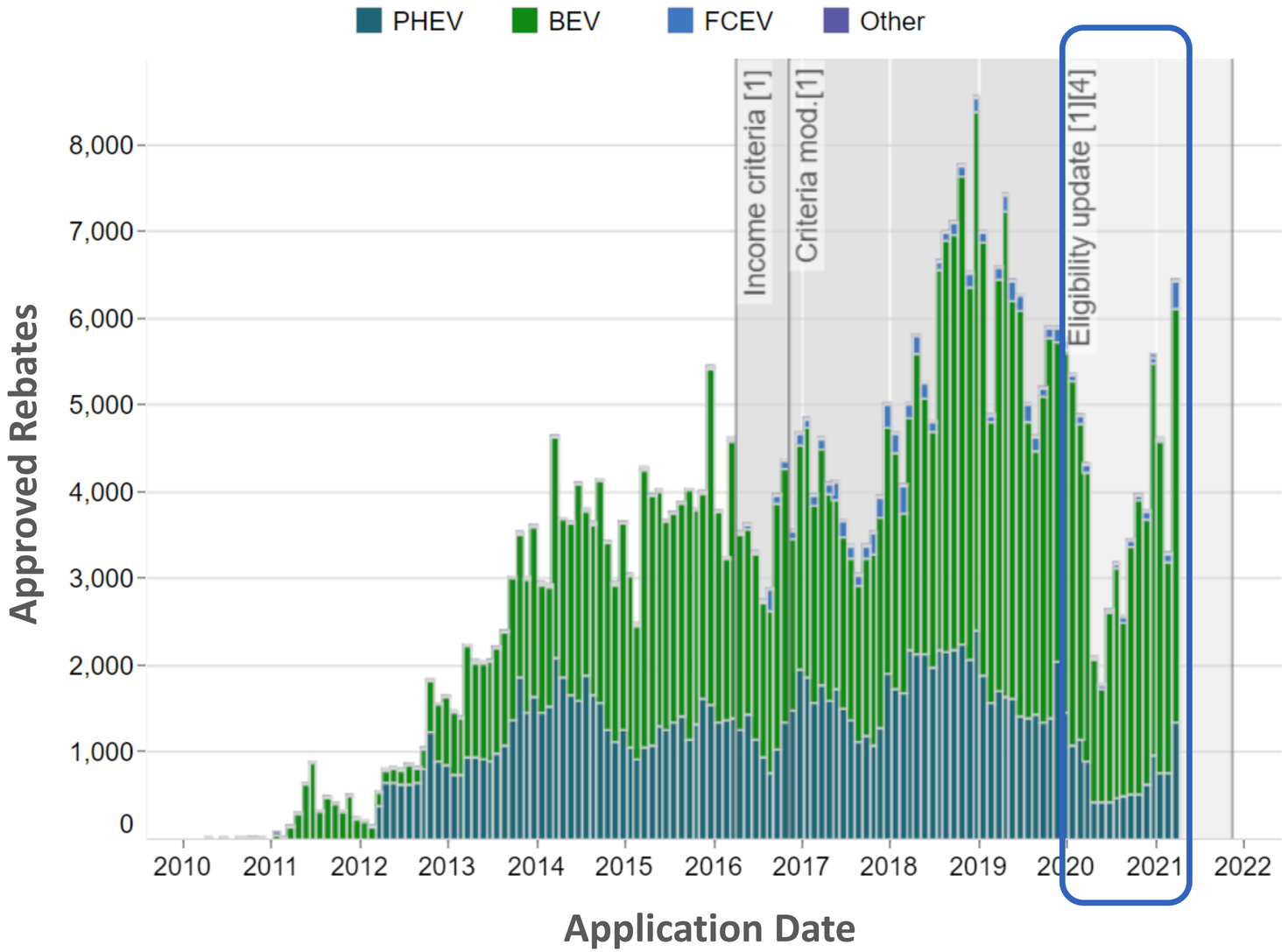
as of Jan. 2018	as of Jan. 2019	as of Dec. 2019	as of Apr. 2020	as of Apr. 2021
• $150k–$300k income cap on stacking HOV decal • (only binding on FCEVs) • Rebate Now San Diego County preapproval pilot with point-of-sale option	• Stacking with CVAP grant not permitted (retroactive)	• Base MSRP ≤ $60k (PEVs) • ≥ 35 UDDS electric miles • +$2,500 † for income-qualified households (≤ 300% FPL), excl. ZEMs • Total rebates limit = 1 § • 3-month application window ‡	• Stacking with CVAP grant permitted **as of Jan. 2021** • +$2,500 for income-qualified households (≤ 400% FPL), excl. ZEMs	• ≥ 30 U.S. EPA electric miles (45 UDDS) • Rebate Now preapproval option limited to income-qualified households, expanded to include SJ Valley

PEVs = plug-in EVs. FPL = Federal Poverty Level. ZEMs = zero-emission motorcycles. UDDS = Urban Dynomometer Driving Schedule. HOV = high-occupancy-vehicle. FCEVs = fuel-cell EVs. CVAP = Clean Vehicle Assistance Program. MSRP = manufacturer suggested retail price.

† Change due to $500 decrease in standard rebate amounts. ‡ COVID exemptions on application window effectively delayed implementation until 4/15/2021.

§ A second rebate can be approved for a FCEV if the first rebate was for a PEV.

2020 Applications Saw Dramatic Decline But Significant Recovery



With COVID exemptions, rebate applications for calendar year 2020 purchases/leases for individuals spanned 1/1/2020 – 4/15/2021.

12% applied in 2021.

12/29/21 image from https://cleanvehiclerebate.org/eng/rebate-statistics

Consumer Survey Design Changes: Home Ownership

Source	CVRP 2017–2020 Consumer Survey	CVRP 2020–2021 Interim Dataset
Question Language	Do you own or rent your residence?	Do you own or rent your residence?
Response Options	• Own • Rent • Prefer not to answer	• Own • Rent • Neither rent nor own • Prefer not to answer

Question Language: Race

Source	CVRP 2017–2020 Consumer Survey	CVRP 2021 Application Data	NHTS 2017	Census 2021
Question Language	How do you prefer to describe your racial/ethnic identity? [check all that apply]	How do you prefer to describe your racial identity? [check all that apply]	Which of the following describes your race? Please SELECT ALL that apply.	What is Person 1's race? Mark one or more boxes AND print origins.
Response Options	• Black or African American • East Asian • Latino(a) or Hispanic • Middle Eastern • Native American or Alaska Native • Native Hawaiian or other Pacific Islander • South Asian • White or Caucasian • Other, please specify: • Prefer not to answer	• American Indian or Alaska Native • Black or African American • East Asian • Middle Eastern or North African • Native Hawaiian or other Pacific Islander • South Asian • Southeast Asian • White or Caucasian • Other • Prefer not to answer	• White • Black or African American • Asian • American Indian or Alaska native • Native Hawaiian or other Pacific islander • Some other race • I don’t know • I prefer not to answer	• White • Black or African Am. • American Indian or Alaska Native • Chinese • Filipino • Asian Indian • Vietnamese • Korean • Japanese • Other Asian • Native Hawaiian • Samoan • Chamorro • Other Pacific Islander • Some other race

Question Language: Ethnicity

Source	CVRP 2017–2020 Consumer Survey	CVRP 2021 Application Data	NHTS 2017	Census 2021
Question Language	How do you prefer to describe your racial/ethnic identity? [check all that apply]	Are you Hispanic or Latino?	Are you of Hispanic or Latino origin?	Is Person 1 of Hispanic, Latino, or Spanish origin?
Response Options	• Black or African American • East Asian • Latino(a) or Hispanic • Middle Eastern • Native American or Alaska Native • Native Hawaiian or other Pacific Islander • South Asian • White or Caucasian • Other, please specify: • Prefer not to answer	• Yes • No • Prefer not to answer	• Yes, Hispanic or Latino • No, Not Hispanic or Latino • I don't know • I prefer not to answer	• No, not of Hispanic, Latino, or Spanish origin • Yes, Mexican, Mexican Am., Chicano • Yes, Puerto Rican • Yes, Cuban • Yes, another Hispanic, Latino, or Spanish origin

Setting an Appropriate Baseline:
U.S. Car Buyers Are Different Than the Population

	 **U.S. Population** 2017–2021 (Census 2021)		**U.S. New-Vehicle Buyers** MYs 2016–17 (2017 NHTS)
Selected solely white/Caucasian	59%	<<	74%
≥ 50 Years Old	35%	<<	51%
≥ Bachelor's Degree	25%	<<<<	57%
≥ $75k HH Income*	46%	<<	62%
Own Residence*	64%	<<	77%
Selected Male	49%	≈	51%

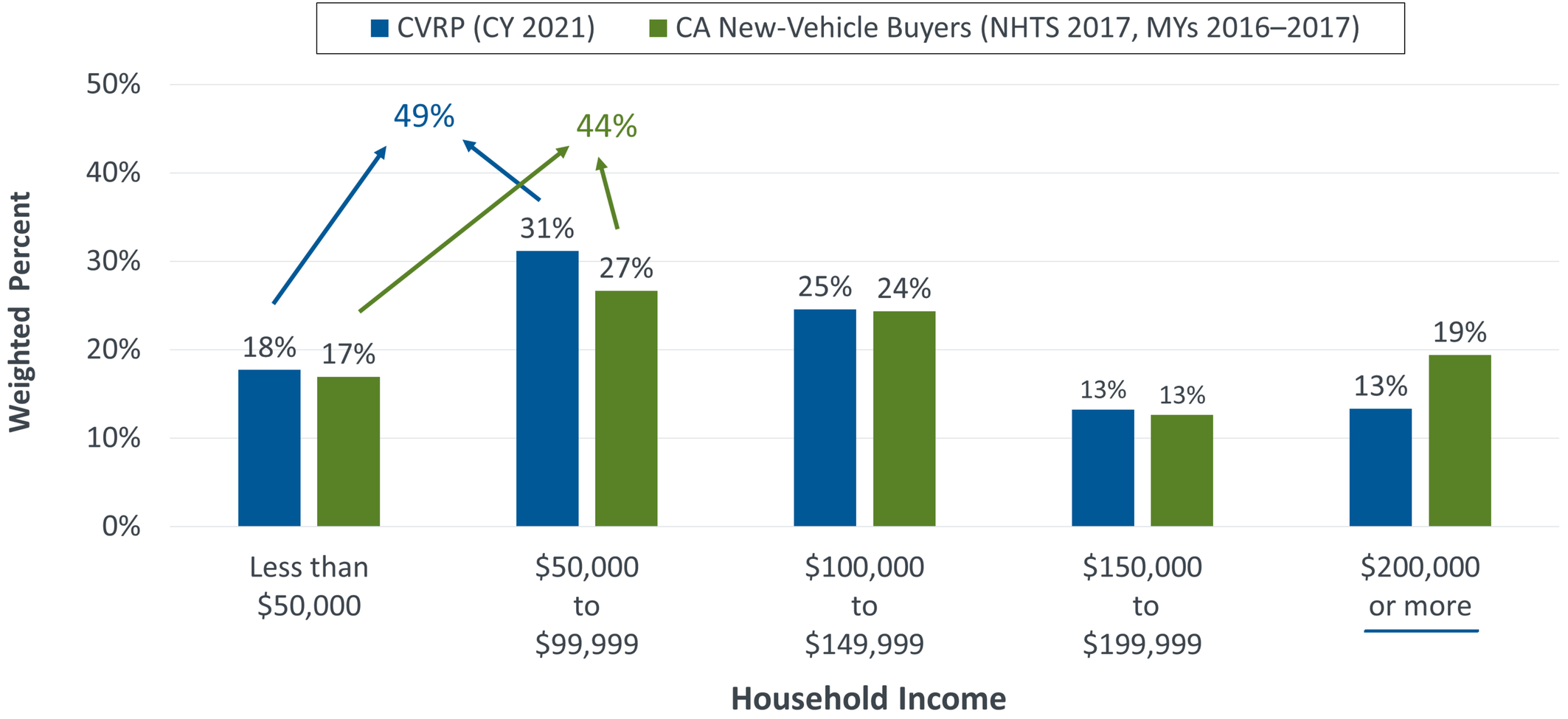
New-car buyers are different on almost every dimension.

- More frequently:
  - White
  - Older
  - Degree holders
  - Higher income
  - Residence owners
- *Some* of the difference explained by driving or buying age
- The rest may be due in part to ***social inequities***

** Based upon household level data.*

Census 2021: 2017–2021 American Community Survey, PUMS. NHTS 2017 is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned. "Prefer not to answer," "I don't know," and similar responses are excluded throughout.

Households with income < $100k are just 44% of new-vehicle buyers, but received 49% of funding



CVRP Consumer Survey, 2020–2022 Interim Dataset. Filtered, question-specific n = 6,874.
NHTS 2017 (CA add-on) is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

Latest Characteristics with Appropriate Comparisons (*not* population statistics)

CALIFORNIA CLEAN VEHICLE REBATE PROJECT™

The majority of new-car buyers	CVRP Plug-in EV Rebates 2020 n = 4,331 Weighted results	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	CA Population 2015–2019 (Census 2019)
Selected solely white/Caucasian	50%	51%	37%
≥ 40 years old	75%	68%	45%
≥ Bachelor's degree in HH	79%	‡	‡
≥ $100k household income	66%	56% §	38% §
Own residence	80%	63% §	54% §
Selected male	71% ¶	50%	50%

‡ Census & NHTS data characterize individual educational attainment, whereas rebate data characterize highest household attainment. § Based upon household-level data. ¶ 100% includes non-binary options. "Prefer not to answer," "I don't know," and similar responses are excluded throughout. Census 2019: 2015–2019 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Latest Characteristics with Comparisons

CVRP Application data

The majority of new-car buyers	CVRP Plug-in EV Rebates 2021 *N* = 45,288	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	CA Population 2017–2021 (Census 2021)
Selected solely white/Caucasian	34%	51%	36%
≥ 40 years old	53%	68%	46%
≥ Bachelor's degree	n.a.	58%	26%
≥ $100k household income	n.a.	56% §	42% §
Own residence	n.a.	63% §	55% §
Selected male	64%¶	50%	50%

§ Based upon household-level data. ¶ 100% includes non-binary options. "Prefer not to answer," "I don't know," and similar responses are excluded throughout.

Census 2021: 2017–2021 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Explaining Differences with Appropriate Comparisons (*not* population statistics)

CY 2019 UPDATE

The majority of new-car buyers	**CVRP** Plug-in EVs **CY 2019** n = 8,991 **Weighted results**	Portion of total difference attributable to EVs	**CA New-Vehicle Buyers MYs 2016–17** (2017 NHTS CA add-on)	Portion of total difference explained by car buying	CA Population 2015–2019 (Census 2019)
Selected solely white/Caucasian	50%	← –8% →	51%	← 108% →	37%
≥ 40 years old	73%	← 18% →	68%	← 82% →	45%
≥ Bachelor's degree in HH	83%	n.a.	‡	n.a.	‡
≥ $100k Household Income	68%	← 40% →	56% §	← 60% →	38% §
Own Residence	79%	← 64% →	63% §	← 36% →	54% §
Selected Male	71% ¶	← 100% →	50%	← 0% →	50%

‡ Census & NHTS data characterize individual educational attainment, whereas rebate data characterize highest household attainment. § Based upon household-level data.
¶ Starting in June 2017, 100% includes non-binary options.
"Prefer not to answer," "I don't know," and similar responses are excluded throughout. Census 2019: 2015–2019 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Explaining Differences with Appropriate Comparisons (*not* population statistics)

CALIFORNIA CLEAN VEHICLE REBATE PROJECT™

The majority of new-car buyers	**CVRP Plug-in EV Rebates 2020** n = 4,331 **Weighted results**	Portion of total difference attributable to EVs	**CA New-Vehicle Buyers MYs 2016–17** (2017 NHTS CA add-on)	Portion of total difference explained by car buying	CA Population 2015–2019 (Census 2019)
Selected solely white/Caucasian	50%	← –8% →	51%	← 108% →	37%
≥ 40 years old	75%	← 23% →	68%	← 77% →	45%
≥ Bachelor's degree in HH	79%	n.a.	‡	n.a.	‡
≥ $100k household income	66%	← 36% →	56% §	← 64% →	38% §
Own residence	80%	← 65% →	63% §	← 35% →	54% §
Selected male	71% ¶	← 100% →	50%	← 0% →	50%

‡ Census & NHTS data characterize individual educational attainment, whereas rebate data characterize highest household attainment. § Based upon household-level data. ¶ 100% includes non-binary options. "Prefer not to answer," "I don't know," and similar responses are excluded throughout. CY 2020 weights specific to 2020 purchases/leases. Census 2019: 2015–2019 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Paths Forward: CA Plug-in Vehicle Rebates

CALIFORNIA CLEAN VEHICLE REBATE PROJECT℠

The majority of new-car buyers	Low-Hanging Fruit (Existing Adopters) CY 2020 n = 4,331 **Weighted results**	*"Rebate Essentials"* CY 2020 n = 1,669 **Weighted results**	*"EV Converts"* CY 2020 n = 834 **Weighted results**	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS)	Increased Rebate Recipients Low-/Moderate-Income CY 2020, n = 507 **Weighted results**
Selected solely white/Caucasian	50%	42%	36%	51%	34%
≥ 40 years old	75%	71%	67%	68%	67%
≥ Bachelor's degree in HH	79%	79%	75%	*	63%
≥ $100k HH income	66%	57%	58%	56% †	9%
Own residence	80%	76%	74%	63% †	60%
Selected male	71% ‡	71% ‡	70% ‡	50%	66% ‡

** NHTS data characterize individual educational attainment, whereas other data characterize highest household attainment. † Based upon household-level data. ‡ 100% includes non-binary options. Rebate data filtered by purchase/lease date. "Prefer not to answer," "I don't know," and similar responses are excluded throughout. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.*

Summary & Select Findings: 2020 Consumer Characteristics

Program Design:

- Shapes impacts

Rebated Consumer Characteristics vs. CA New-Vehicle Buyers:

- Different picture than painted by population stats
  - Depending on the characteristic, up to 100% of the difference between rebate recipients and the population can be explained by new-vehicle buying (e.g., 64% of the income difference is not about EVs)
- Metric of ***race/ethnicity comparable***
- Metric of ***age somewhat higher***, stopped progressing (still within 7 percentage points)
- ***Income:***
  - metric ***trending toward*** new-vehicle buyers (rebates within 10 percentage points, funding even closer)
    - percent of ***PHEV participants ≥$100k lower*** than new-car buyers
  - 66% of funding went to households <$150k, who are 68% of new-vehicle buyers
- ***Home ownership*** and ***male gender much more frequent*** (less so for PHEVs)
- Metrics can help ***quantify "length of road ahead"***

Paths Forward:

- ***Strategic consumer segments*** present possible steppingstones on a path toward the mainstream and beyond to increased access (see related work)

EV Rebate Program Impacts: Select Publications

(Reverse Chronological, as of 10/2023. Additional related items.)

- B.D.H. Williams and N. Pallonetti (2023, Mar.), New York State's Drive Clean Rebate for Electric Vehicles: Measures of Impact, *36th International Electric Vehicle Symposium (EVS36)*, EDTA, Sacramento CA, USA. Paper. Slides. CSE posting.
- B.D.H. Williams and N. Pallonetti (2023, Mar.), Rebate Influence on Electric Vehicle Adoption in California, *36th International Electric Vehicle Symposium (EVS36)*, EDTA, Sacramento CA, USA. Paper. CSE posting. Precursor slides. Conference slides with updates.
- N. Pallonetti and B.D.H. Williams (2023, Mar.), Vehicle Replacement: Findings from California's Clean Vehicle Rebate Project, *36th International Electric Vehicle Symposium* (EVS36), EDTA, Sacramento CA, USA. Paper. CSE posting. Precursor slides.
- B.D.H. Williams (2023, Apr.), Assessing progress and equity in the distribution of electric vehicle rebates using appropriate comparisons, *Transport Policy*, *137*, 141–151. DOI: 10.1016/J.TRANPOL.2023.04.009. Paper. CVRP posting. CSE posting. Precursor video. Slides.
- N. Pallonetti and B.D.H. Williams (2023, Feb.), *CVRP Greenhouse Gas Emission Reductions and Cost-Effectiveness: 2020 Purchases/Leases*, Clean Vehicle Rebate Project. DOI: 10.13140/RG.2.2.21731.12324. Paper. CVRP posting.
- B.D.H Williams and J.B. Anderson (2022, Sep.), From Low Initial Interest to Electric Vehicle Adoption: "EV Converts" in New York State's Rebate Program. *Transportation Research Record: Journal of the Transport. Research Board*, 2677, 866–882. DOI: 10.1177/03611981221118537. Data-summary appendix.
- B.D.H. Williams (2022, Jun.), Targeting Incentives Cost Effectively: "Rebate Essential" Consumers in the New York State Electric Vehicle Rebate Program, *35th International Electric Vehicle Symposium (EVS35)*, AVERE, Oslo, Norway. Paper. Slides.
- B.D.H. Williams, J.B. Anderson (2022, Jun.), Lessons Learned About Electric Vehicle Consumers Who Found the U.S. Federal Tax Credit Extremely Important in Enabling Their Purchase, *35th International Electric Vehicle Symposium (EVS35),* Oslo, Norway. Paper. Slides.
- B.D.H. Williams (2021, Oct.), *An Electric-Vehicle Consumer Segmentation Roadmap: Strategically Amplifying Participation in the New York Drive Clean Rebate Program*, Report 21-30, *Clean Transportation Reports*, NYSERDA.
- B.D. Williams, J. Orose, M. Jones, J.B. Anderson (2018, Oct.), Summary of Disadvantaged Community Responses to the Electric Vehicle Consumer Survey, 2013–2015 Edition, Clean Vehicle Rebate Project Report, San Diego CA. DOI: 10.13140/RG.2.2.36500.58243.
- C. Johnson, B.D. Williams, J.B. Anderson, N. Appenzeller (2017, Jun.), *Evaluating the Connecticut Dealer Incentive for Electric Vehicle Sales*, Center for Sustainable Energy (CSE). DOI: 10.13140/RG.2.2.24448.00004. CSE posting.
- C. Johnson, B.D. Williams (2017, Jan.), Characterizing Plug-In Hybrid Electric Vehicle Consumers Most Influenced by California's Electric Vehicle Rebate, *Transportation Research Record: Journal of the Transport. Research Board,* 2628, 23–31.

EV Rebate Program Impacts: Select Presentations & Videos

(Reverse Chronological, as of 10/2023. Additional related items.)

- CVRP 2021 Data Compilation: Incentive Influence and MSRP Considerations, (2023, Oct.).
- NY Drive Clean Rebates: Select Impacts Through 2021, (2023, Jun. 12). Paper. CSE posting.
- Lessons Learned About Electric Vehicle Consumers Who Rated the U.S. Federal Tax Credit 'Extremely Important,' (2022, Jun. 15). Paper.
- Targeting Incentives Cost Effectively: 'Rebate Essential' Consumers in the New York State Electric Vehicle Rebate Program, (2022, Jun. 13). Paper.
- Conference video: "HEC 2022 Panel - Electrification and Transportation," opening pres. minutes 2–10; 40-min. panel total, (2022, May). Slides.
- CVRP 2020 Data Brief: Vehicle Replacement, (2022, Jun.).
- CARB Video: "CVRP 2020 Data Brief: Consumer Characteristics," time 1:05:43–1:26:09, (2022, Mar.). Slides. Related journal article.
- CARB Video: "Cost-Effectiveness of Greenhouse Gas Emission Reductions Associated with California's Clean Vehicle Rebate Project in 2019 (and 2020)," time 2:01-2:31, (2022, Feb.). Slides.
- Data from Statewide Electric Vehicle Rebate Programs: Vehicles, Consumers, Impacts, and Effectiveness, (2021, Jul.).
- EV Purchase Incentives: Program Design, Outputs, and Outcomes of Four Statewide Programs with a Focus on Massachusetts, (2020, Dec.).
- What Vehicles Are Electric Vehicles Replacing and Why?, (2019, Nov.).
- Electric Vehicle Incentives and Policies, (2019, Nov.).
- Targeting EV Consumer Segments & Incentivizing Dealers, (2017, Jun.).
- Yale Webinar: "Supporting EV Commercialization with Rebates: Statewide Programs, Vehicle & Consumer Data, and Findings," 58 minutes, (2017, Apr.). Slides.
- Electric Vehicle Rebates in Disadvantaged Communities: Evaluating Progress with Appropriate Comparisons, (2016, Oct.)
- Characterizing California Electric Vehicle Consumer Segments, (2016).

Recommended citation

B.D.H. Williams and N. Pallonetti (2023, Dec.), Presentation: “CVRP 2021 Data Brief: Consumer Characteristics,” prepared by the Center for Sustainable Energy for the Clean Vehicle Rebate Project, California Air Resources Board, Sacramento USA.

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