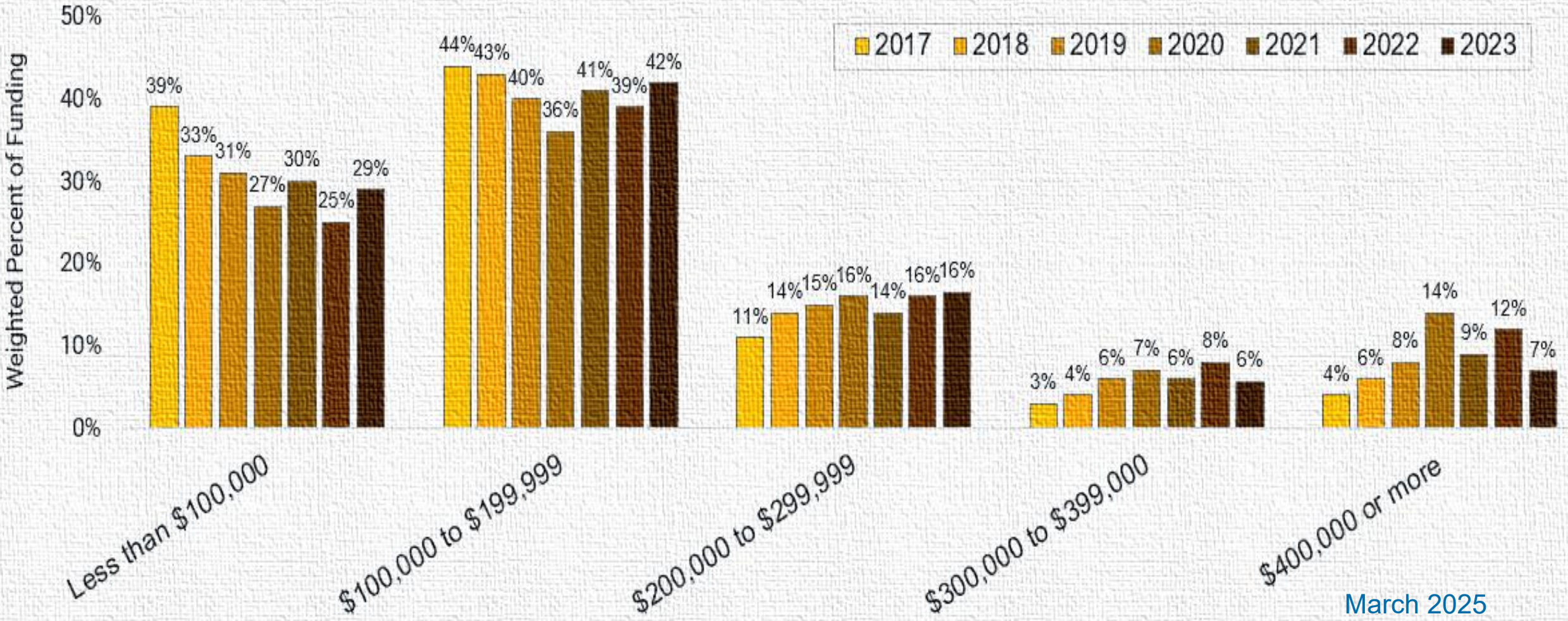

March 2025

NY Drive Clean Rebate: Consumer Characteristics & Equity Metrics thru 2023

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with thanks to J. Bowers, A. Thang, E. Fullenkamp, and others at the Center for Sustainable Energy (CSE)

NEW YORK STATE | NYSERDA

Outline

- **Highlights**
- **Who do rebates benefit?**
  - Household Income
  - Consumer Characteristics & Comparisons
  - Breaking Disparities into Two Components
  - Assessing Progress
- **Summary**

Appendix

Highlights of Select Findings for 2023 Purchases/Leases

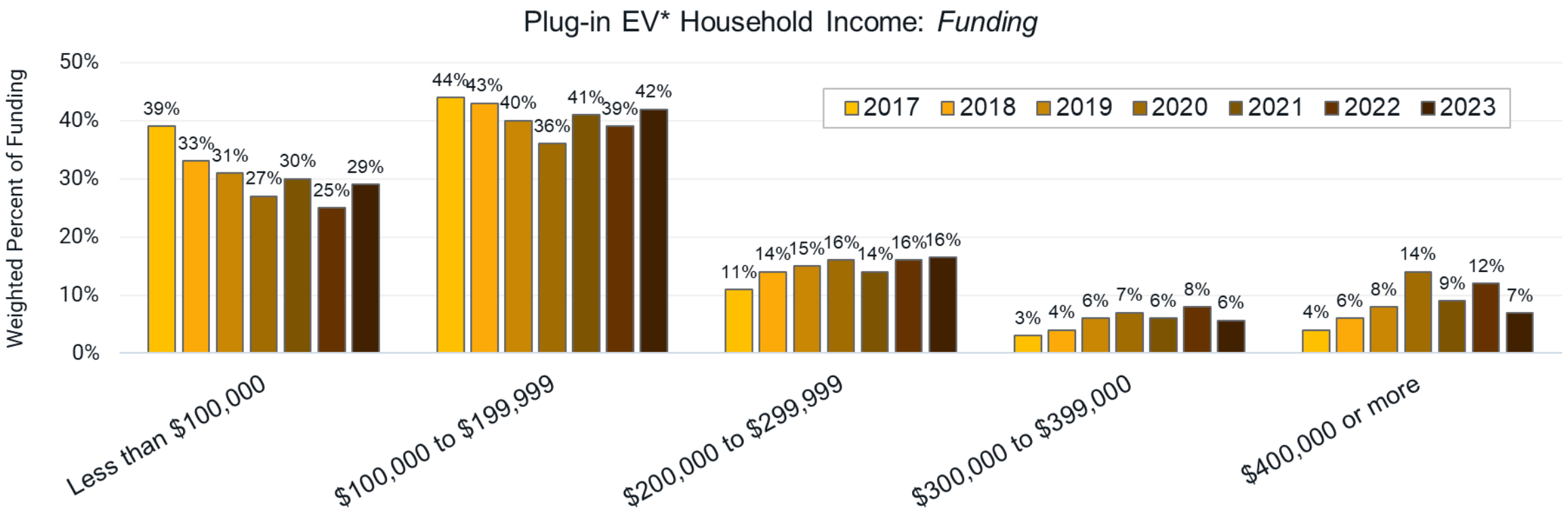
Context

- 2023 was dominated by the Model Y and $500 rebates
  - See “NY Drive Clean Rebated Vehicle Characteristics Through 2023”

Consumers Rebated

- **71% of funding went to households with income < $200k**
- Comparison to new-vehicle buyers:
  - **Identification as solely white/Caucasian** by rebate recipients now **much less frequent** than new-car buyers
  - **Age ≥ 40 years** now **less frequent** than new-car buyers
  - **Household income > $100k** and **male gender** were still **most distinguishing**
    - However, 2/5^{ths} of “income disparity” findings based on Census data likely due to structural inequities in car buying, not particular to rebated EVs

71% of funding for 2023 purchases/leases claimed by households with income < $200k (up from 64% for 2022; falling prices presumably contributed)



NY DCRP Adoption Survey. 2017 *n* = 842; 2018 *n* = 1,813; 2019 *n* = 1,817; 2020 *n* = 2,852; 2021 *n* = 4,237; 2022 *n* = 4,607; 2023 *n* = 6,159.
n-values are filtered and question-specific. 2020–2023 weights specific to 2020–2023 purchases/leases, respectively.
* Plug-in EV = BEV and PHEV.

Are rebates disproportionately benefiting the majority?

Step 0: Who is the majority in new-car markets?

The majority of new-car buyers
Selected solely white/Caucasian
≥ 40 years old
Own residence
≥ Bachelor's degree
Selected male
≥ $100k household income

"Prefer not to answer," "I don't know," and similar responses are excluded throughout.

Are rebates disproportionately benefiting the majority?

Step 1: Measure the proportions of rebate recipients falling into “Market-Majority” characteristics

The majority of new-car buyers	**Drive Clean Rebate Program** Rebates **2023** purchases/leases *n* = 7,225
Selected solely white/Caucasian	61%
≥ 40 years old	72%
Own residence	81%
≥ Bachelor’s degree	76%
Selected male	72%
≥ $100k household income	73%

“Prefer not to answer,” “I don’t know,” and similar responses are excluded throughout.

Are rebates disproportionately benefiting the majority?

Step 2: Measure what "mainstream" looks like

The majority of new-car buyers	**Drive Clean Rebate Program** Rebates **2023** purchases/leases *n* = 7,225	**NY New-Vehicle Buyers** **2022** (NVES 2022)
Selected solely white/Caucasian	61%	76%
≥ 40 years old	72%	76%
Own residence	81%	77%
≥ Bachelor's degree	76%	64%
Selected male	72%	55%
≥ $100k household income	73%	55%*

"Prefer not to answer," "I don't know," and similar responses are excluded throughout. * NVES represents income > $100k (not ≥).

NVES 2022 (Strategic Vision New Vehicle Experience Study): Note: no Tesla consumers were in the NVES sample.

Are EVs “going mainstream”? In some ways more than others.

Step 3: Compare

Rebated EV consumers are most distinguished by higher income and male gender but identify as white less frequently.

The majority of new-car buyers	**Drive Clean Rebate Program** Rebates **2023** purchases/leases *n* = 7,225	**Difference** (percentage points, ppt)	**NY New-Vehicle Buyers** **2022** (NVES 2022)
Selected solely white/Caucasian	61%	← -15 ppt →	76%
≥ 40 years old	72%	← -4 ppt →	76%
Own residence	81%	← 4 ppt →	77%
≥ Bachelor’s degree	76%	← 12 ppt →	64%
Selected male	72%	← 17 ppt →	55%
≥ $100k household income	73%	← 18 ppt →	55%*

“Prefer not to answer,” “I don’t know,” and similar responses are excluded throughout. * NVES represents income > $100k (not ≥).

NVES 2022 (Strategic Vision New Vehicle Experience Study): Note: no Tesla consumers were in the NVES sample.

Assessing Differences with Appropriate Comparisons

Population statistics do not tell the story accurately because car buyers are already different.

The majority of new-car buyers	Drive Clean Rebate Program Rebates 2023 purchases/leases *n* = 7,225	NY New-Vehicle Buyers 2022 (NVES 2022)	≠	NY Population 2018–2022 (Census 2022)
Selected solely white/Caucasian	61%	76%		54%
≥ 40 years old	72%	76%		49%
Own residence	81%	77%		54% §
≥ Bachelor's degree	76%	64%		30%
Selected male	72%	55%		49%
≥ $100k household income	73%	55%*		42% §

§ Based upon household-level data. * NVES represents income > $100k (not ≥).

"Prefer not to answer," "I don't know," and similar responses are excluded throughout. NVES 2022 (Strategic Vision New Vehicle Experience Study): Note: no Tesla consumers were in the NVES sample. Census 2022: 2018–2022 American Community Survey, PUMS.

Breaking Inequities Into Two Components

Rebated EVs are most distinguished by differences in income and gender

The majority of new-car buyers	Drive Clean Rebate Program Rebates 2023 purchases/leases *n* = 7,225	Portion of total difference attributable to EVs	NY New-Vehicle Buyers 2022 (NVES 2022)	Portion of total difference explained by car buying	NY Population 2018–2022 (Census 2022)
Solely white/Caucasian	61%	← -214% →	76%	← 314% →	54%
≥ 40 years old	72%	← -17% →	76%	← 117% →	49%
Own residence	81%	← 15% →	77%	← 85% →	54% §
≥ Bachelor's degree	76%	← 26% →	64%	← 74% →	30%
Selected male	72%	← 74% →	55%	← 26% →	49%
≥ $100k household income	73%	← 58% →	55%*	← 42% →	42% §

§ Based upon household-level data. * NVES represents income > $100k (not ≥).

"Prefer not to answer," "I don't know," and similar responses are excluded throughout. NVES 2022 (Strategic Vision New Vehicle Experience Study): Note: no Tesla consumers were in the NVES sample. Census 2022: 2018–2022 American Community Survey, PUMS.

- Most new-car buyers are represented by the blue characteristics in column 1.
- Since DCRP is a new-car program, new-car buyers are the appropriate baseline for comparison.
- Comparing NY DCRP (gold), car-buyers (blue), & population (gray) clarifies how much of the difference between the state and program populations are particular to inequities in car buying vs. EVs specifically.
- For example, 42% of the "income disparity" between the population and DCRP is explained by car-buying (and 58% by EV buying).

Assessing Progress with Appropriate Comparisons

The majority of new-car buyers	NY DCRP Rebates, Purchase/Lease Year: 2017†	2018	2019	2020	2021	2022	2023	NY New-Vehicle Buyers (NVES 2022)	NY New-Vehicle Buyers (2017 NHTS) Latest Available MYs (2016–17)	NY Population 2019–2023 (Census 2023)
Solely white/Caucasian	86%	82%	78%	75%	75%	68%	61%	76%	75%	53%
≥ 40 years old	79%	76%	74%	71%	71%	71%	72%	76%	70%	50%
Own Residence	90%	90%	88%	85%	83%	86%	81%	77%	75% §	54% §
≥ Bachelor's degree	73%	80%	77%	80%	78%	80%	76%	64%	65%	31%
Selected male	68%	71%	73%	75%	68%	71%	72%	55%	51%	49%
≥ $100k household income	63%	68%	69%	72%	71%	78%	73%	55%*	51% §	43% §

- Some differences between DCRP and new-vehicle buyers have faded away (green circles) while others remain (red circle).

In 2023:

- Home ownership, educational attainment, and income progressed toward the mainstream (gold circles)
- Age and gender are stalled
- Race/ethnicity continued progression "beyond the mainstream"
- The "road ahead" is the longest for income and gender (17–18 ppt)

† From program launch in March 2017. § Based upon household-level data. ppt = percentage points

"Prefer not to answer," "I don't know," and similar responses are excluded throughout. * NVES represents income > $100k (not ≥). NVES 2022 (Strategic Vision New Vehicle Experience Study): Note: no Tesla consumers were in the NVES sample. 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. Census 2022: 2018–2022 American Community Survey, PUMS.

Summary of Select Findings for 2023 Purchases/Leases

Context

- 2023 was dominated by the Model Y (at reduced prices) and $500 rebates
  - See “NY Drive Clean Rebated Vehicle Characteristics through 2023”

Consumers Rebated

- **71% of funding went to households with income < $200k.**
  - Up from 64% in 2022
- Comparison to new-vehicle buyers (rather than census data):
  - **Identification as solely white/Caucasian now *much* less frequent** than new-car buyers after recent steps forward
  - **Age ≥ 40 years less frequent** than new-car buyers (or comparable, vs. NHTS baseline)
  - **Household income > $100k and male gender were still most distinguishing**
    - But income metric decreased after reaching an all-time high in 2022 (73% > $100k, down from 78% in 2022)
    - And 2/5^{ths} of “income disparity” findings based on Census data likely due to structural inequities in car buying (up from 1/3rd)
- Metrics help **quantify “length of road ahead”** and through **strategic segments**

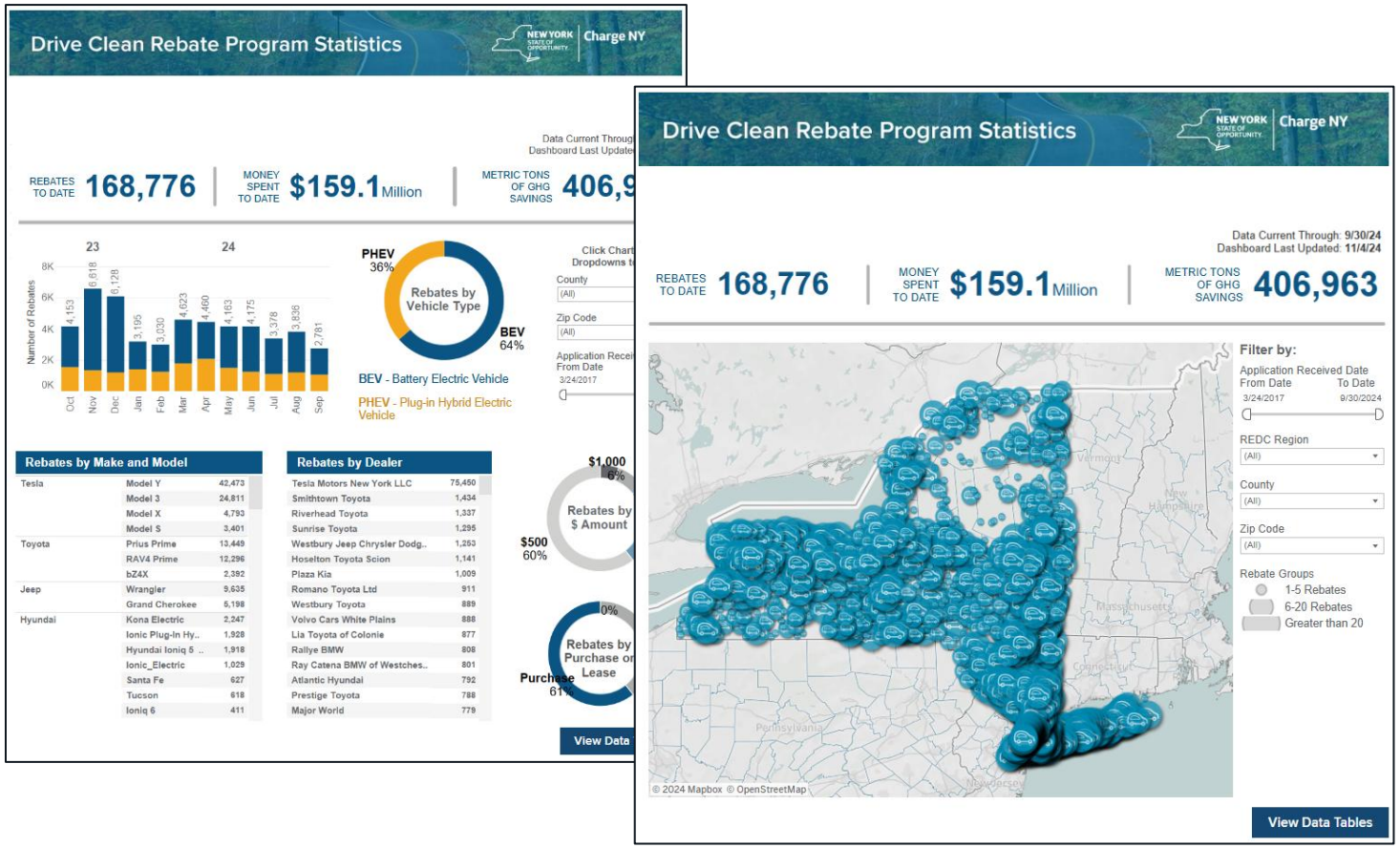
Appendix

- Acronyms
- Additional Details
- Resources

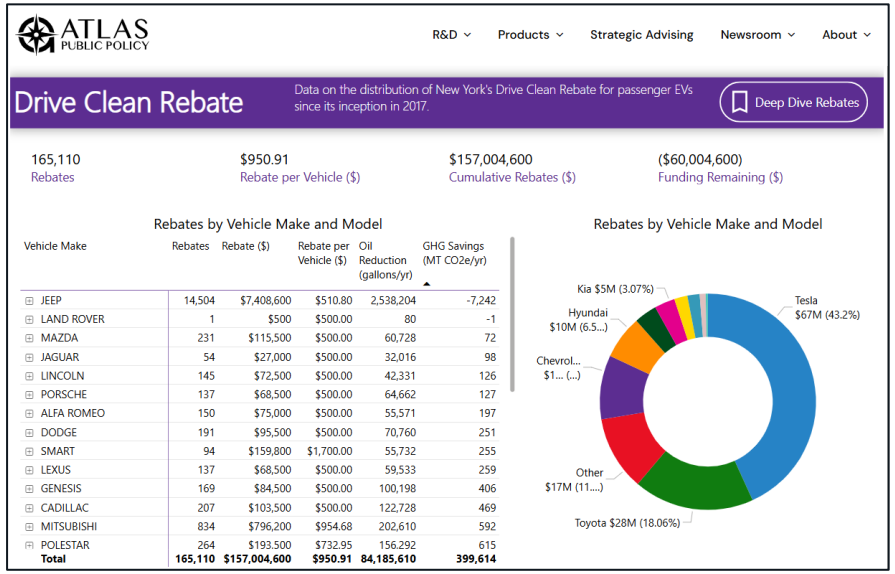
Acronyms

BEV – Battery Electric Vehicle
DAC – Disadvantaged Community
DCRP – Drive Clean Rebate Program (statewide)
e-mile – EPA-rated all-electric mile of driving range
EPA – U.S. Environmental Protection Agency
EV – Electric Vehicle (including PHEVs and BEVs; FCEVs not in the data)
FCEV – Fuel-Cell Electric Vehicle
HH – Household
MSRP – Manufacturer's Suggested Retail Price
MY – Model Year
N.A. – Not Applicable
NHTS – National Household Travel Survey
NVES – New Vehicle Experience Survey
NY – New York State
PHEV – Plug-in Hybrid Electric Vehicle
PPT – Percentage Point
PUMS – Public Use Microdata Sample

For Additional, Up-to-date Program Data (images as of 11/4/2024)



[Drive Clean Rebate Program Statistics Dashboard]



[EValuateNY Dashboard]

Program data: a large number of applications and surveys

Survey data statistically represents all participants

		Annual →				
Vehicle Purchase/Lease Dates	**3/23/2017 – 12/31/2019**	**1/2/2020 – 12/31/2020**	**1/1/2021 – 12/31/2021**	**1/2/2022 – 12/31/2022**	**1/1/2023 – 12/31/2023**	**Total**
Survey Responses (*n*)¶	5,474	3,480	5,087	5,472	7,225	26,738
Program Applicant Population (*N*)§	21,843	13,038	23,098	27,187	46,237	131,403
Program as % of Market *	~56%	~72%	~65%	~66%	~61%	~63%

¶ Subsequently weighted to represent the program population along the dimensions of vehicle technology (PHEV vs. BEV), model, buy vs. lease, and county.

§ Small numbers of rebated vehicles are not represented in the time frames due to application lags.

* Based on approximate comparisons to total EV sales from https://www.autosinnovate.org/EVDashboard (AAI & CSE 2024).

Rebate design shapes outcomes

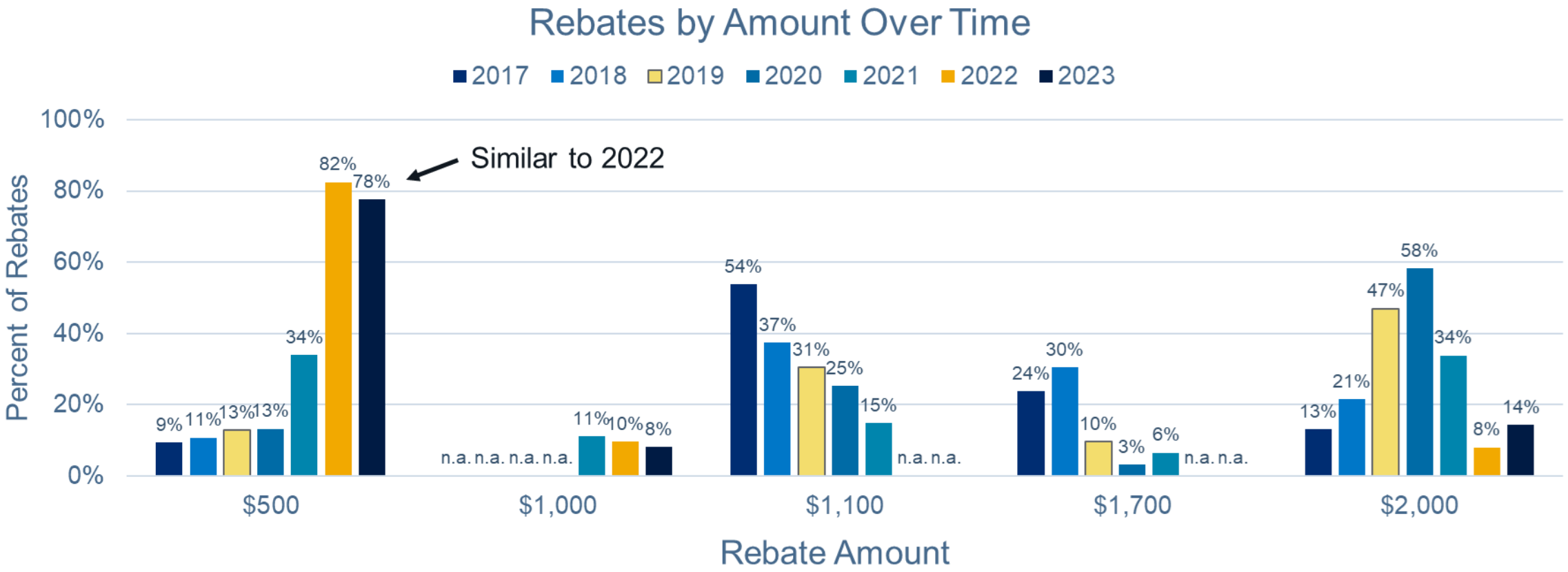
Program design changed mid-2021

Category	Purchase/lease dates through June 30, 2021	Purchase/lease dates after June 30, 2021
Fuel-Cell EVs*, All-Battery EVs (BEVs), and Plug-in Hybrid EVs (PHEVs)	≥ 120 e-miles†: $2,000 ≥ 40 e-miles: $1,700 ≥ 20 e-miles: $1,100 < 20 e-miles: $500	≥ 200 e-miles: $2,000 ≥ 40 e-miles: $1,000 < 40 e-miles: $500
Misc.	MSRP > $60,000 = $500 Point-of-sale	MSRP > $42,000 = $500 Point-of-sale

* FCEVs eligible but unavailable in NY; none rebated. † Electric miles (e-miles) are U.S.-EPA-rated all-electric miles.

The program has shifted dramatically toward $500 rebates

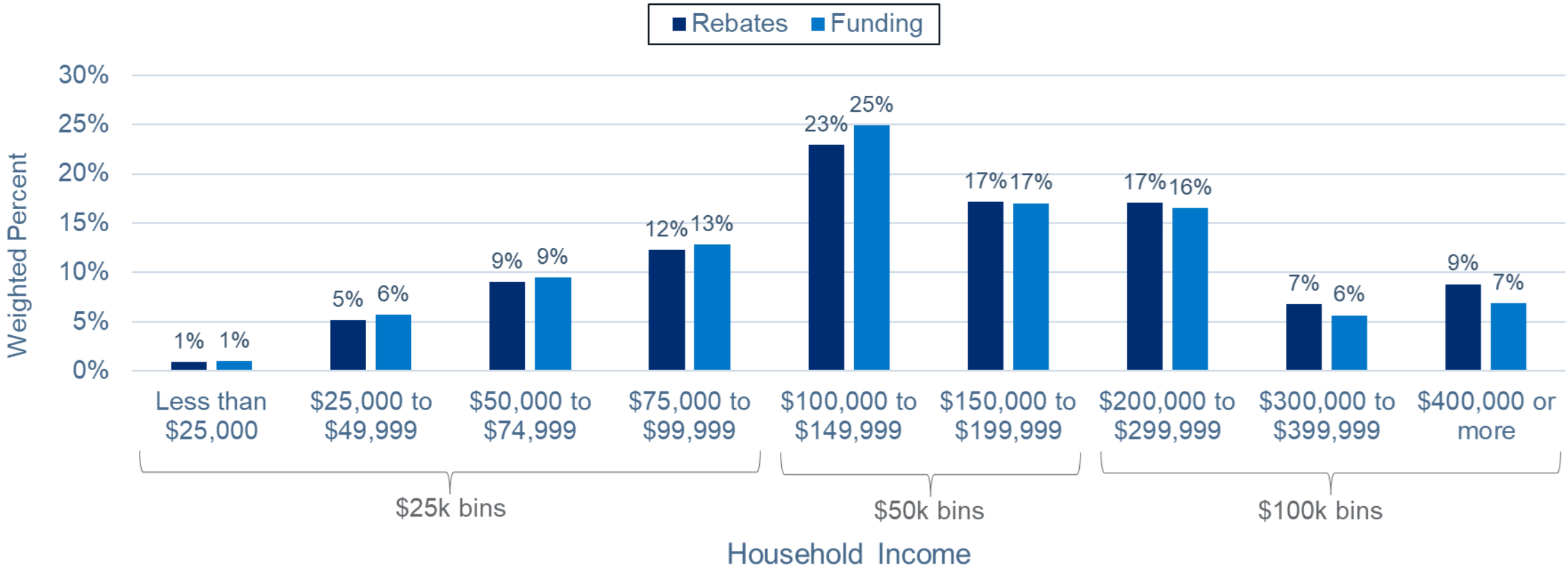
These rebates acknowledge EV adoption, but have lower influence*



* See “Rebate Influence through 2023 and Designing for Cost-Effectiveness”
Excludes 12 rebates with irregular amounts (< 0.1% of rebates).

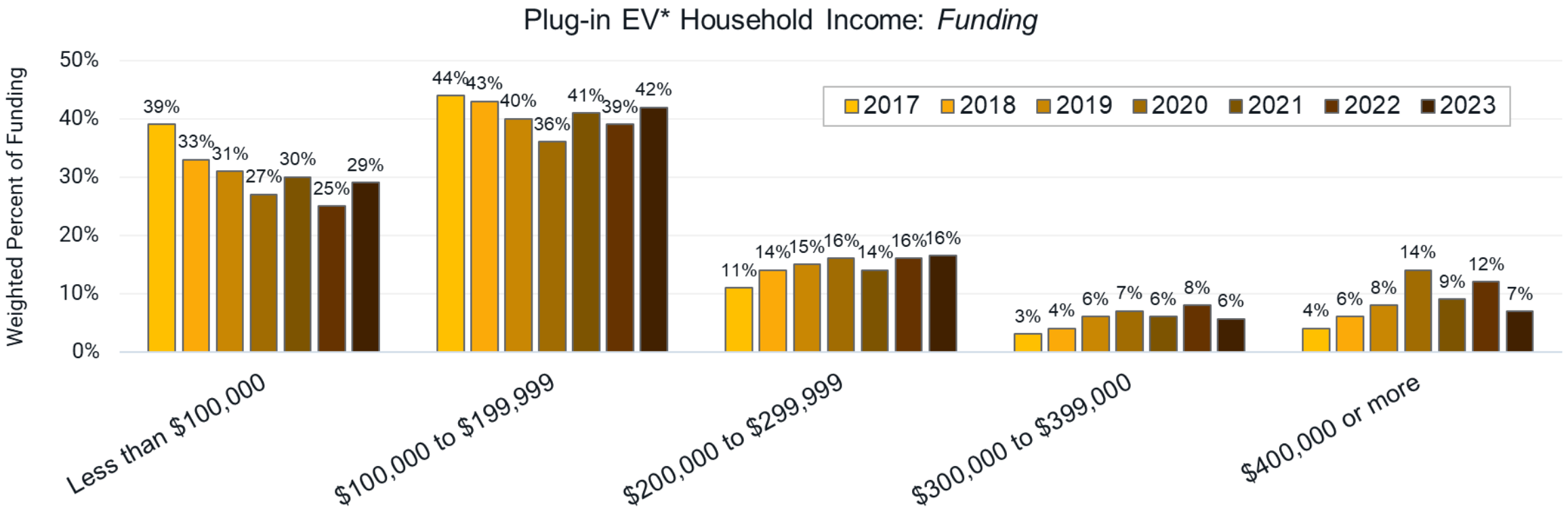
Plug-in EV Household Income: Rebates & Funding

2023 purchases/leases, higher resolution (but uneven bins)



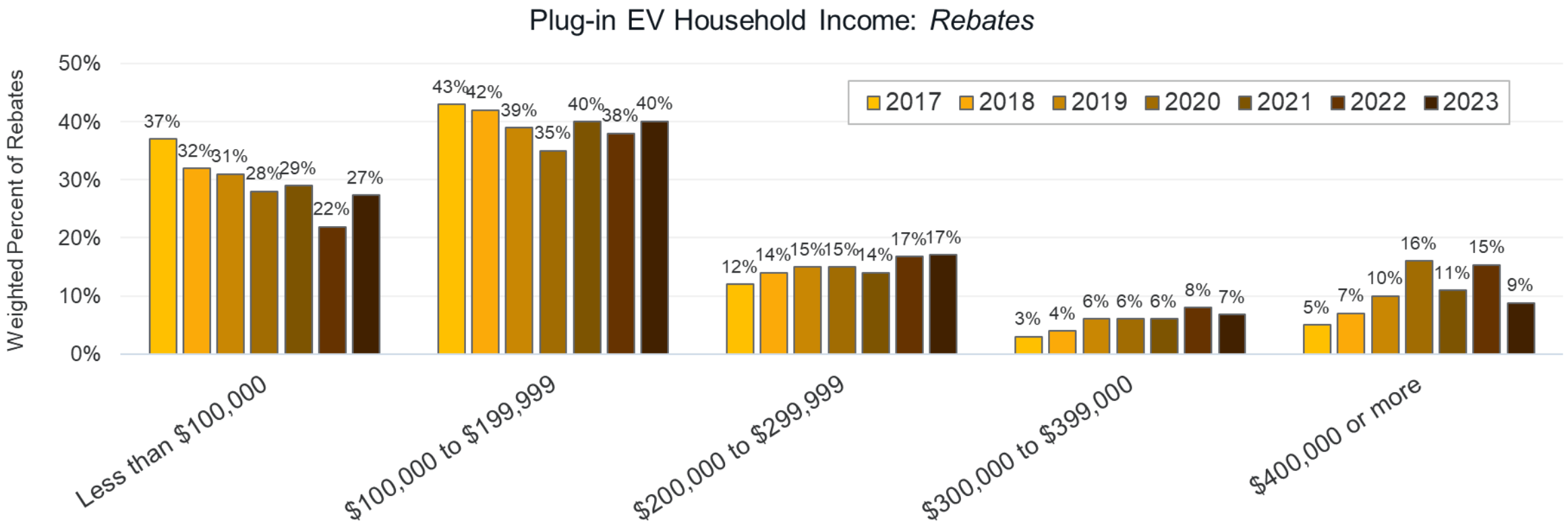
NY DCRP Adoption Survey. 2023 *n* = 6,159.
n-values are filtered and question-specific. 2023 weights specific to 2023 purchases/leases.

Flipping the perspective into an equity metric: 71% of funding for 2023 purchases/leases also went to households with income > $100k (down from 75% for 2022)



NY DCRP Adoption Survey. 2017 *n* = 842; 2018 *n* = 1,813; 2019 *n* = 1,817; 2020 *n* = 2,852; 2021 *n* = 4,237; 2022 *n* = 4,607; 2023 *n* = 6,159.
n-values are filtered and question-specific. 2020–2023 weights specific to 2020–2023 purchases/leases, respectively.
* Plug-in EV = BEV and PHEV.

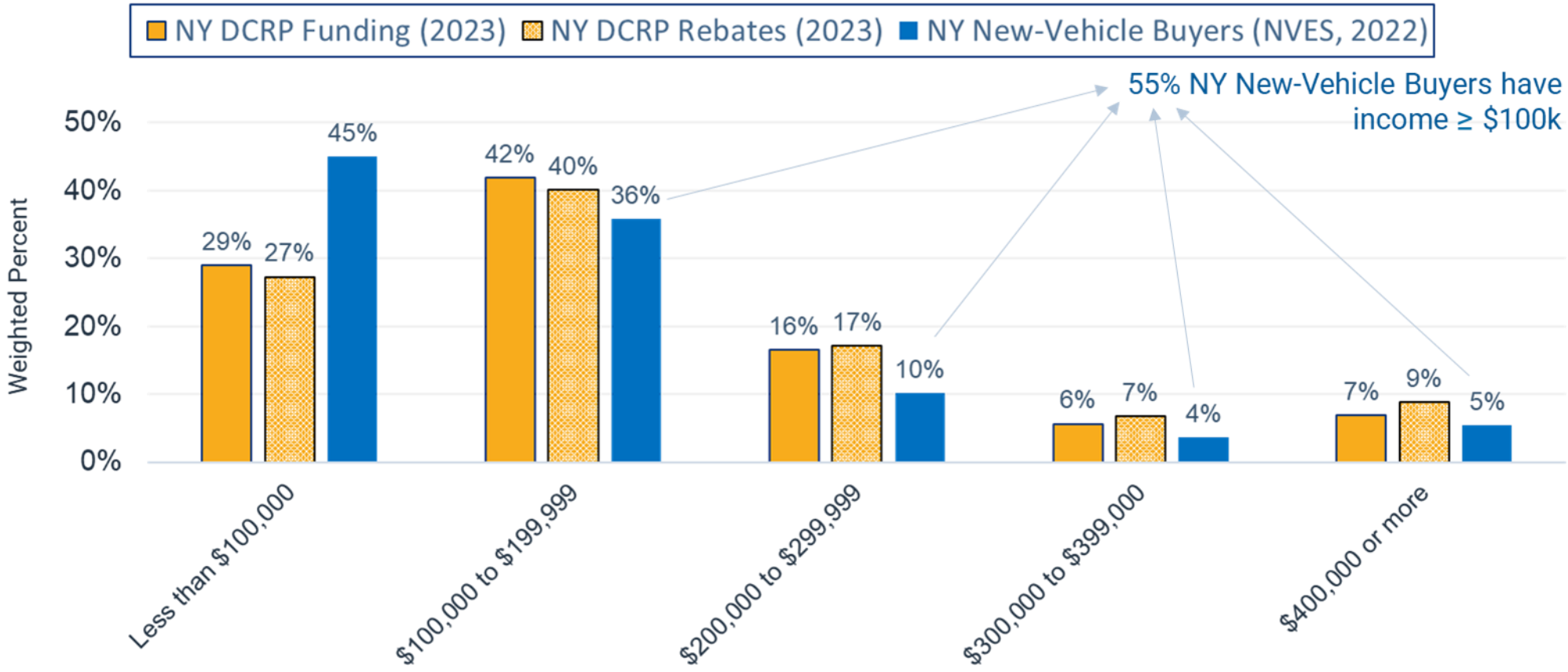
73% of rebates for 2023 purchases/leases went to households with income > $100k (down from 78%)



NY DCRP Adoption Survey. 2017 *n* = 842; 2018 *n* = 1,813; 2019 *n* = 1,817; 2020 *n* = 2,852; 2021 *n* = 4,237; 2022 *n* = 4,607; 2023 *n* = 6,159.
n-values are filtered and question-specific. 2020–2023 weights specific to 2020–2023 purchases/leases, respectively.

NY DCRP Rebates & Funding with New-Vehicle Buyers*

Distribution of Household Income



* NVES 2022 (Strategic Vision New Vehicle Experience Study): Note: No Tesla consumers were in the NVES NY data sample. However, BEVs were only 3.8% of 2022 NY sales, per Autos Innovate Electric Vehicle Sales Dashboard. Income labels use 100k values as lower limits based on NY DCRP data, but NVES uses 100k values as upper limits.

NY DCRP Adoption Survey. 2022 *n* = 4,607. n-values are filtered and question-specific.

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

"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

Characterize adoption by communities with disproportionate socioeconomic vulnerability or pollution exposure, to go beyond the mainstream toward equitable access

Illustrative Progression Using Percentage-Point Differences From the New-Vehicle Baseline (circa 2019, from contract 66267§)

New-Vehicle Buyer Majority Characteristic	All DCRP	*Rebate Essentials*	*EV Converts*	NY New-Vehicle Buyers†	DAC Participants
Household Size ≤ 3	+4%	+2%	+1%	0%	+7%
≥ 40 Years Old	+6%	+3%	+3%	0%	-11%
Selected solely White	+7%	+6%	+6%	0%	-4%
≥ 2 Household Cars	+9%	+10%	+8%	0%	-8%
≥ 2 Household Drivers	+10%	+10%	+10%	0%	-1%
≥ Bachelor's Degree	+12%	+12%	+8%	0%	+4%
Own Home	+14%	+13%	+12%	0%	-9%
≥ $100k HH Income	+16%	+14%	+11%	0%	-1%
Selected male	+21%	+23%	+16%	0%	+20%
total points:	+95%	+91%	+74%	0%	-10%
progression from step:		-4%	-17%	-74%	-10%
progression from starting point:		-4%	-21%	-95%	-105%

§ Table 7 from: B.D.H. Williams (2021), An Electric-Vehicle Consumer Segmentation Roadmap: Strategically Amplifying Participation in the New York Drive Clean Rebate Program, NYSERDA Report 21-30.

† New York State responses to the 2017 National Household Travel Survey (NHTS). NHTS is weighted to represent its population, not the new-vehicle subset. New-vehicle buyers were identified by the authors based on a within-100-mile match between odometer and miles driven while owned.

Related Analysis & Video

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. Video. Slides.

Transport Policy 137 (2023) 141–151

Contents lists available at ScienceDirect

Transport Policy

journal homepage: www.elsevier.com/locate/tranpol

Assessing progress and equity in the distribution of electric vehicle rebates using appropriate comparisons

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ARTICLE INFO

Keywords:
Electric vehicles
Incentives
Transport policy
Adopter characteristics
Equity
Consumer demographics

ABSTRACT

To meet aggressive transportation-electrification goals, electric-vehicle (EV) sales must expand deeper into mainstream markets. To address equity concerns, EV sales must go beyond the mainstream to increase access to EV benefits. To support needed expansion in sales and equity, this research examined the characteristics of California consumers that claimed the statewide rebate for EVs purchased/leased in 2017–2020. It weighted n = 32,524 survey responses to represent N = 193,167 rebate recipients and focused on 2020 adoption, trends over time, and differences between consumers of battery and plug-in hybrid EVs. Importantly, incentive-recipient characteristics were compared using Market-Majority Metrics to those of California new-vehicle buyers as a more appropriate baseline. Results raise the possibility that findings about the equity of EV-rebate-recipient incomes based upon comparisons to Census data could largely and more simply be findings about new-car buying, rather than particular to EV-incentive recipients. Rebate-recipient incomes continued to progress toward the mainstream despite the dominance of Tesla consumers and COVID. The distribution of rebate funding by income is now roughly comparable to new-vehicle buyers. Indeed, fewer rebated PHEV consumers (52%) had household incomes greater than $100,000 than even new-vehicle buyers (56%). Except for age, PHEV consumers are more similar to typical vehicle buyers than BEV consumers are. The characteristics most distinguishing of EV consumers are now home ownership and male sex/gender identification. Market-Majority Metric "heat map tables" are developed as an intuitive but quantitative tool to highlight the length of the road ahead that EV markets must travel toward the mainstream and beyond to priority populations.

1. Introduction

1.1. Problem & research aims

Significant public investments are being made to incentivize the purchase or lease of plug-in electric vehicles (EVs). Questions are frequently raised about the beneficiaries of these investments: Who is receiving EV incentives? Is the distribution of EV incentives equitable? Headlines raise concerns about progress—e.g., "'Silicon Valley dudes buying Teslas': California struggles to expand electric car market" (Gardiner, 2020).

Discussion about these important topics typically suffers from one or more challenges, including: 1) lack of a quantitative basis and clear definitions upon which to ground specific issues, 2) lack of access to pertinent data that adequately characterize a dynamically evolving nascent EV market, and/or 4) lack of appropriate baselines of comparison that provide meaningful context. For example, it is well established that early EV adoption was associated with "high income" (e.g., (Brückmann et al., 2021; Hardman et al., 2016)). However, determining what is "high"—let alone how concerning we should consider incentive-recipient incomes to be—turns out to be surprisingly difficult. This, in turn, complicates the development of optimal strategies to effectively address legitimate concerns about equity and public investment.

> "If we could first know where we are, and whither we are tending, we could better judge what to do, and how to do it" –Abraham Lincoln ("House Divided Speech - Lincoln Home National Historic Site," n.d.)

This research aims to aid the discussion by 1) updating the characterization of EV incentive recipients with relatively recent data, 2) exploring trends over time, and 3) calibrating the conversation about inequities with appropriate bases of comparison. The purpose is not to make final proclamatory determinations, but rather to develop and discuss simple yet illuminating metrics that can inform and empower evaluations of market status, equity, and the road ahead.

Specifically, the characteristics of consumers that have received

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https://doi.org/10.1016/j.tranpol.2023.04.009
Received 2 August 2022; Received in revised form 14 April 2023; Accepted 18 April 2023
Available online 26 April 2023

NY Drive Clean Rebates: Select Related Analysis

Rebate Impacts (DCRP Resources)

- ❖ Williams, B.D.H. and Pallonetti, N. (2024, Mar.). Presentation: "NY Drive Clean Rebate: Vehicle Replacement & Rebate Influence thru 2022." New York State Drive Clean Program (DCRP), NYSERDA. Slides.
- ❖ B.D.H. Williams and N. Pallonetti (2023, Mar.), New York State's Drive Clean Rebate for Electric Vehicles: Measures of Impact, for procs. *36th International Electric Vehicle Symposium (EVS36)*, EDTA, Sacramento CA, USA. Paper. CSE paper posting. Slides.
- B.D.H Williams and N. Pallonetti (2022, Jun), Presentation: "NY Drive Clean Rebate: Select Impacts thru 2020 (and Lessons from Other State Electric Vehicle Programs)," Internal Presentation for NYSERDA, presented on 1 Sep. 2022.

Consumer Segmentation (NYSERDA Contract 66267 & Derivative Products)

- ❖ B.D.H. Williams and J.B. Anderson (2024, May). Expanding Electric Vehicle Adoption in Disadvantaged Communities. *Transportation Research Record: Journal of the Transportation Research Board*. https://doi.org/10.1177/03611981241242753. Paper. CSE posting. Open-access data-summary appendix. TRB 2024 slides.
- B.D.H. Williams (2024, Jan. 9). Presentation: "Amplifying Electric Vehicle Adoption in Disadvantaged Communities, Consumer Segmentation Roadmaps, and Additional Equity Considerations." *103rd Annual Meeting of the Transportation Research Board*. NASEM, Washington DC, USA. Slides. TRB 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.* https://doi.org/10.1177/03611981221118537. Paper. Open-access data-summary supplement.
- ❖ B.D.H. Williams (2022, Jun.), Targeting Incentives Cost Effectively: "*Rebate Essential*" Consumers in the New York State Electric Vehicle Rebate Program, for procs. *35th International Electric Vehicle Symposium (EVS35),* 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, NYSERDA Report 21-30, *Clean Transportation Reports*. Also linked to ResearchGate.

Incorporated Into Multi-state Analysis

- B.D.H. Williams (2021, Jul. 28), Presentation: "Data from Statewide Electric Vehicle Rebate Programs: Vehicles, Consumers, Impacts, and Effectiveness," *Collaboration for ZEV Success*, Multi-state ZEV Task Force and Alliance of Automotive Innovation. Slides. CSE posting.
- B.D.H. Williams (2020, Dec.), Presentation: "EV Purchase Incentives: Program Design, Outputs, and Outcomes of Four Statewide Programs with a Focus on Massachusetts," *Behavior, Energy & Climate Change Conference 2020*, ACEEE, UC Berkeley CIEE, and SEEPAC. Slides. CSE posting.
- B.D.H. Williams (2019, Oct.), Presentation: "Transportation Electrification: Incentives." *REV2019 Conference*, Burlington VT. Slides. CSE posting.
- Williams, B. D., & Jones, M. (2018, June 20). Presentation: "Electric Vehicle Rebates: Exploring Indicators of Impact in Four States." *EV Roadmap 11 Conference*. ResearchGate DOI. CSE posting.

Reverse chronological within each section, as of 5/2024. Key resources marked with a diamond bullet.

For More Information

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Recommended citation:

B.D.H. Williams and N. Pallonetti (2025, Mar.), Presentation: “NY Drive Clean Rebate: Consumer Characteristics & Equity Metrics thru 2023,” prepared by the Center for Sustainable Energy for NYSERDA.

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