

NYSERDA Drive Clean Rebate Ownership Survey 2018–2019 Results

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Our Mission:

Advance clean energy innovation and investments to combat climate change, improving the health, resiliency, and prosperity of New Yorkers and delivering benefits equitably to all.

NYSERDA Drive Clean Rebate Ownership Survey 2018–2019 Results

Final Report

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Abstract

This report summarizes results of a survey of rebate recipients approximately one year after adopting an electric vehicle (EV) through the New York State Energy Research and Development Authority's (NYSERDA) Drive Clean Rebate program between 2018 and 2019. The program offered point-of-sale rebates on new car purchases and leases for eligible electric cars.

Survey results are grouped by technology type, that is, plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs). Results summarize demographics, that is, homeowners versus renters, residence type, gender, age, income and racial/ethnic identity, electric car driving patterns, charging behaviors and concerns.

The Ownership Survey showed high levels of participant satisfaction. Charging infrastructure and vehicle range limitations were the most commonly reported concerns. Relative to results from the 2017–2018 Ownership Survey, BEV drivers were more likely to report using their vehicle for long (>50 miles from home) trips. BEV drivers were also charging their car at home more frequently and were less likely to use public chargers.

Keywords

Electric cars, electric vehicles (EVs), plug-in electric hybrid vehicles (PHEVs), battery electric vehicles (BEVs), all-battery cars, Drive Clean Rebate program, point-of-sale rebates, rebate importance, Rebate Essentiality, auto dealers, EV ownership

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Executive Summary

NYSERDA's Drive Clean Rebate program provides point-of-sale rebates to consumers who purchase or lease eligible new electric vehicles, both plug-in hybrid and battery vehicles included. The program launched in March 2017, administered by the Center for Sustainable Energy (CSE). Participants in the program are invited to take an Ownership Survey approximately one year after acquiring their vehicle. The survey asks about ownership experience and what could make electric vehicle ownership more attractive. This report summarizes findings for rebated vehicles purchased between April 1, 2018, and December 31, 2019.

A total of 15,489 program participants received a rebate for vehicles purchased during this time, and each received an invitation to complete the survey. Of these, 3,257 completed the survey, for a response rate of 21%. Twenty-five respondents were disqualified because they no longer own the electric car that they were incentivized for. After eliminating these responses, a total of 3,232 (20.9%) valid responses remained and were analyzed in this report. To better represent the larger population of program participants, survey data were then weighted; key findings include the following:

- Respondents have driven an average¹ of:
 - 11,500 miles (for plug-in hybrid electric vehicles, or PHEVs)
 - 10,600 miles (for all-battery electric vehicles, or BEVs)
- Typical vehicle uses² include:
 - Running errands (90%)
 - Commuting (76%)
- Respondents are satisfied with their electric vehicles:
 - Ninety-three percent are “very” or “extremely” satisfied with their ownership experience.
 - Ninety-three percent would “probably” or “definitely” recommend electric vehicle (EV) ownership to others.

Despite the high levels of overall satisfaction reported by participants, challenges remain.

- Most respondents have concerns about the availability of public charging infrastructure:
 - Sixty-seven percent of respondents selected “access to public charging stations” as one of the top three challenges of owning an electric vehicle, and only 9% agreed with the statement “there are enough public chargers.”
 - Thirty percent of BEV respondents agreed with the statement “I frequently see gasoline-fueled cars parked in spaces with public electric chargers.”
- Performance in cold weather is a greater concern for owners of BEVs than for owners of PHEVs:
 - Thirty-nine percent of BEV respondents selected this as one of their top three challenges.
 - Among PHEV respondents, this number is only 33%.
- Charging behavior of both BEV and PHEV drivers is different from the 2017–2018 Ownership Survey results:
 - The percent of BEV drivers who charge at home daily increased from 22% to 68%.
 - The percent of BEV drivers who never use public chargers increased from 30% to 58%.
 - The percent of PHEV drivers who never charge at home fell from 28% to 8%.
 - The percent of PHEV drivers who never use public chargers decreased from 62% to 23%.

1 Introduction

NYSERDA’s Drive Clean Rebate program provides point-of-sale rebates to consumers who purchase or lease eligible new all-battery or plug-in hybrid electric cars. Hydrogen fuel-cell electric cars will be eligible when they are available in New York State.

The program launched in March 2017 and is administered by the Center for Sustainable Energy (CSE). Individual program participants³ are invited to take two voluntary surveys designed to help researchers better understand owner experience and behavior. The first is shared with participants two weeks after the rebate is approved and is referred to as the Adoption Survey. This report summarizes findings from the second survey—referred to as the Ownership Survey—which is designed to better understand rebated electric car ownership experiences in New York State, and to identify ways to make ownership attractive and sustainable.

1.1 Administration Details

The Drive Clean Rebate Ownership Survey is administered on a quarterly basis. Program participants receive a survey invitation by email approximately one year after they acquired their vehicle.⁴ The participants included in this analysis purchased or leased electric cars between April 1, 2018 and December 31, 2019 (Table 1). A total of 15,489 participants received a rebate for cars acquired during this window and were invited to take the survey.

Table 1. 2018–2019 Drive Clean Rebate Ownership Survey

	Date Ranges
Responses Received:	5/16/2019–3/11/2021
Vehicle Purchase/Lease Dates:	4/1/2018–12/31/2019 ⁶

Of those invited to take the survey, 3,257 responded, resulting in a response rate of 21%. These respondents completed the survey between May 16, 2019 and March 11, 2021. Twenty-five respondents were disqualified because they no longer own the electric car that they were incentivized for. Of those 25, 10 respondents stated that their household no longer owns an electric car, and 15 respondents stated their household owns a different electric car. After eliminating these responses, a total of 3,232 valid responses remained and were analyzed in this report.

1.2 Representativeness and Weighting

Since the Ownership Survey is voluntary and not everyone chooses to complete it, responses may not be representative of the entire Drive Clean Rebate participant population. However, using application information available for all program participants, response weights were created to compensate for over- or under-representation among various groups.⁷ The dimensions used for weighting were car model, purchase versus lease, county, and technology type (plug-in hybrid electric vehicle [PHEV] versus battery electric vehicle [BEV]). The weights were calculated using the raking method.⁸ Weighted responses are presented in this report and are representative of applicants who purchased their cars between April 1, 2018 and December 31, 2019. In this report, responses are segmented by technology type when the differences between these two are statistically significant.⁹ Rao-Scott adjusted Pearson’s Chi-square testing with weighted data was used to test for differences between PHEV and BEV respondents.¹⁰

Table 2. 2018–2019 Drive Clean Rebate Ownership Survey Sample Size and Representativeness

Program Participant Population	N=15,489
Responses in Data Set	n=3,232 (20.9%)
Weighting Method	Raking
Representative Dimensions	Car Model, Purchase vs. Lease, County, Technology Type

Frequencies shown in figures throughout this report have been made proportionate based on the applied weights. In other words, all “%” results given below are proportionately weighted. Although the weighted frequency percentages tend to be the most-used summary statistics, the reader can approximate the number of program participants per each response option, if desired, using the program population size (N=15,489) and the percentages given in the tables below. For example, approximately 3,222 respondents answered the question “Do you have solar electric panels at your residence?” making the number of respondents to the question 99.7% of the survey sample (n=3,232 respondents in the data set). Nineteen percent of those responses indicated they have solar electric panels installed at their residence. Thus, the number of program participants represented by the respondents answering that they have solar electric panels installed at their residence is approximately 2,934 (15,489 x 99.7% x 19%).

2 Results

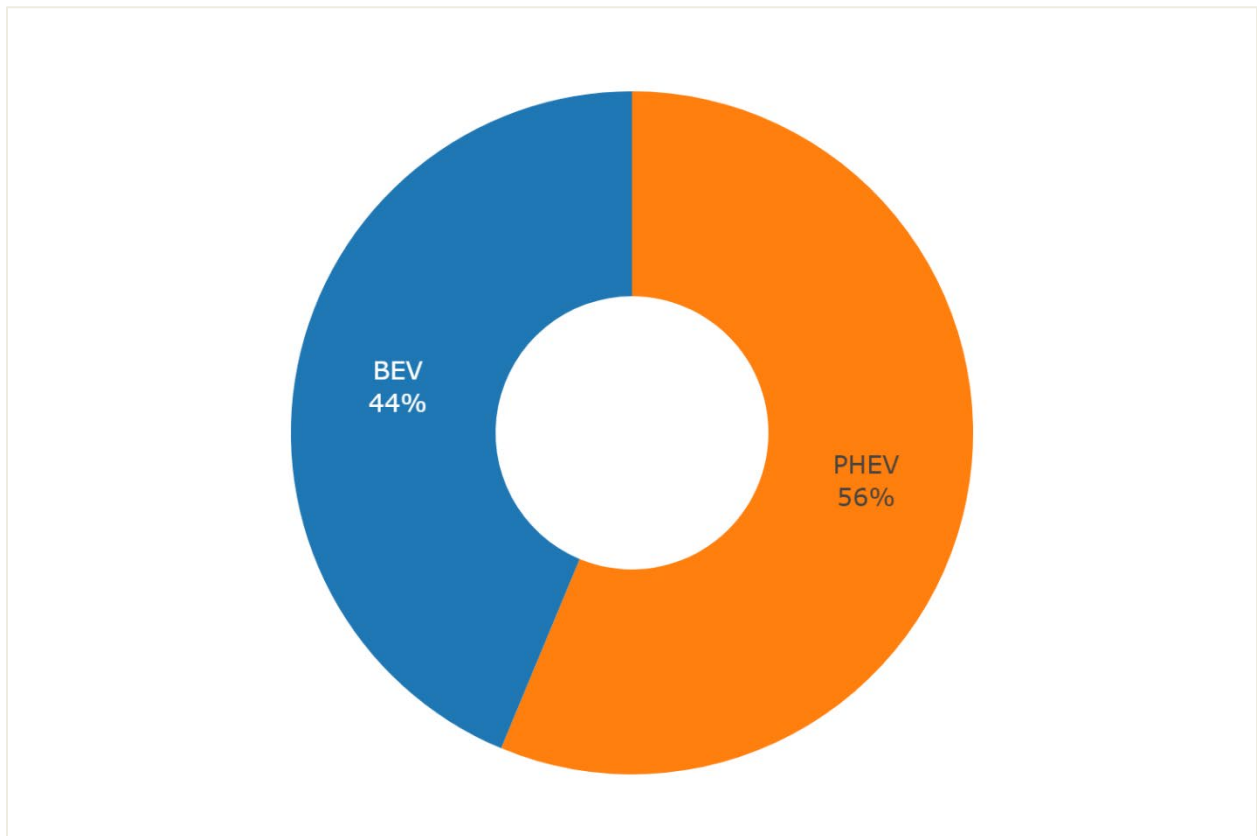
Please note, all frequencies and percentages given below are proportionately weighted.

2.1 Technology Types

Figure 1 shows that PHEVs were more commonly rebated than BEVs during this time period (56% versus 44%). However, the proportion of BEVs among program participants has been growing substantially; BEVs represented only 28% of participants in the 2017–2018 Ownership Survey report.

Figure 1. Rebates by Technology Type

(*n*=3232)



2.2 Car Status

Nearly all 3,257 respondents (99.1%) said their household still had the rebated electric car. Only 0.5% (15 respondents) reported that their household now has a different electric car, and the remaining 0.4% (10 respondents) no longer own any electric car. Of the ten who no longer had the rebated car, nine sold or traded it in and one selected “other.” Exact question wording can be found in the appendix.

2.3 Demographics and Housing Characteristics

Table 3 compares program participants with new car buyers in the United States, based on data from the National Household Travel Survey (NHTS).¹¹

Table 3. Comparison of Program Participants with New Car Buyers in the United States

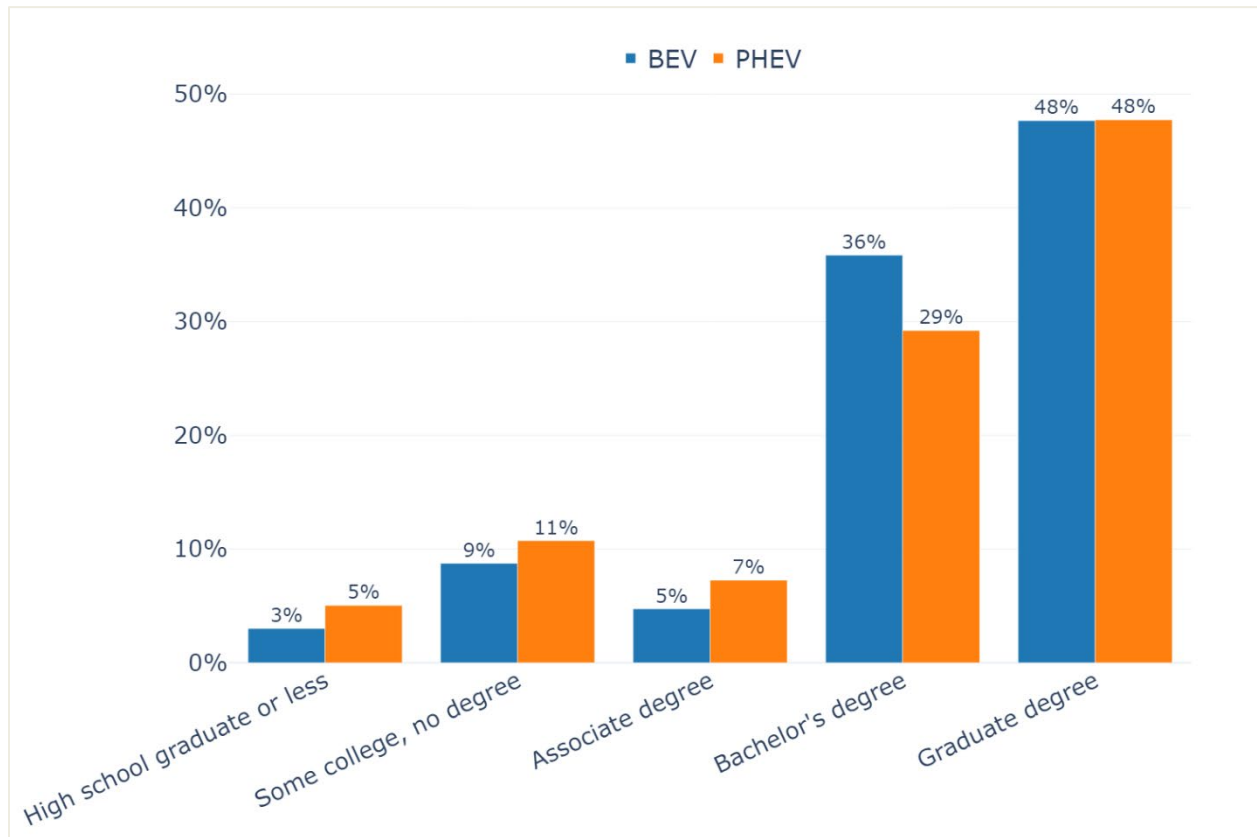
Characteristic	Drive Clean Program Participants	New Car Buyers in the US (NHTS 2017)
Male	73%	49%
Selected Solely White/Caucasian	84%	74%
50+ Years Old	56%	43%
Bachelor’s Degree or Higher	80%	50%
Family Income \$150,000+	46%	23%
Own Home	91%	73%

Table 3 provides a helpful reference point when interpreting the data from rebate recipients, shown in greater detail below. This is because new car buyers—rather than the population of New York State in general as a whole—is a more appropriate basis for comparison.

Program participants more frequently have college degrees, have higher incomes, and are older than average new car buyers in the United States. Over three-quarters of program participants (80%) have at least a bachelor’s degree (relative to 50% of new car buyers). Figure 2 shows that there are significant education differences between PHEV and BEV drivers, with BEV drivers more likely to have a college degree.

Figure 2. Highest Level of Education Completed

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=29$, $p<0.01$, $n=3126$).



Forty-six percent of program participants have an annual household income of \$150,000 or more compared to 23% of new car buyers. Figure 3 shows that there were also significant differences in income between PHEV and BEV drivers, with BEV drivers more likely to report annual household incomes of \$400,000 or more.

Fifty-six percent of rebate recipients are 50 years old or older, versus 43% of new car buyers overall. This is a notable decrease from the 2017–2018 Ownership Survey results, in which 64% of respondents were 50 years old or older. Figure 4 shows that there are significant age differences between PHEV and BEV drivers, with BEV drivers being younger than PHEV drivers.

While new car buyers in the U.S. are evenly split between male and female (49% male), program participants were 73% male. Figure 5 shows that females make up a larger portion of PHEV drivers than BEV drivers (33% versus 18%, respectively). The 18% share of BEV drivers who are female is a decrease from 25% in the 2017–2018 survey.

Figure 3. Annual Gross Household Income from All Sources

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=192$, $p<0.01$, $n=2604$).

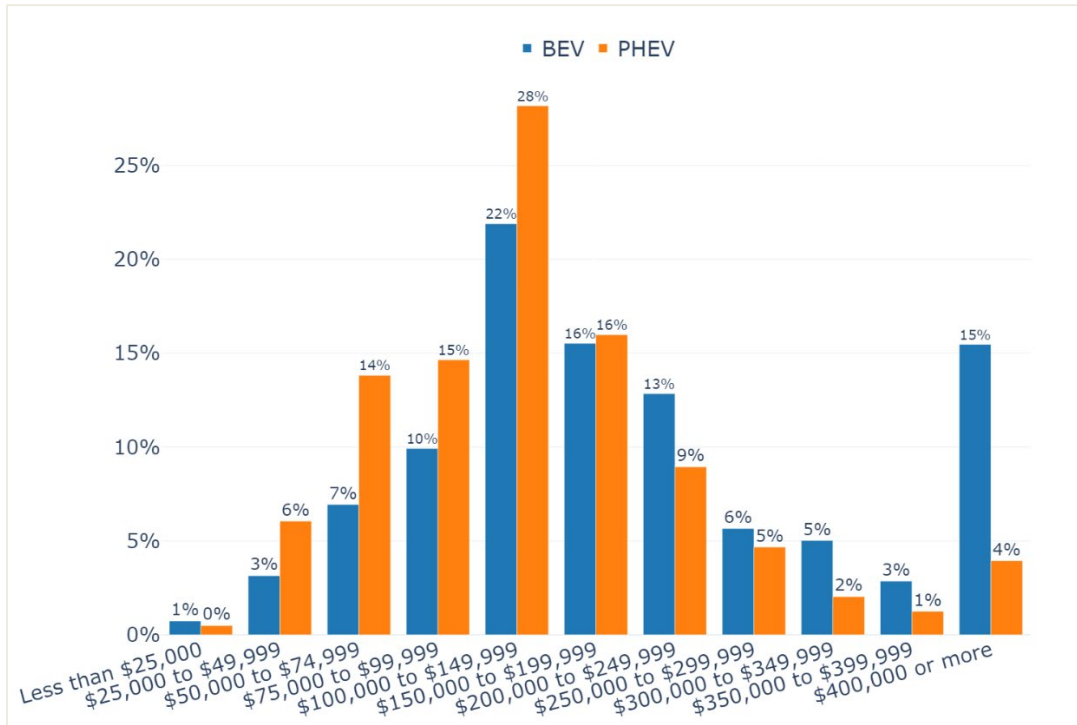


Figure 4. Age

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=91$, $p<0.01$, $n=3136$).

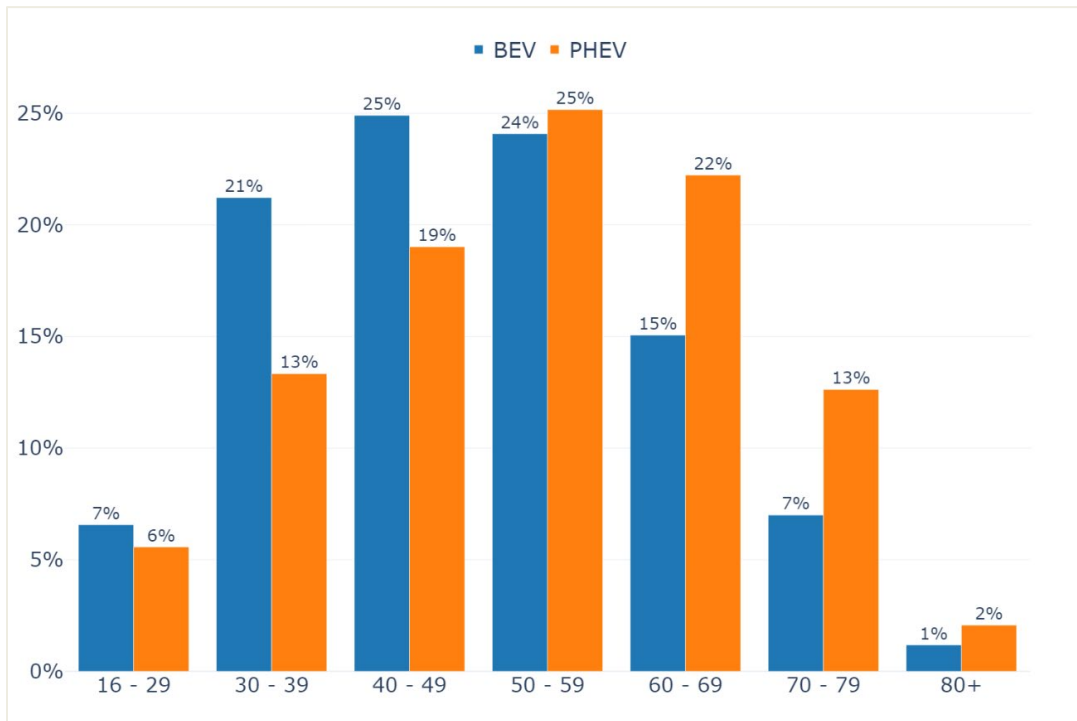


Figure 5. Gender

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=90$, $p<0.01$, $n=3117$).

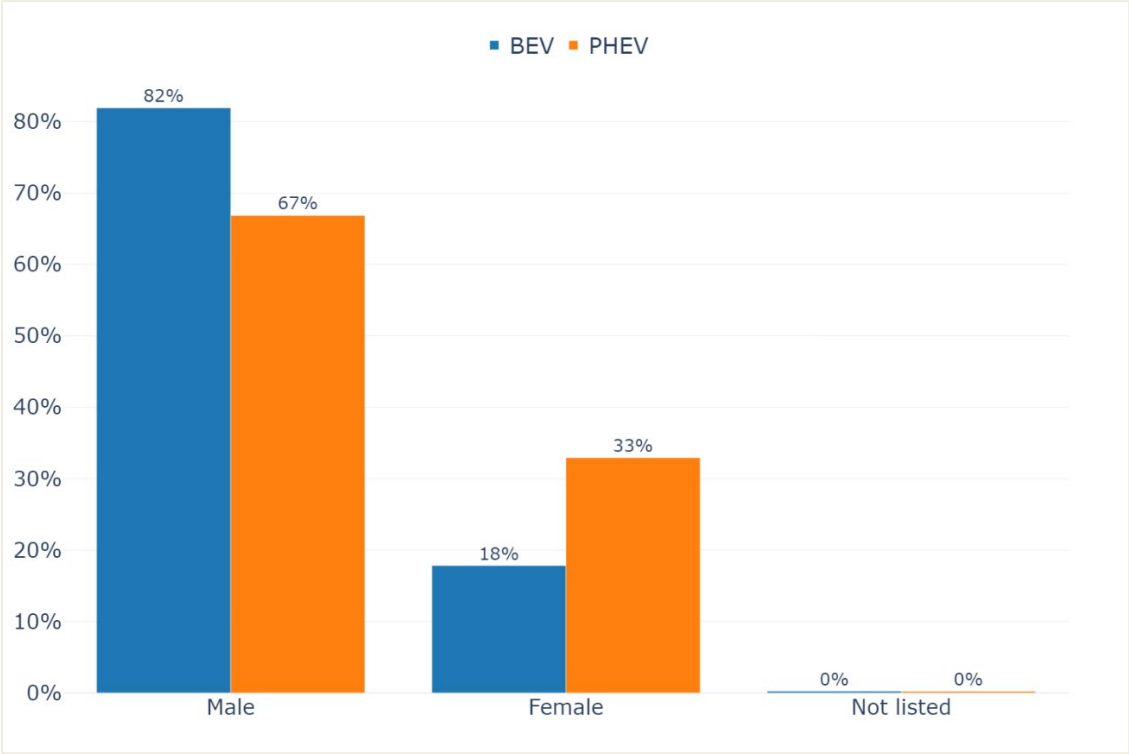


Figure 6. “How Do You Prefer to Describe Your Racial/Ethnic Identity?”

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=104$, $p<0.01$, $n=2812$). Note: Respondents can select all that apply for this question. Response options were: Black or African American, East Asian, Latino/a or Hispanic, Middle Eastern, Native American or Alaska Native, Native Hawaiian or Pacific Islander, South Asian, White or Caucasian, Other, and Prefer not to answer. Several categories are condensed for ease of reporting: East Asian and South Asian are included in Asian. Middle Eastern is included in Caucasian. Any respondent who selected two or more races is included in More than one race.

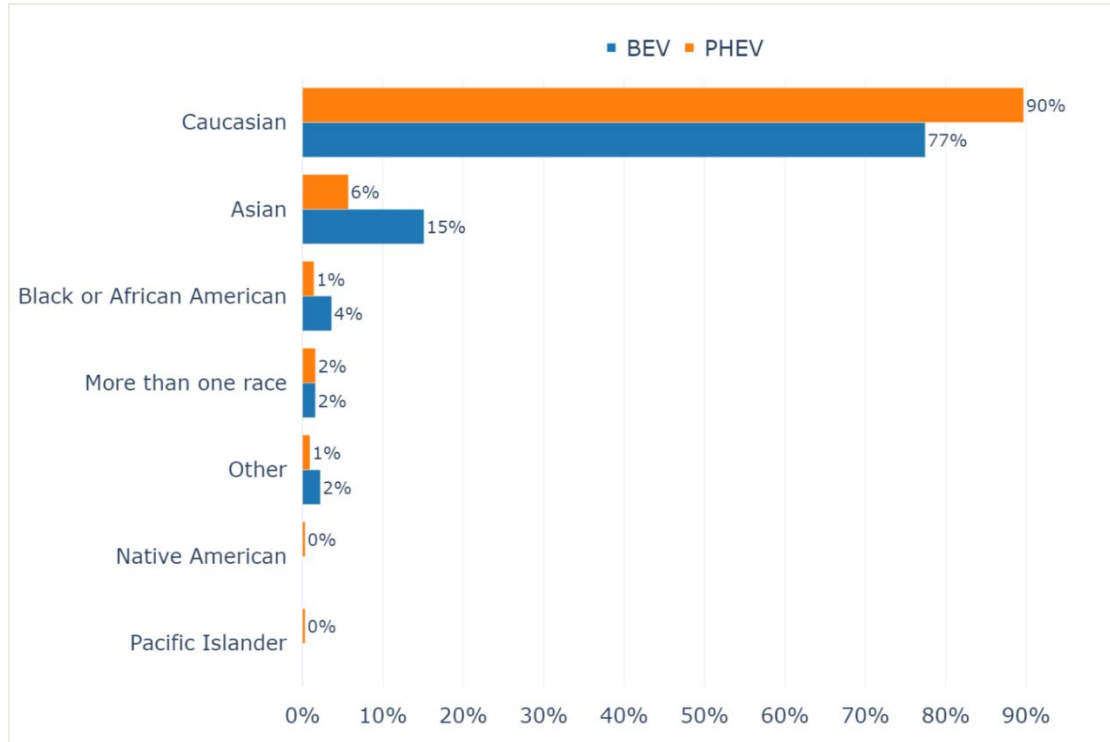


Figure 6 shows that program participants are more likely to identify as White or Caucasian than new car buyers overall (84% versus 74%). It is important to note that respondents who selected “Middle Eastern” are grouped with respondents who selected “White or Caucasian,” while the NHTS survey (Table 3) did not include a Middle Eastern option. Five percent of respondents selected “Latino/a or Hispanic.”

Figure 7. “Do You Own or Rent Your Residence?”

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=5$, $p<0.03$, $n=3107$).

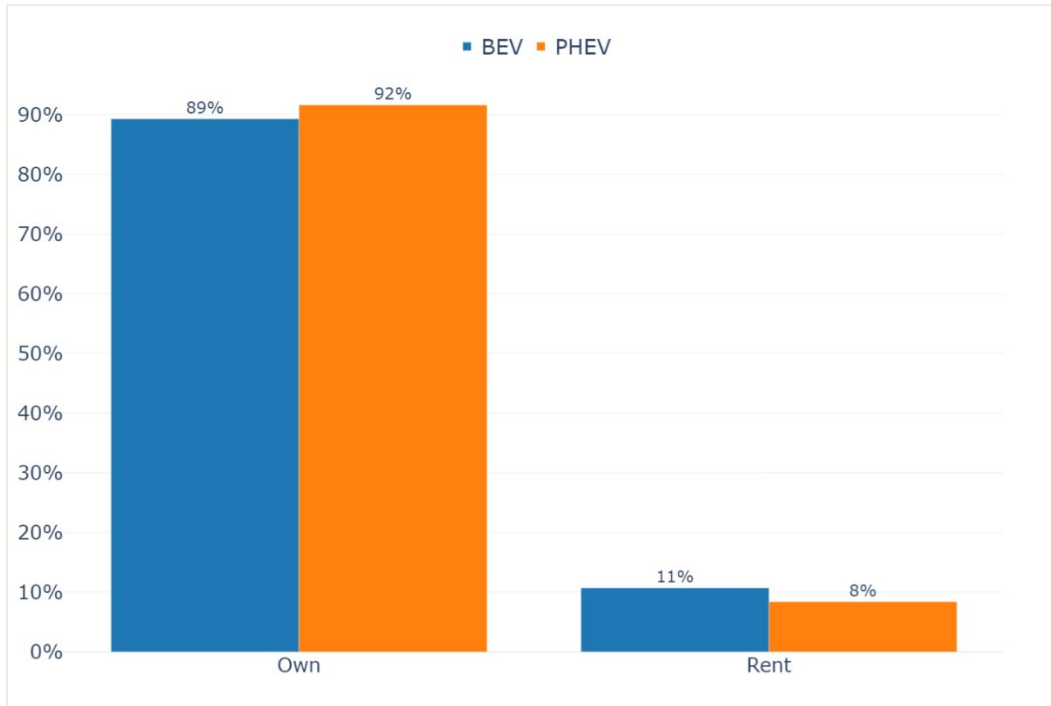


Figure 8. “What Type of Residence Do You Live In?”

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=28$, $p<0.01$, $n=3165$).

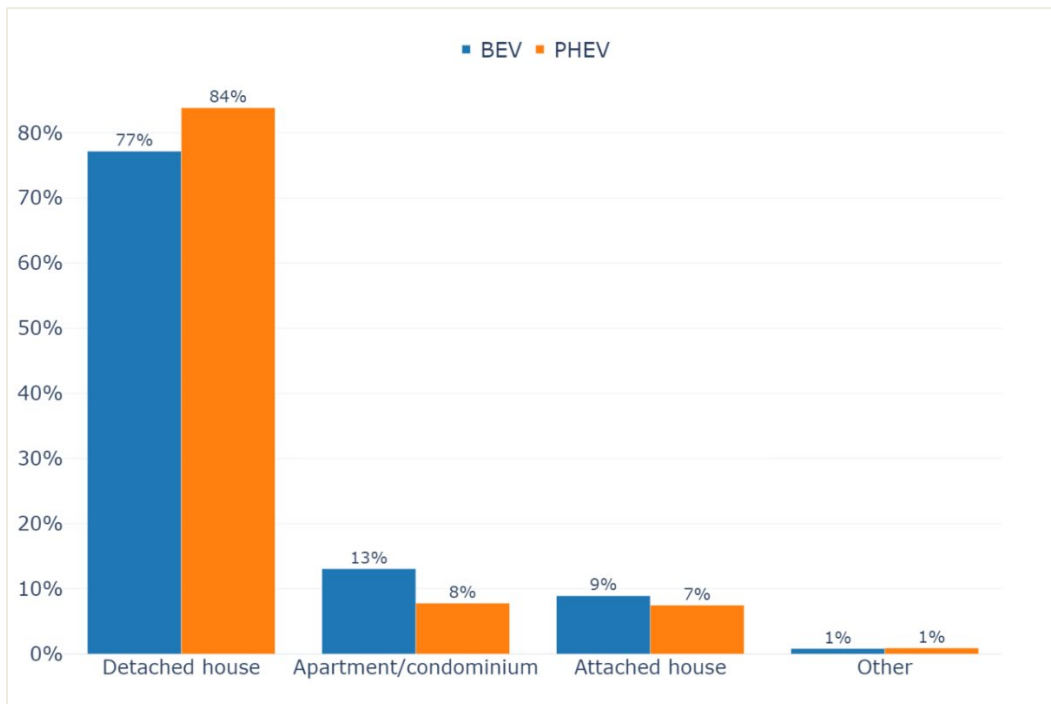
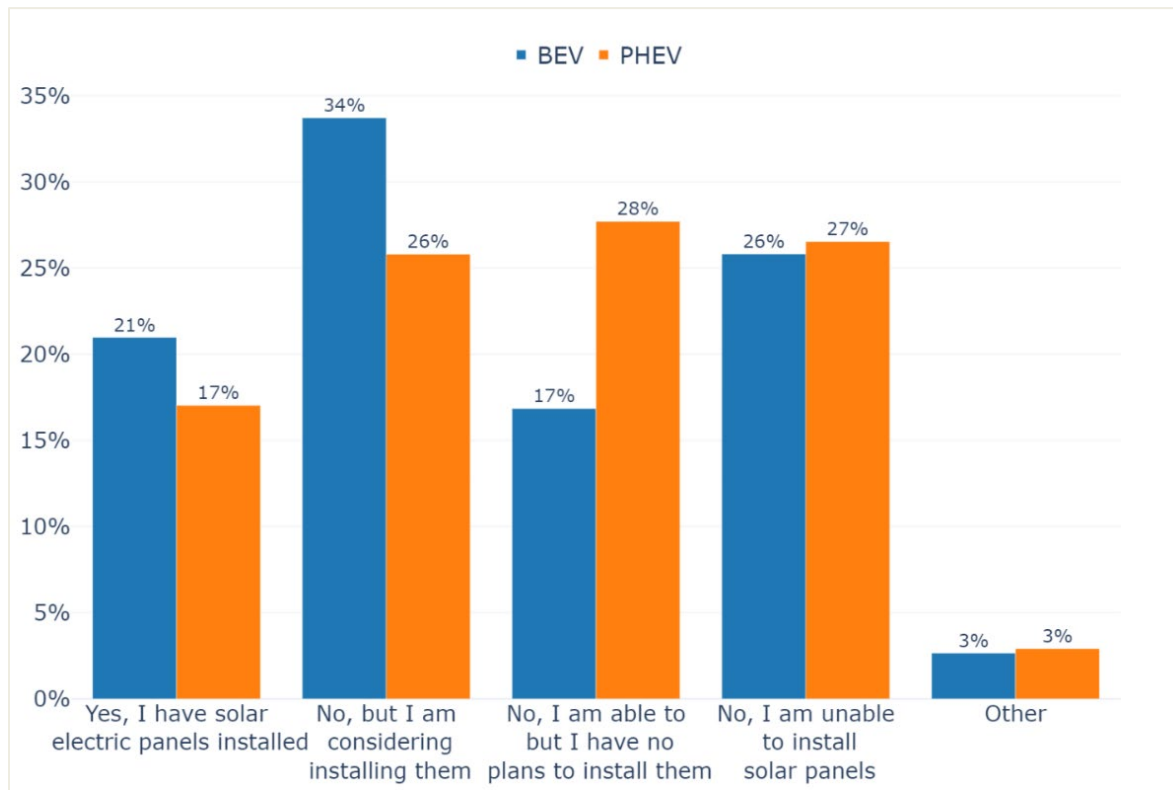


Figure 7 shows that respondents are more likely to be homeowners than the average new car buyer (91% versus 73%, respectively). Figure 8 shows that most (81%) respondents live in detached houses.

Overall, 19% of respondents own solar panels (Figure 9), with BEV drivers more likely than PHEV drivers to have solar panels installed at their residence (21% versus 17%, respectively).

Figure 9. “Do You Have Solar Electric Panels at your Residence?”

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=65$, $p<0.01$, $n=3222$).

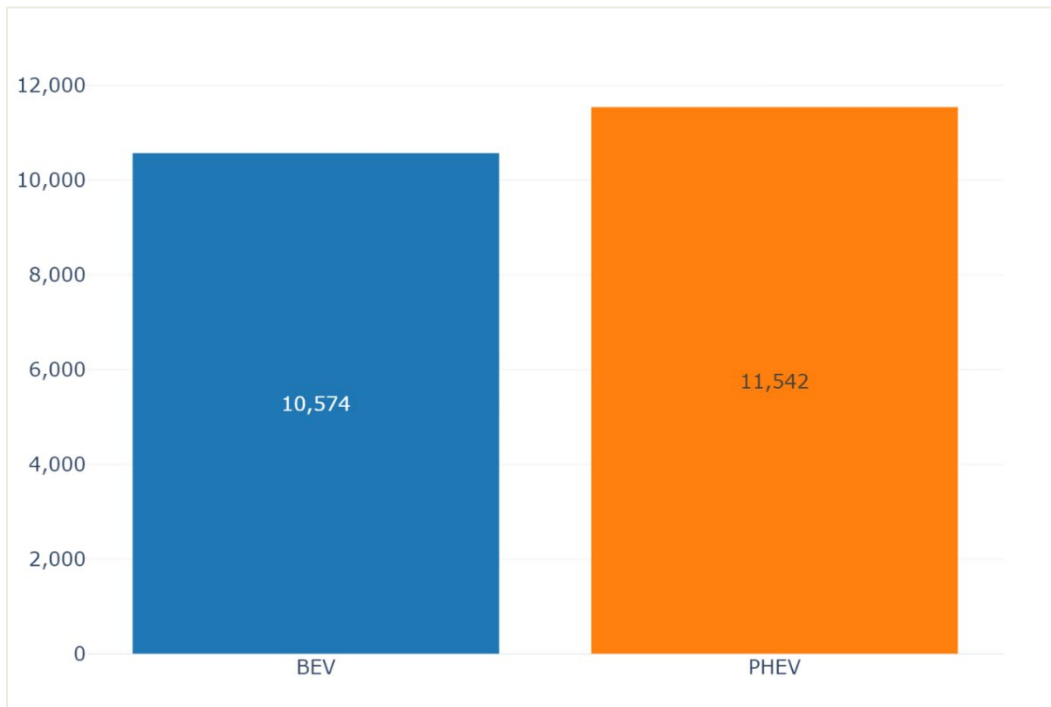


2.4 Electric Car Driving

Respondents were asked how many miles they drive their electric car per day and the total miles driven since acquiring their car. Total miles driven should approximate the respondent's annual mileage, since they have owned the car for about one year. The miles driven per day are significantly different between BEV and PHEV respondents ($p < 0.01$, $n = 3109$), with BEV respondents averaging 37.6 miles driven per day and 36.1 miles for PHEV respondents. Despite the minimal distance of 1.5 miles between the EVs, the annual mileage is about 1,000 miles larger for PHEV than for BEV respondents, as shown in Figure 10. This difference has decreased relative to findings in the 2017–2018 Ownership Survey report. In the 2017–2018 survey, BEVs reported average mileage of 10,564 miles and PHEVs reported an average of 13,229 miles.

Figure 10. “How Many Total Miles Have You Driven Your Electric Car So Far?”

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2 = 3105$, $p < 0.01$, $n = 3109$).



Respondents were asked how often they use their electric car for a variety of tasks. Seventy-six percent of respondents reported using their cars at least a few times a week for their commute (Figure 11) and 21% reported using their car at least a few times a week for partial commute (Figure 12). Most respondents (90%) reported using their cars at least a few times a week to run errands (Figure 13). Figure 14 shows that 66% of respondents use their cars a few times a month or less for long trips (defined as >50 miles from home). There was no significant difference between PHEV and BEV respondents when asked about frequency of car use to provide ride-sharing services; 96% of respondents reported they never use their electric car for this task (Figure 15).

Figure 11. Frequency of Full Commute by Vehicle Type

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=25$, $p<0.01$, $n=2865$).

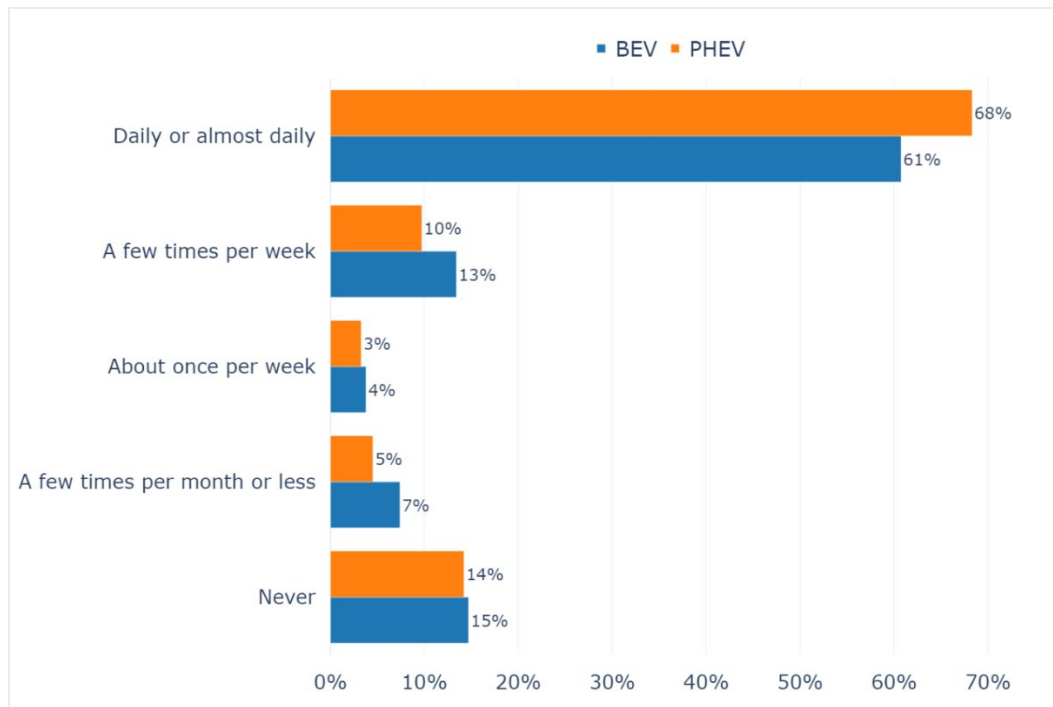


Figure 12. Frequency of Partial Commute by Vehicle Type

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=21$, $p<0.01$, $n=2390$).

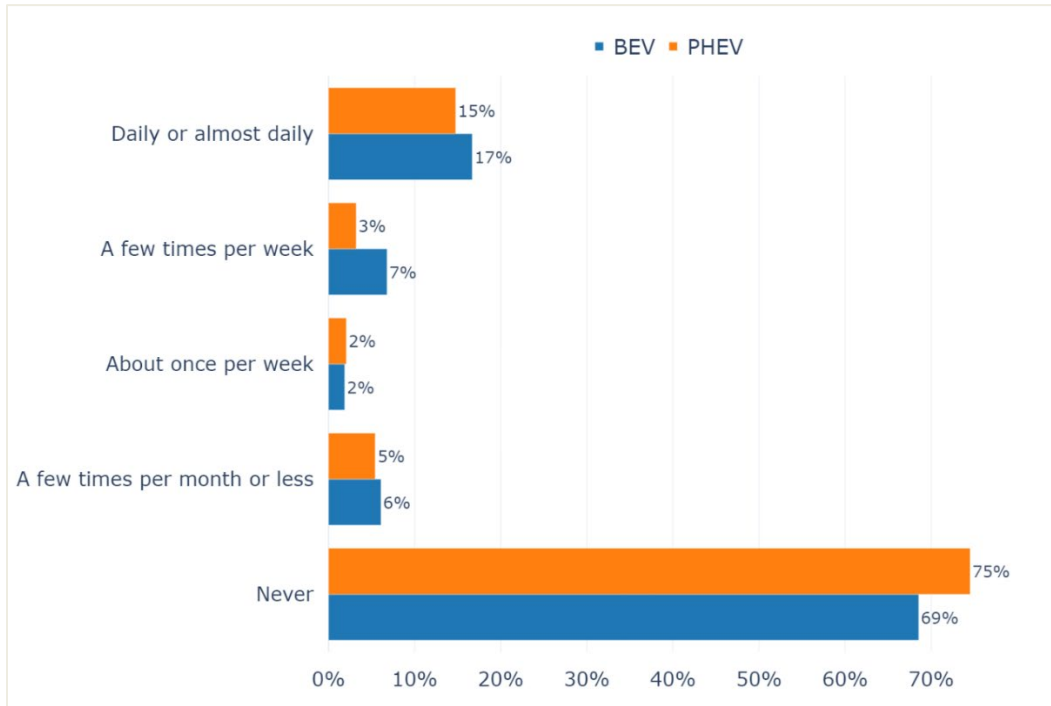


Figure 13. Frequency of Running Errands by Vehicle Type

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=18$, $p<0.01$, $n=3201$).

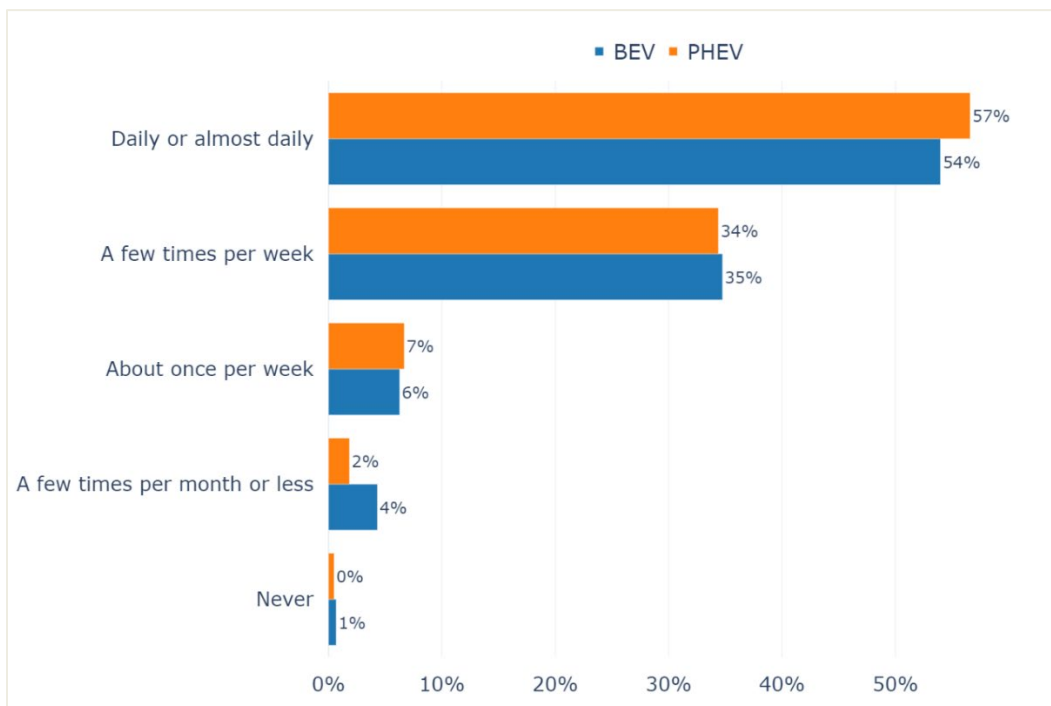


Figure 14 shows how often respondents use their BEVs or PHEVs for long trips (greater than 50 miles from home). A notable change from the 2017–2018 survey is that BEV drivers are more likely to be using their vehicle for long trips. The proportion of BEV drivers that report never using their vehicle for long trips fell from 22% to 8%.

Figure 14. Frequency of Long Trips by Vehicle Type

Trips greater than 50 miles from home.

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=34$, $p<0.01$, $n=3162$).

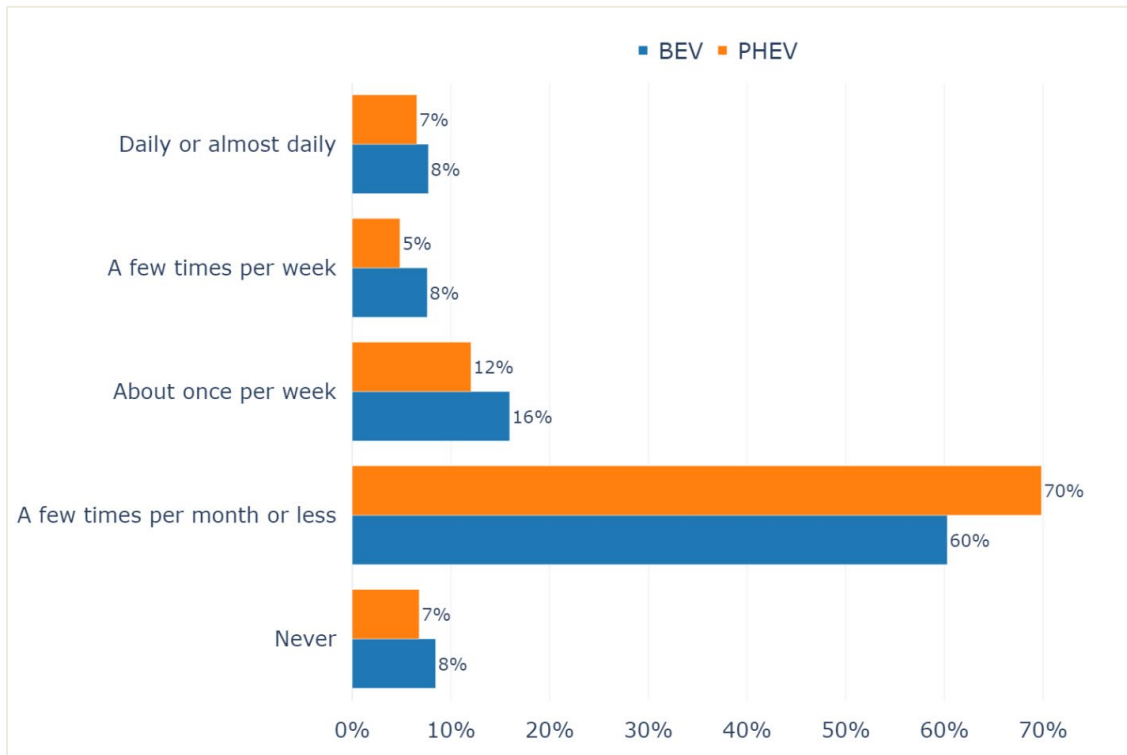
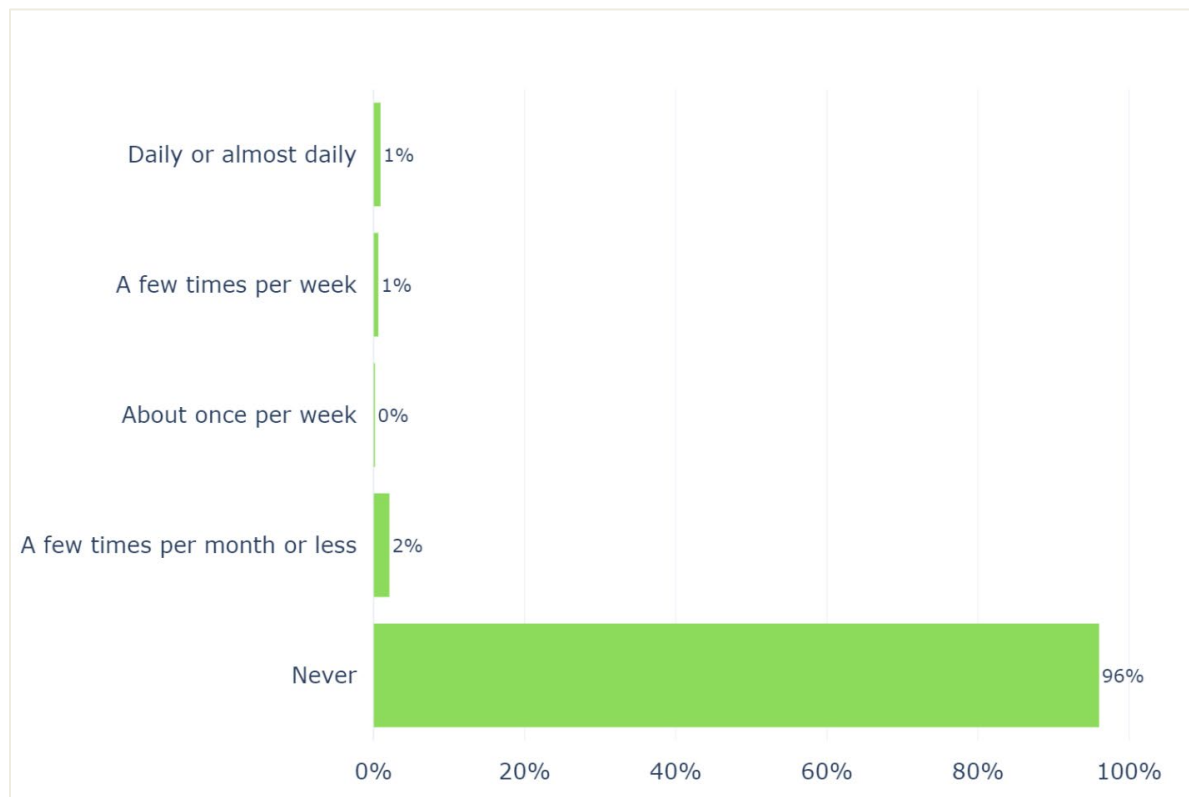


Figure 15. Frequency of Providing Ride-Sharing Services

(For example: Uber/Lyft)

(n=2738)



2.5 Participant Satisfaction

Respondents were asked how satisfied they were with the experience of owning an electric car. Overall, 93% of respondents rated their satisfaction as “Very satisfied” or “Extremely satisfied” (Figure 16). BEV drivers appear to be increasingly satisfied with their experience; the percent of BEV drivers who selected “extremely satisfied” went from 62% in the 2017–2018 survey to 76%. Only 0.3% of respondents described themselves as “Not at all satisfied.”

Respondents were also asked how likely they were to purchase an electric car again. Overall, almost two-thirds (68%) assigned a probability of 90% or greater for a repeat electric car purchase. Figure 17 displays the breakdown between BEV and PHEV respondents.

Figure 16. Participant Satisfaction

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=67$, $p<0.01$, $n=3214$).

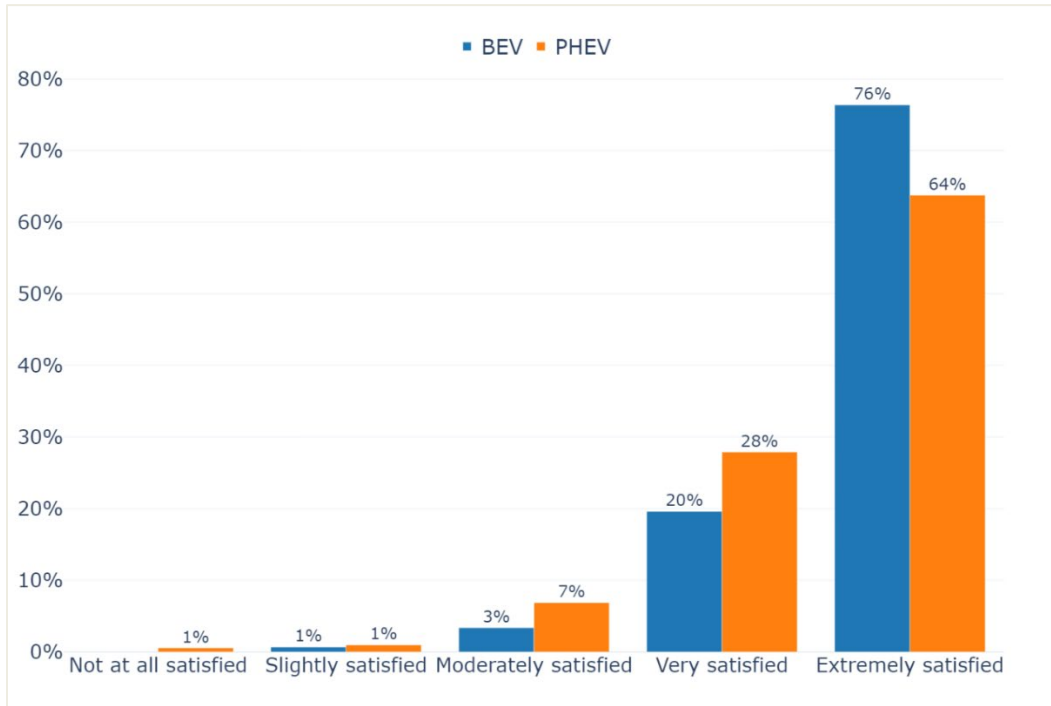
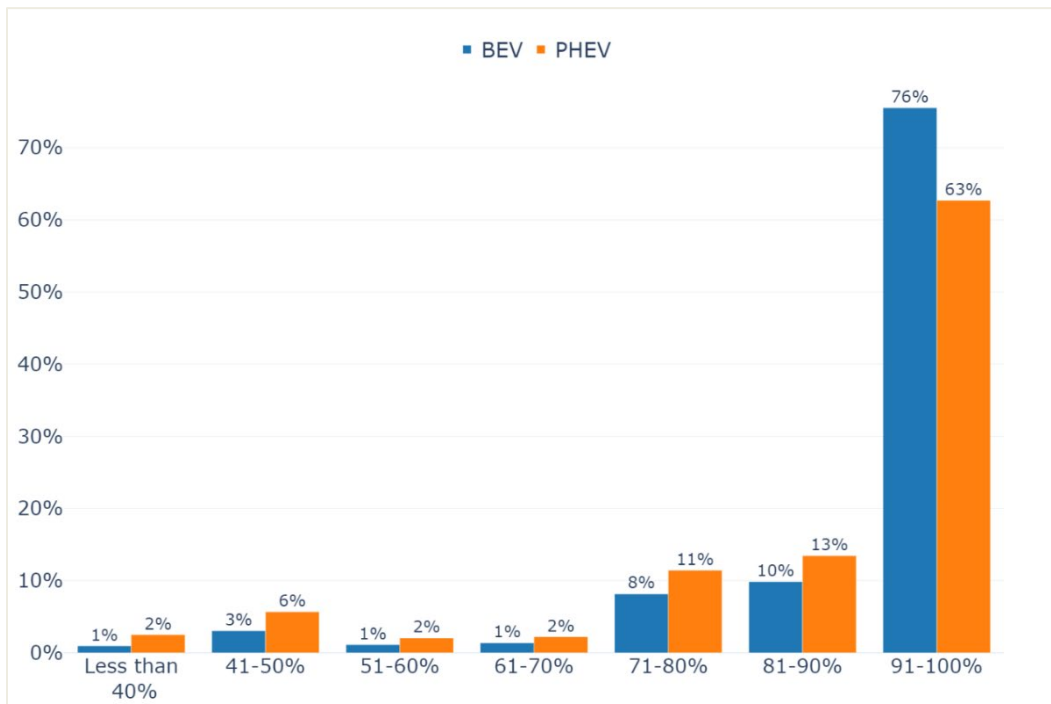


Figure 17. “How Likely Are You to Purchase/Lease Another Electric Car in the Future?”

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=65$, $p<0.01$, $n=3183$).

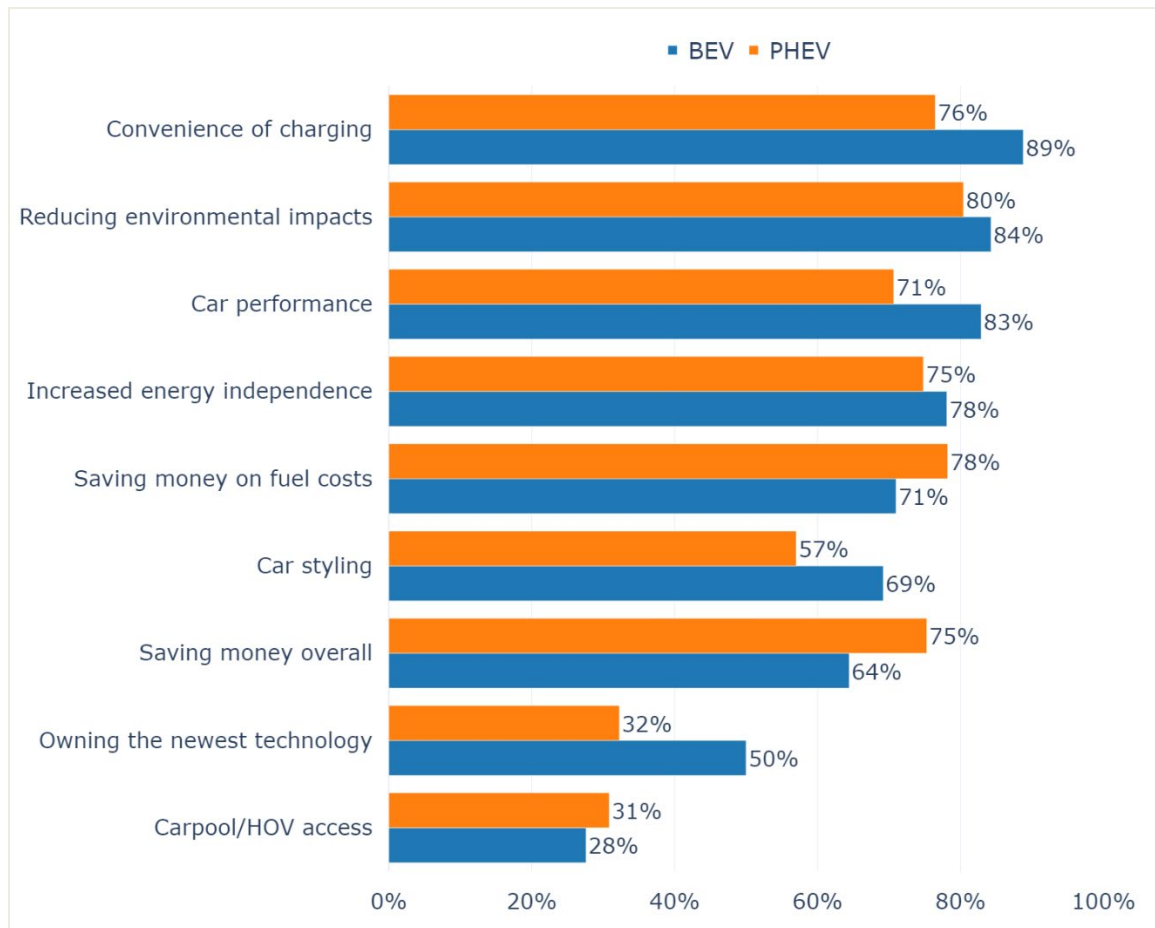


Respondents were asked to rate importance of various aspects of owning an electric car, from “Not at all important” to “Extremely important.” Figure 18 shows the proportion of respondents who rated each factor “Very” or “Extremely Important.” Across all respondents, the most important factors were “convenience of charging,” “reducing environmental impacts,” “car performance,” and “increased energy independence.”

Figure 18. Importance of Aspects of Electric Car Ownership by Technology Type

Percent responding “very” or “extremely important.”

Responses from BEV and PHEV consumers are significantly different for convenience of charging ($p < 0.01$, $n = 3221$), reducing environmental impacts ($p < 0.01$, $n = 3221$), car performance ($p < 0.01$, $n = 3220$), increased energy independence ($p < 0.03$, $n = 3217$), saving money on fuel costs ($p < 0.01$, $n = 3220$), car styling ($p < 0.01$, $n = 3217$), saving money overall ($p < 0.01$, $n = 3220$), owning the newest technology ($p < 0.01$, $n = 3218$), carpool/HOV access ($p < 0.01$, $n = 3214$).



2.6 Program Performance

Survey respondents were very likely to be electric car promoters with 93% reporting that they would “probably” (17%) or “definitely” (76%) recommend electric car ownership to others. BEV drivers were more likely than PHEV drivers to indicate they would “definitely” recommend electric car ownership (Figure 19). Approximately one-third of respondents (37%) have had at least one family member or friend purchase an electric car since their own acquisition of an electric car. BEV respondents are car (Figure 20).

Figure 19. Respondents Who Would Recommend Electric Car Ownership to Others

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=62$, $p<0.01$, $n=3222$).

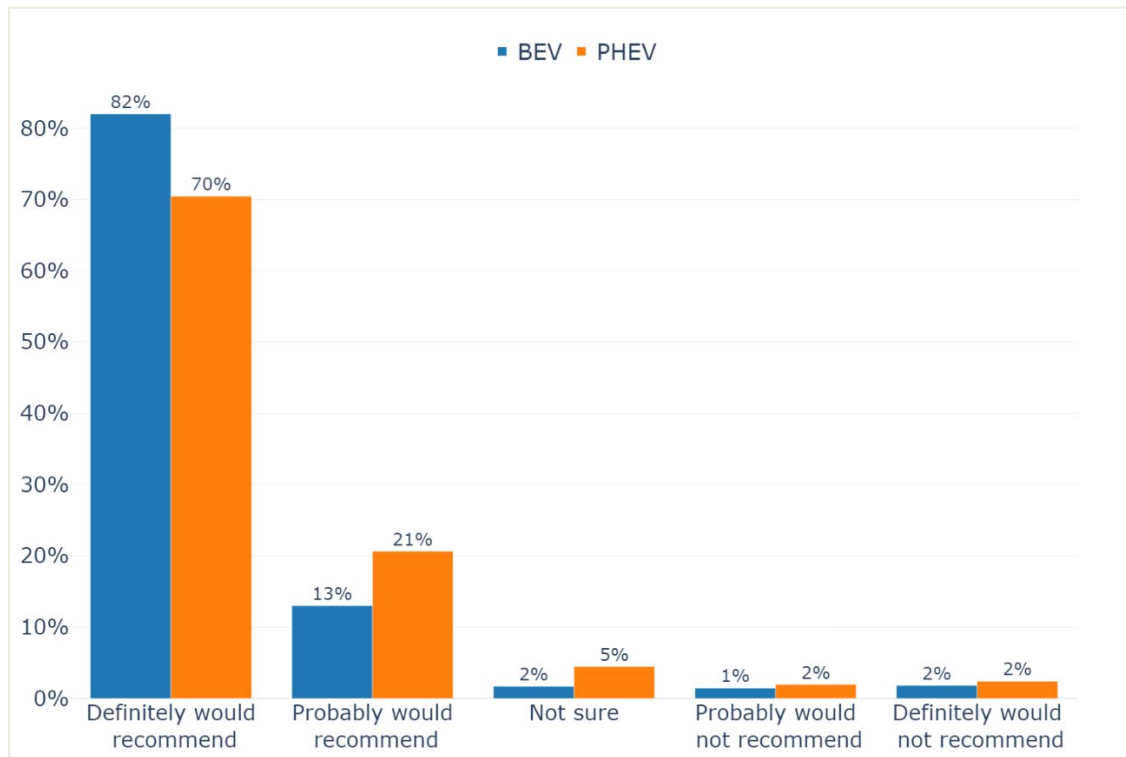
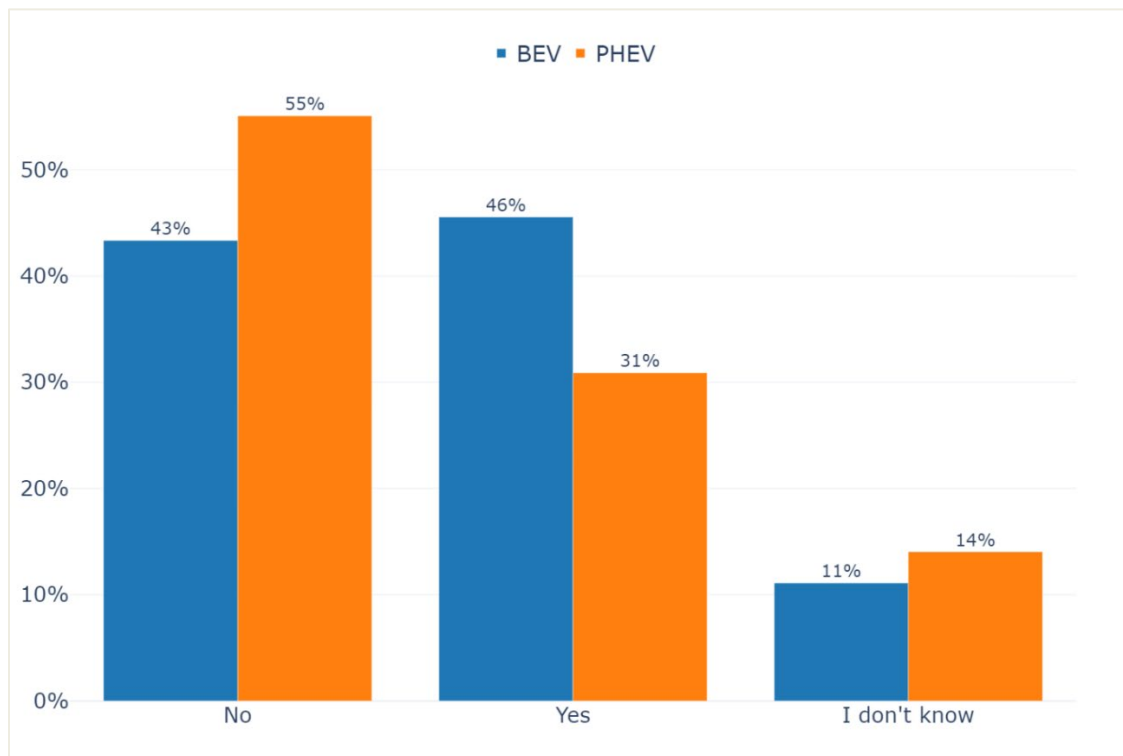


Figure 20. Respondents Whose Friends or Family Purchased/Leased an Electric Car since the Purchase of Their Electric Car

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=73$, $p<0.01$, $n=3222$).



2.7 Participant Concerns

To understand the program participants’ concerns and challenges, respondents were asked to rank “the three greatest challenges to owning an electric car in New York” from a list of possible options. The challenges most frequently selected by participants were “access to public charging stations,” “car performance in cold/inclement weather,” “range limitations,” and “speed of car charging” (Figures 21–23). Unsurprisingly, range limitations and performance in cold weather were selected more frequently for BEV respondents than for PHEV respondents.

While most concerns did not change substantially from the 2017–2018 survey, BEV driver perceptions of their vehicle’s performance in cold weather appears to have improved. The proportion of BEV drivers who rated “car performance in cold/inclement weather” as their top concern decreased from 25% in the 2017–2018 survey to 19% in the 2018Y2019 survey.

Figure 21. Greatest Challenges of Owning an Electric Car in New York State, First Choice

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=31$, $p<0.01$, $n=3145$).

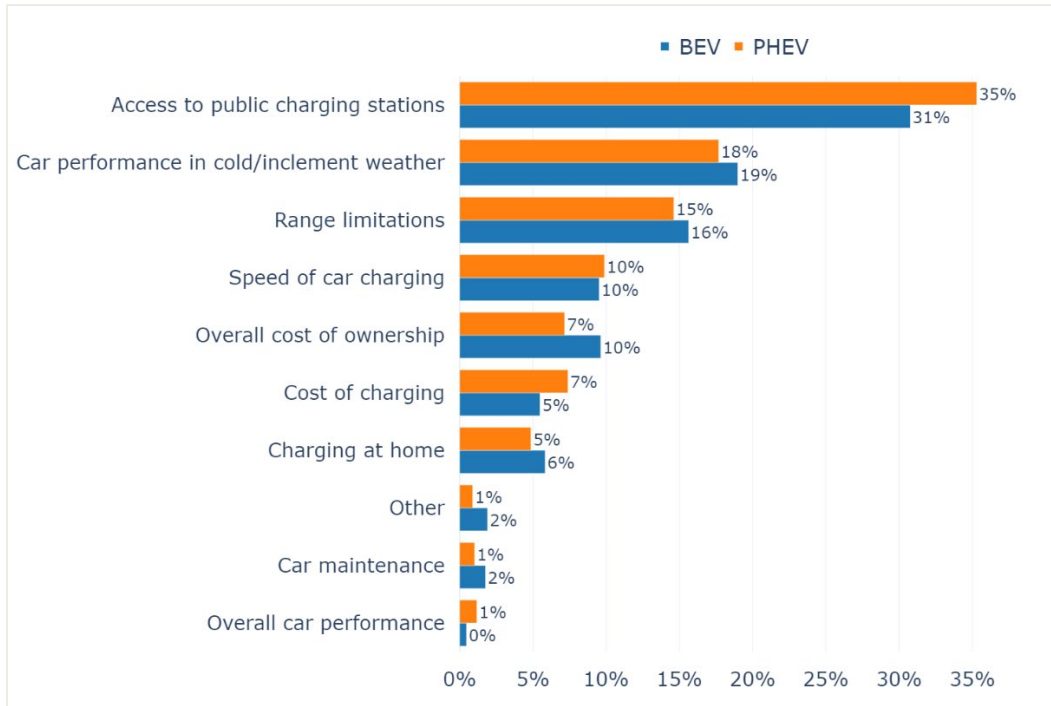


Figure 22. Greatest Challenges of Owning an Electric Car in New York State, Second Choice

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=38$, $p<0.01$, $n=2984$).

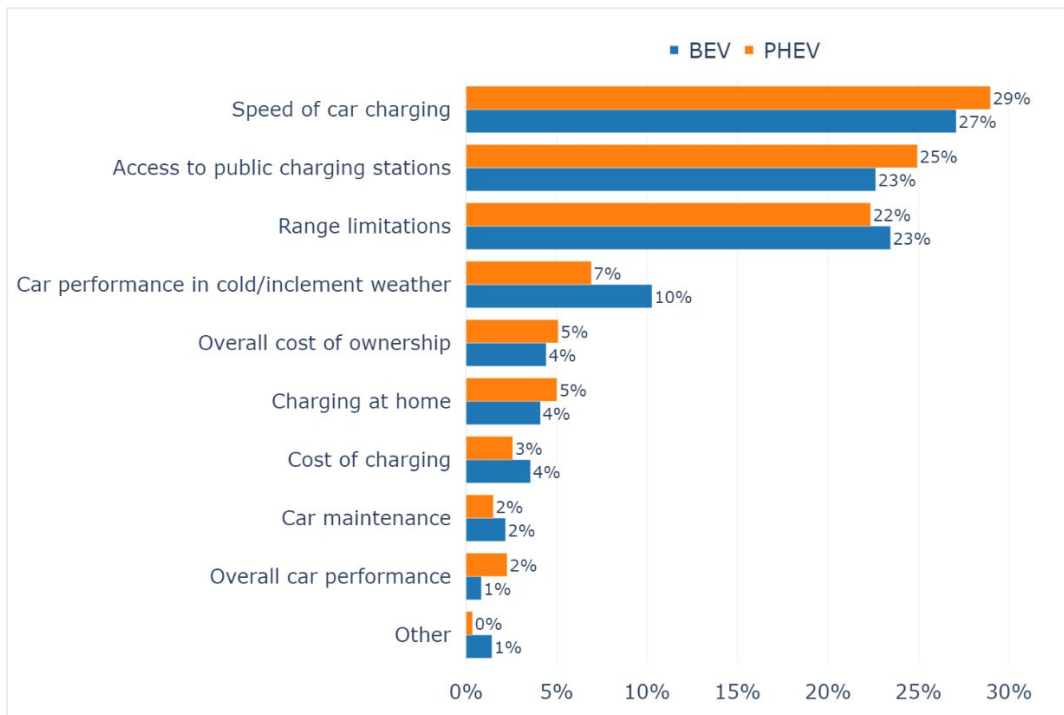
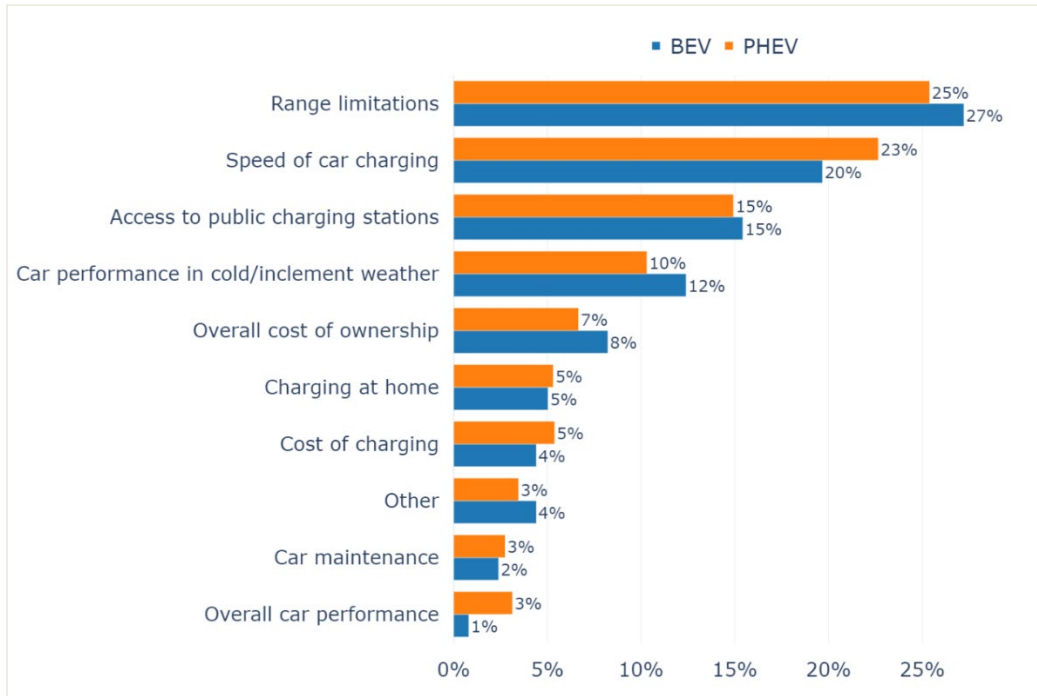


Figure 23. Greatest Challenges of Owning an Electric Car in New York State, Third Choice

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=28$, $p<0.01$, $n=2670$).



2.8 Charging

Figure 24. “Do You Have Access to Charging at Your Place of Work?”

($n=2470$)

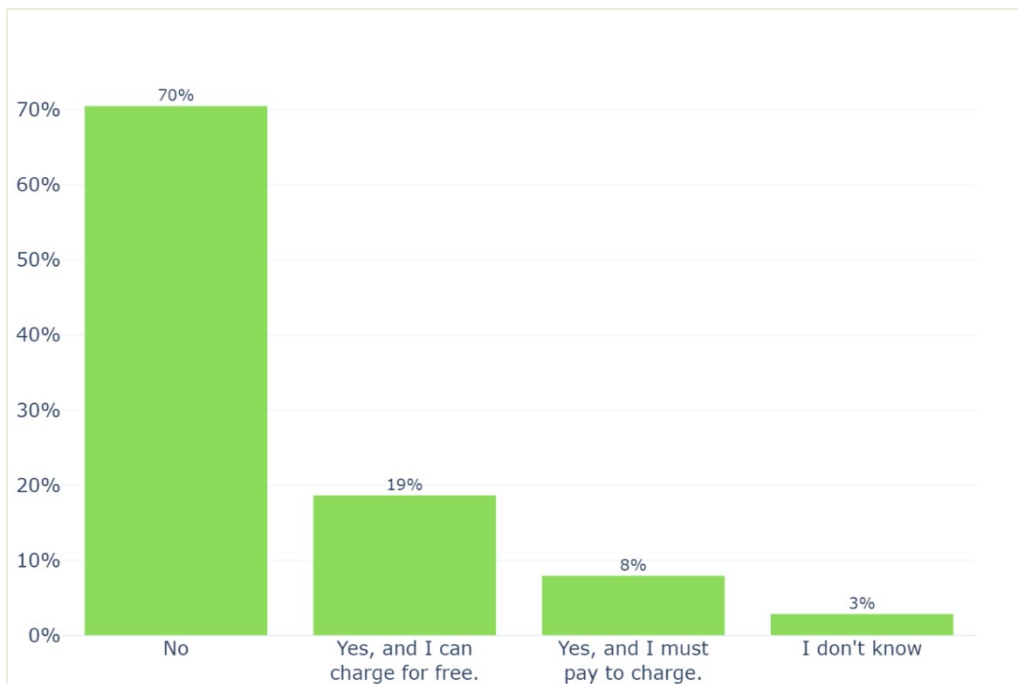


Figure 24 shows that only 27% of respondents have access to charging at their workplace. Figure 25 shows that of the respondents who do have access to workplace charging, 79% of BEV drivers and 76% of PHEV drivers charge at work at least occasionally.

Figure 25. Frequency of Charging at Given Locations

Responses from BEV and PHEV respondents are significantly different for frequency of charging at home ($p < 0.01$, $n = 3213$), on-site at work ($p < 0.01$, $n = 647$), off-site at work ($p < 0.01$, $n = 2389$), public charging stations ($p < 0.01$, $n = 3172$), other ($p < 0.01$, $n = 2589$).

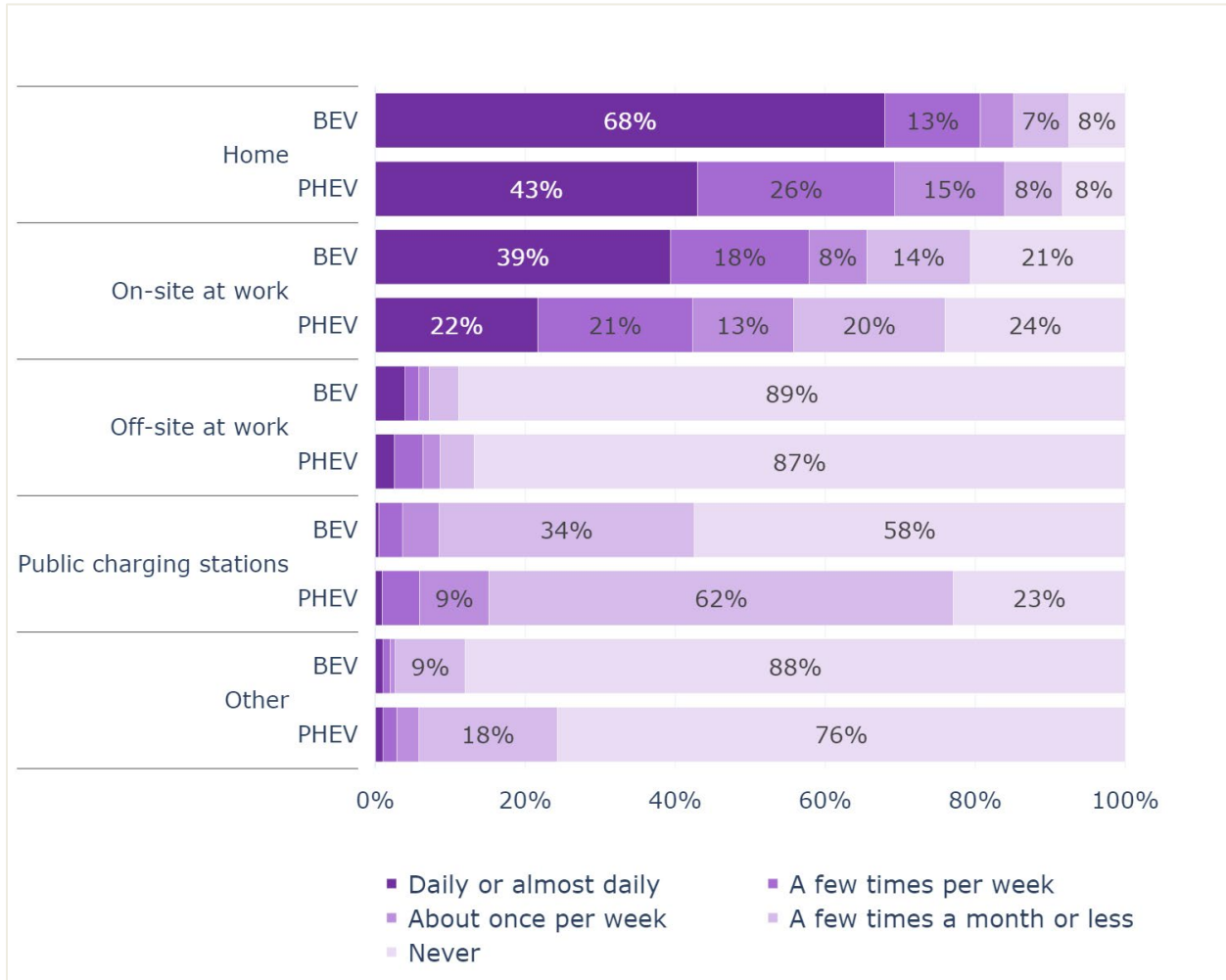


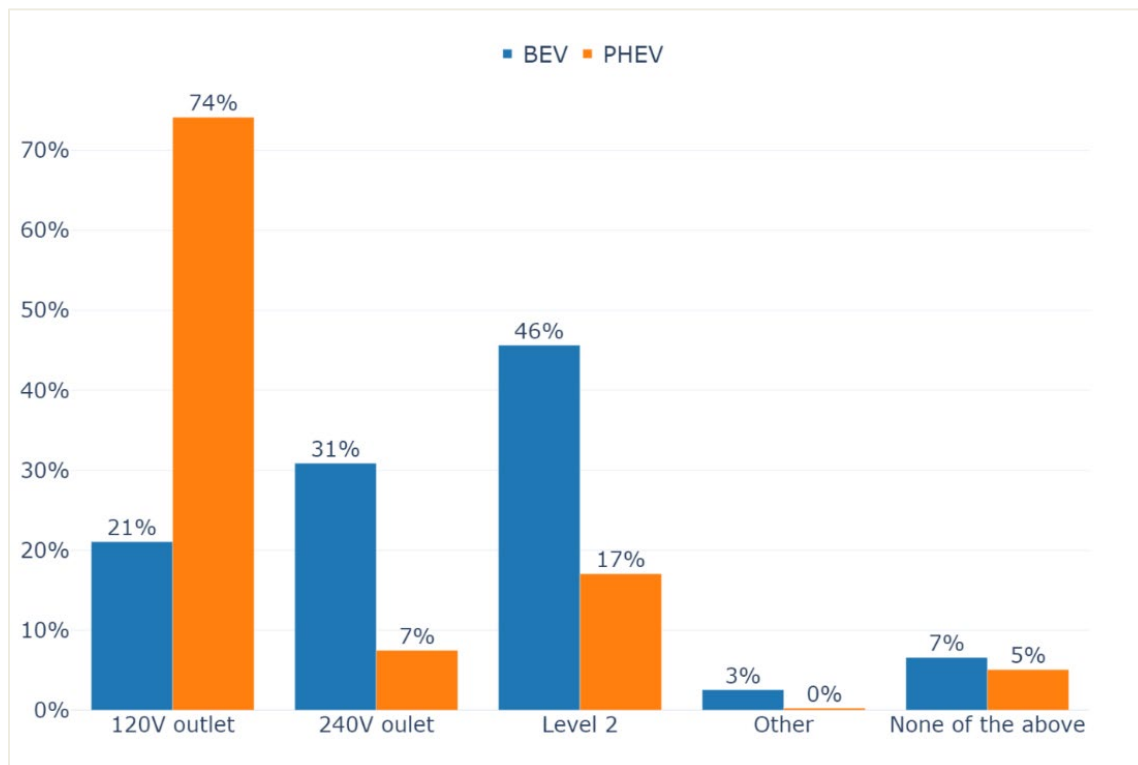
Figure 25 shows that almost all respondents charge their vehicles at home, with only 8% saying they never charge at home. This is a large decrease from the 2017–2018 Ownership Survey results. The share of respondents who reported never charging at home dropped from 20% to 8% for BEVs, and 28% to 8% for PHEVs. BEV drivers are not only more likely to charge at home but are also charging more frequently. Over two-thirds (68%) are charging daily, up from 22% in the 2017–2018 survey.

The proportion of PHEV drivers using public charging has risen dramatically, from 38% the 2017–2018 survey to 77% in the 2018–2019 survey. PHEV drivers are now more likely than BEV drivers to charge at public charging stations (77% versus 42%, respectively); this is a reversal from the 2017–2018 survey in which BEV drivers were more likely to use public charging stations than PHEV drivers (70% versus 38%). It is also important to note that many of the write-in responses for “Other” (N = 2589) included hotels, local stores or malls, parking garages, and Tesla supercharging stations, so the number of respondents who selected public charging may be an underestimate of the number who use them.

Figure 26 shows that PHEV respondents who charge at home are much more likely than BEV respondents to report using a standard 120V outlet (74% versus 21%), while BEV respondents were more likely to use a Level 2 charger (46% versus 17%).¹² Seventy-seven percent of BEV drivers use either a 240V outlet (typical clothes dryer outlet) or a Level 2 charging station. The higher prevalence of Level 2 charging among BEV respondents is unsurprising given the larger battery size of these cars and the inability to fall back on gasoline if a battery is not adequately charged.

Figure 26. How Respondents Charge at Home

Responses from BEV and PHEV respondents were significantly different for 120V outlet ($p < 0.01$), 240V outlet ($p < 0.01$), Level 2 ($p < 0.01$), and Other ($p < 0.01$). There was no significant difference for None of the above. $n = 3218$.



The survey results indicate that many respondents have concerns about the availability of public charging stations. Figure 27 shows that a large majority of respondents (76%) disagreed with the statement “There are enough public chargers.”

Figure 27. Agreement/Disagreement with the Statement: “There Are Enough Public Chargers”

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=66$, $p<0.01$, $n=3217$).

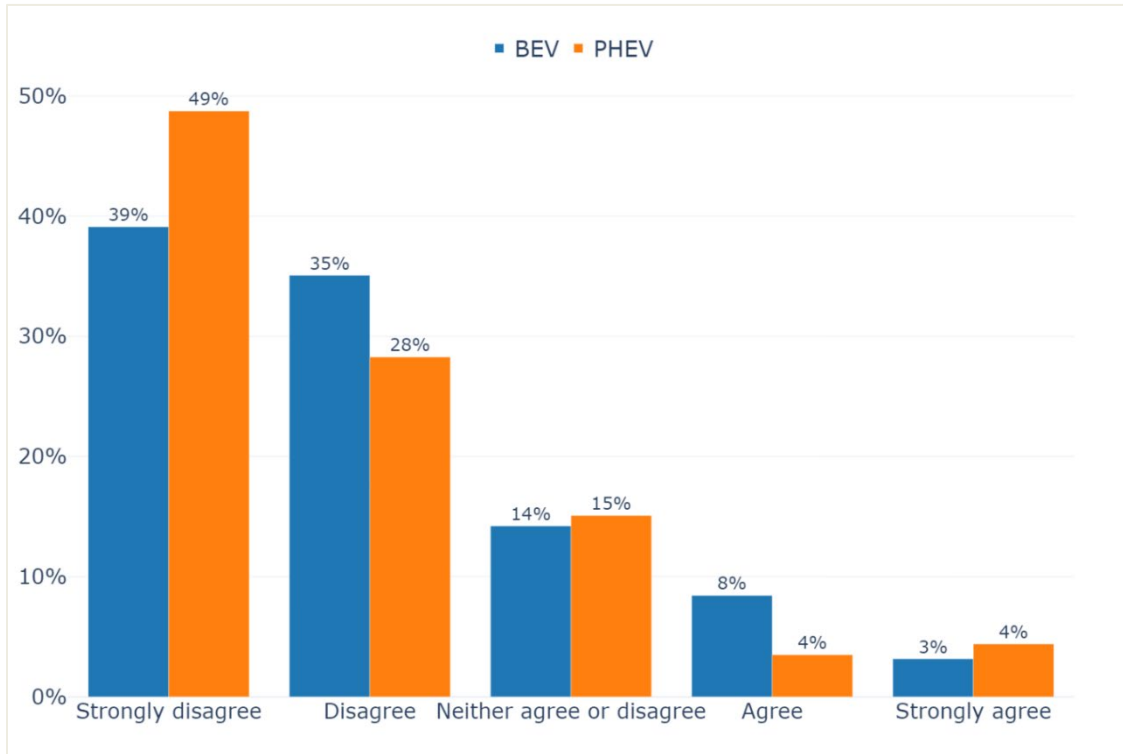
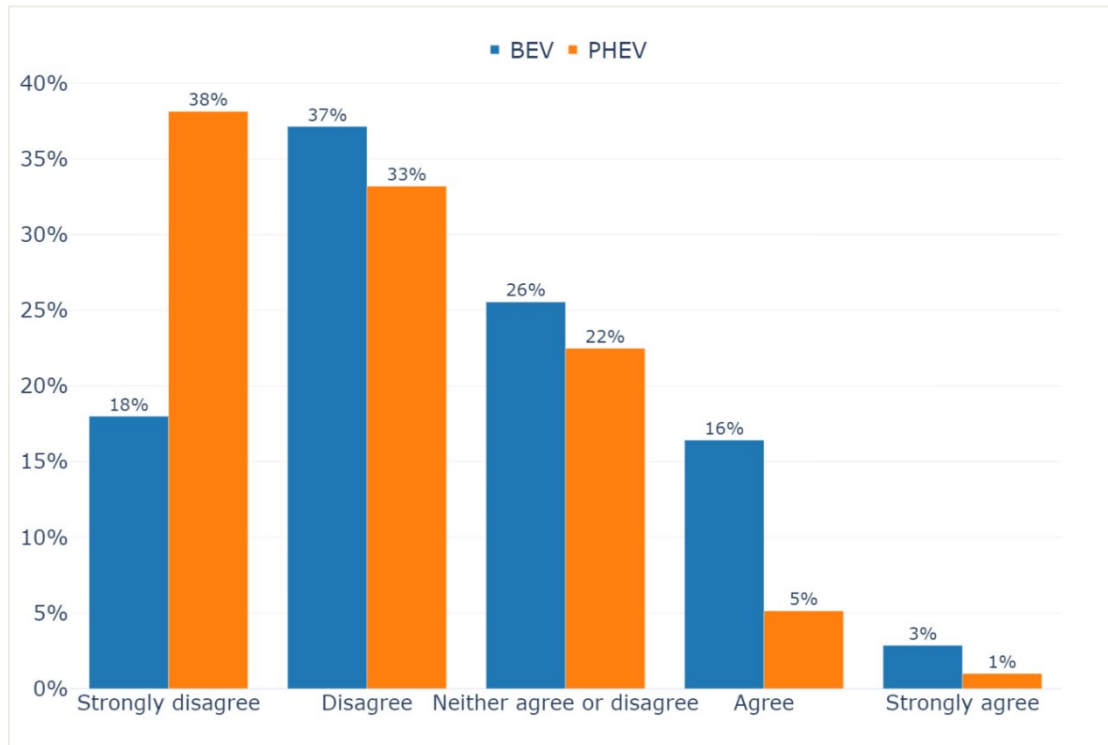


Figure 28. Agreement/Disagreement with the Statement: “There Are Public Chargers Where I Need Them”

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=231$, $p<0.01$, $n=3217$).



Echoing the top concerns reported by respondents, only 12% of respondents agreed with the statement “There are public charging stations in the places where I need them.” However, for BEV respondents these results represent a notable improvement over the previous ownership survey results. In the 2017–2018 survey, 29% of BEV drivers selected “strongly disagree,” versus only 18% in the 2018–2019 survey. The proportion of BEV drivers who selected “agree” or “strongly agree” increased from 13% to 19%. Figure 28 shows that BEV respondents are more likely to agree with the statement than PHEV respondents.

For the next statement, “I frequently see gasoline-fueled cars parked in spaces with public electric chargers,” approximately 30% of respondents agreed or strongly agreed, with BEV respondents selecting this as a more common concern (Figure 29).

Figure 29. Agreement/Disagreement with the Statement: “I Frequently See Gasoline-Fueled Cars Parked in Spaces with Public Electric Car Chargers”

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=42$, $p<0.01$, $n=3206$).

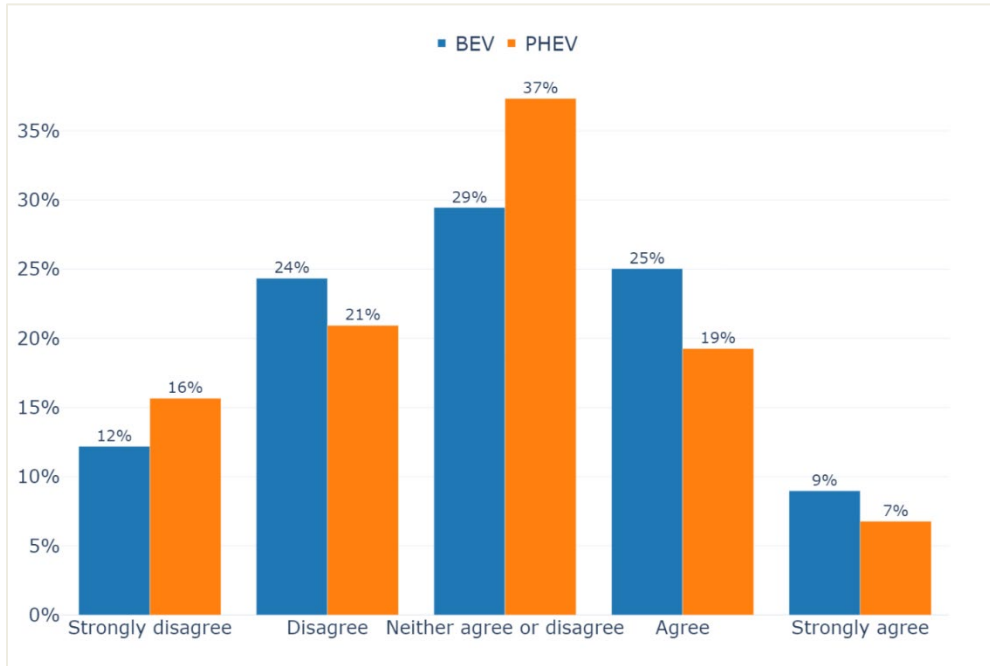


Figure 30. Agreement/Disagreement with the Statement “Public Charging Stations Are Often in Use by Others When I Want to Charge”

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=85$, $p<0.01$, $n=3198$).

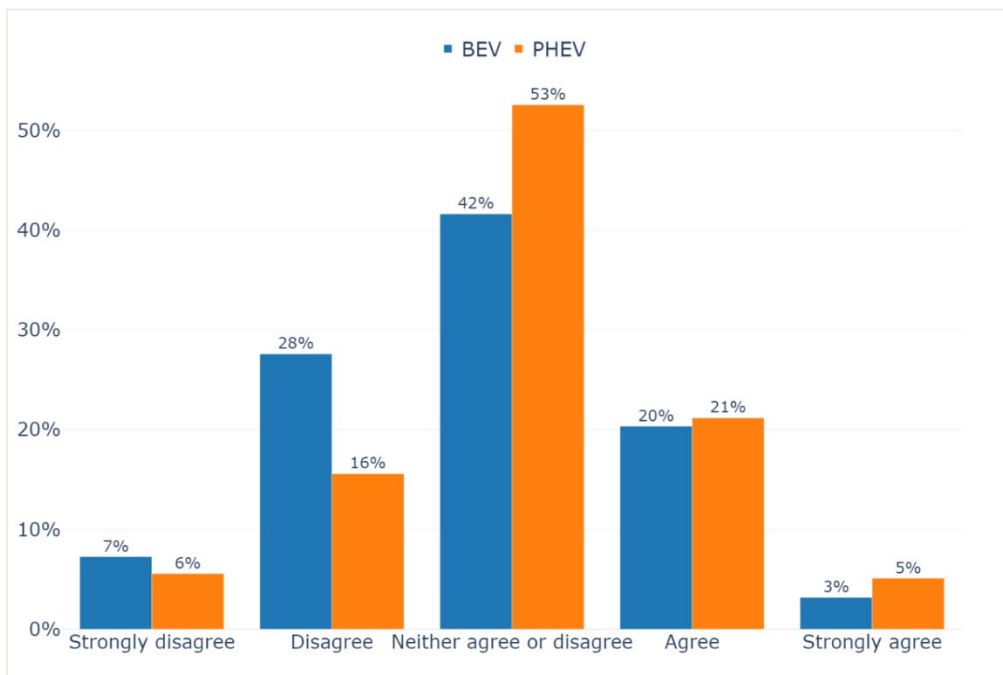
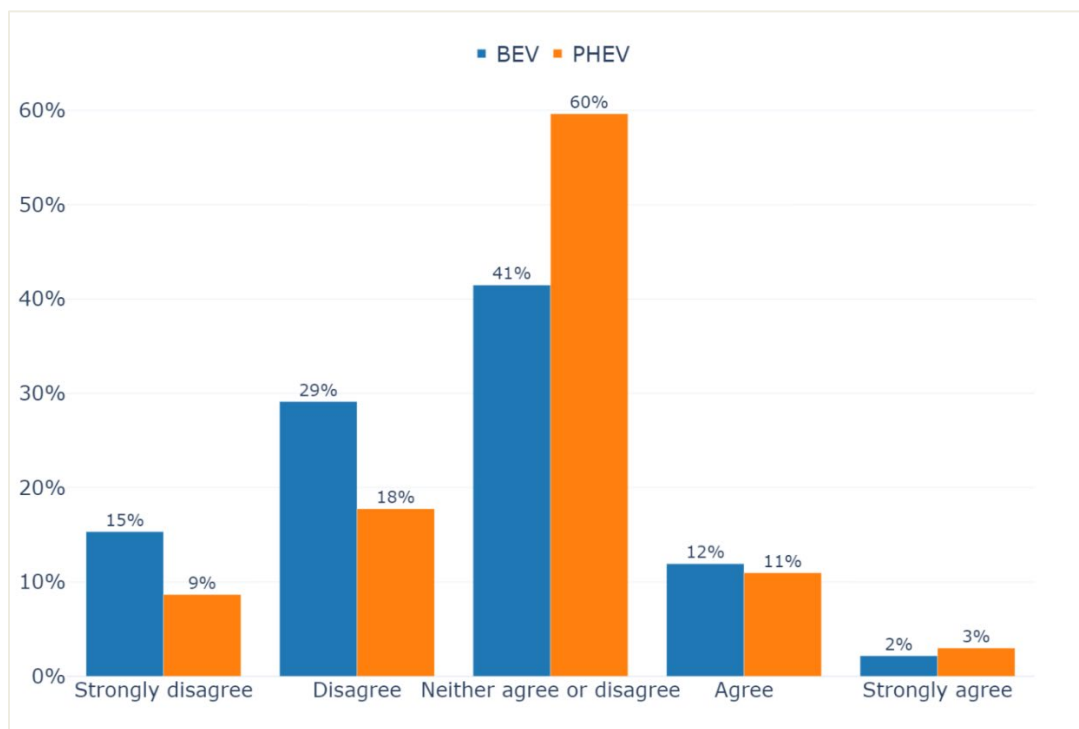


Figure 31. Agreement/Disagreement with the Statement: “Public Charging Stations Are Often Not Working When I Want to Use Them”

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=128, p<0.01, n=3196$).



2.9 Interim DAC Status

Disadvantaged communities (DACs) are communities that are impacted by both economic and environmental burdens and need to be prioritized to achieve environmental justice. New York State has established interim criteria to define DACs.¹³ Based on these criteria, DACs have a higher proportion of minority residents and lower household incomes relative to New York State as a whole. Approximately 27% of State residents live in a DAC.

Overall, 6% of Drive Clean Rebate program participants with vehicles purchased between April 1, 2018 and December 31, 2019 were within DACs (Figure 32). DAC residents were proportionally represented among survey respondents, making up 6% of respondents. DAC residents were more likely to purchase BEVs than non-DAC residents; BEVs made up only 43% of non-DAC rebates versus 52% of DAC rebates (Figure 33).

Figure 32. Rebates by Technology Type within Interim DAC Status

(n=3196)

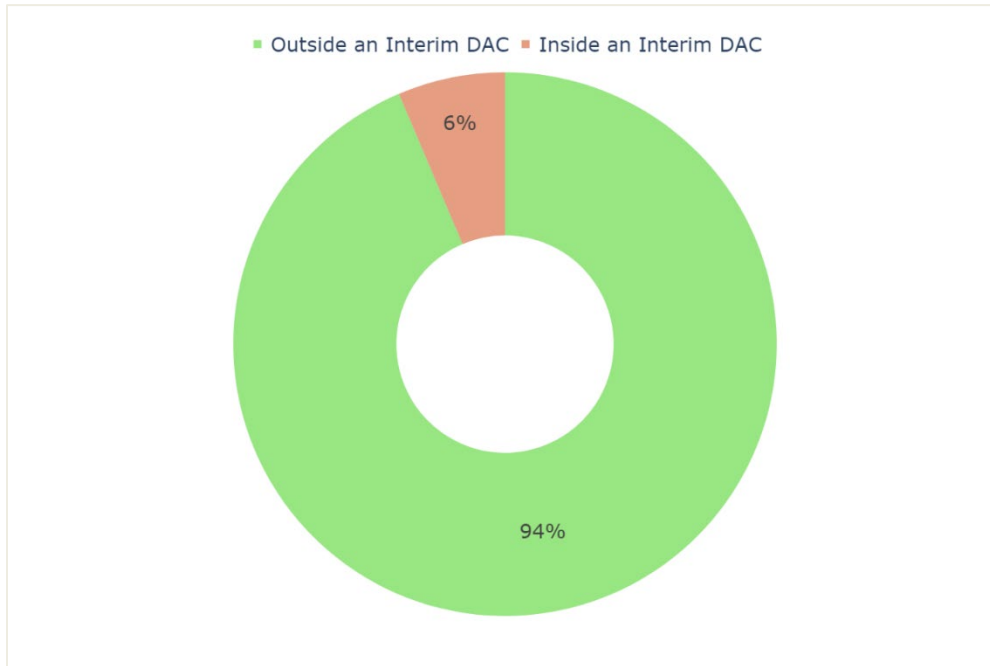
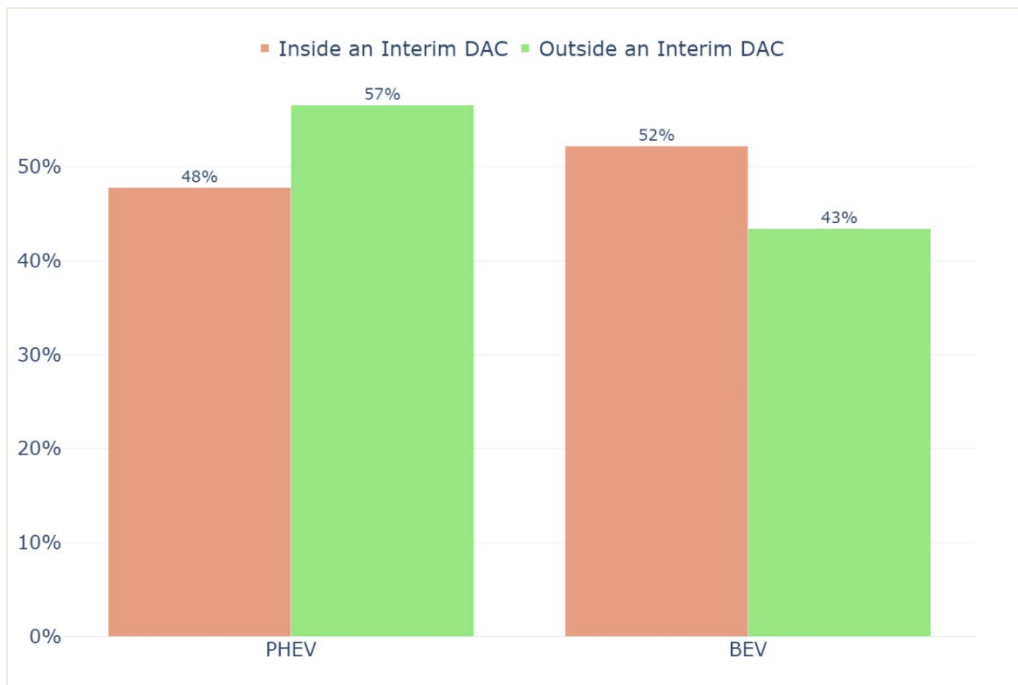


Figure 33. DAC status by Technology Type

Proportion of PHEV and BEV rebates by DAC status is significantly different ($p < 0.01$, $n = 2992$).



DAC residents reported lower satisfaction with owning an electric car than non-DAC residents (Figure 34) and rate themselves as being slightly less likely to purchase another electric car (Figure 35).

Figure 34. Participant Satisfaction with Owning an Electric Car within Interim DAC Status

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=20$, $p<0.01$, $n=3178$).

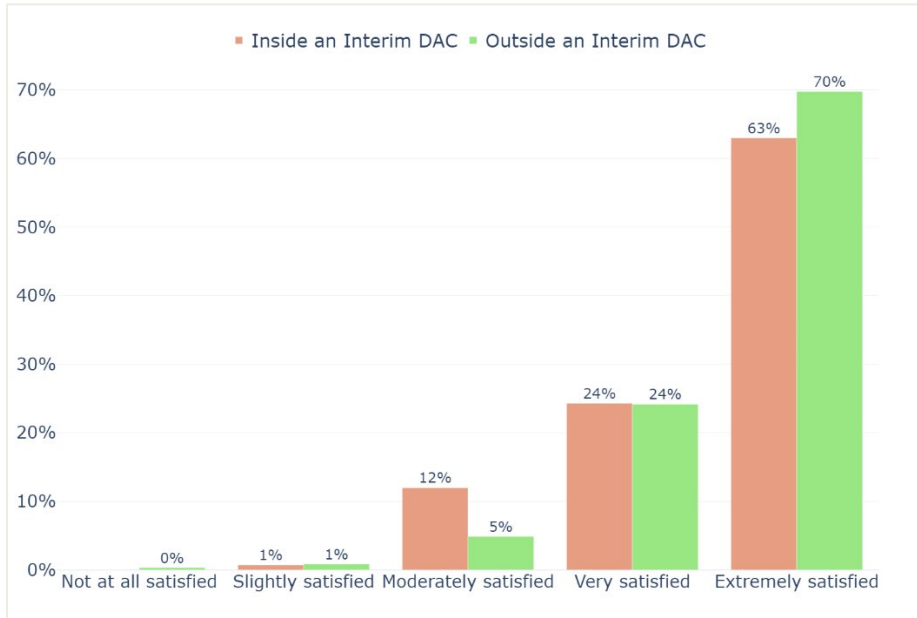
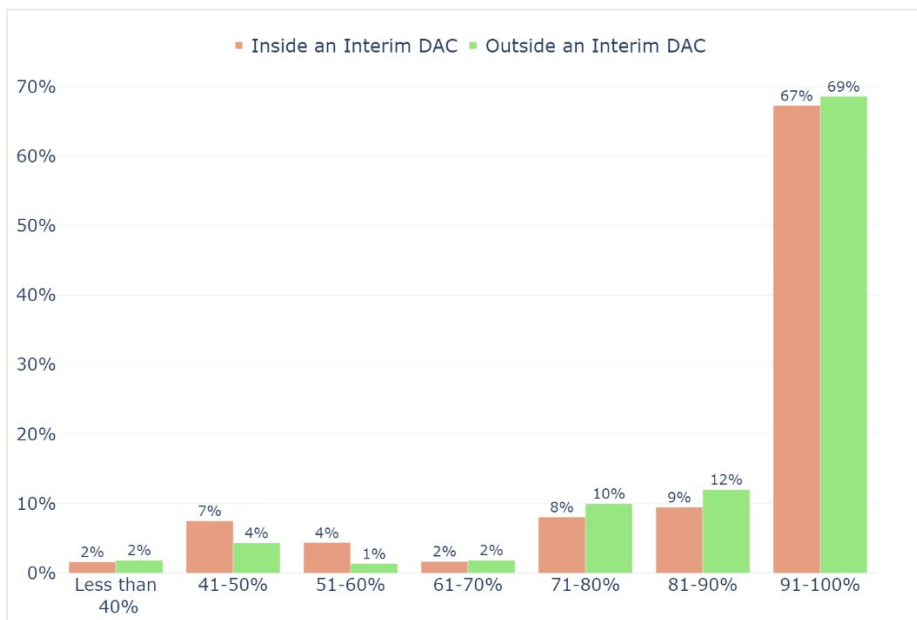


Figure 35. “How Likely Are You to Purchase/Lease Another Electric Car in the Future?” within Interim DAC Status

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=17$, $p<0.01$, $n=3149$).



DAC residents are much less likely to live in a detached house than non-DAC residents (Figure 35). As expected, based on the Interim DAC criteria, DAC residents have lower incomes and are less likely to be White (Figures 36 and 37).

Figure 36. “What Type of Residence Do You Live In?” within Interim DAC Status

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=117$, $p<0.01$, $n=3129$).

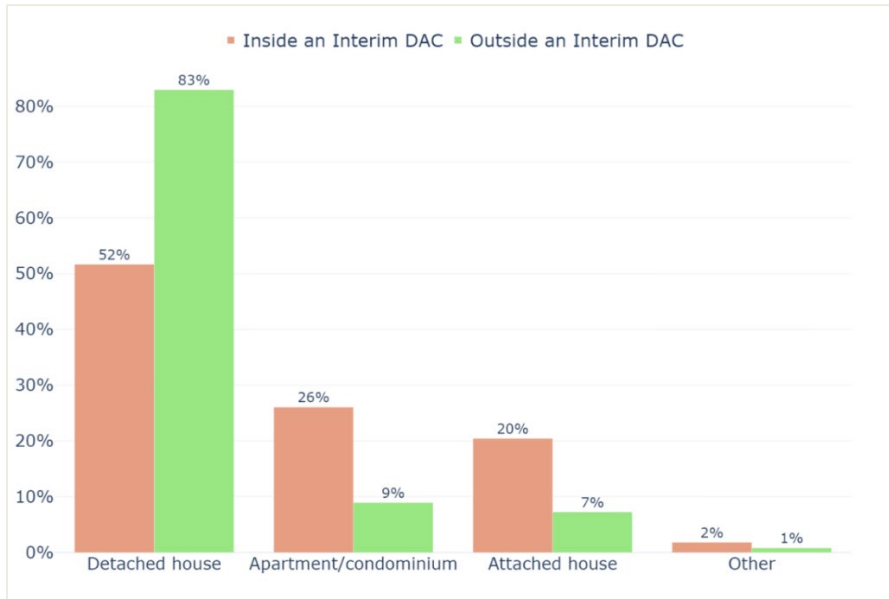


Figure 37. Annual Gross (Pre-Tax) Household Income from All Sources within Interim DAC Status

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=35$, $p<0.01$, $n=2571$).

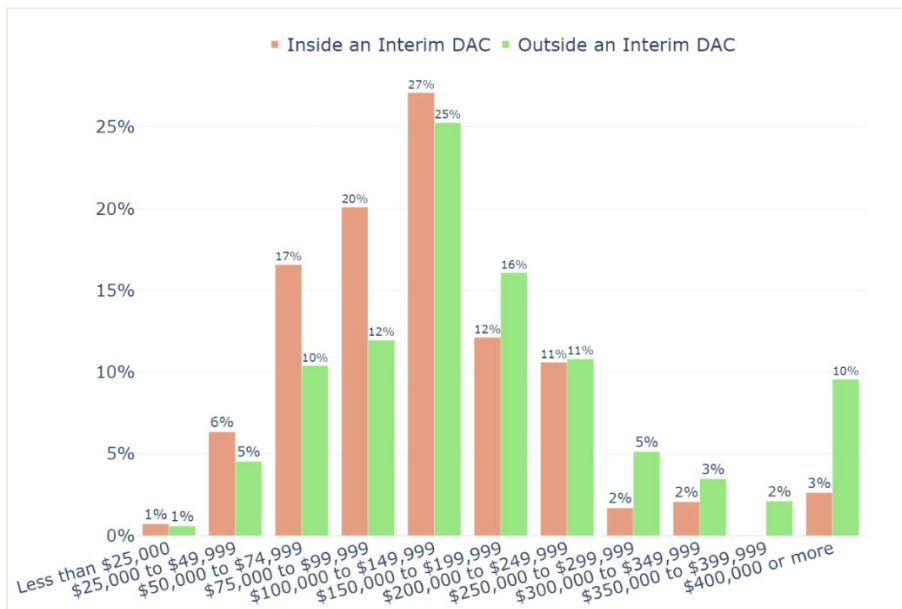
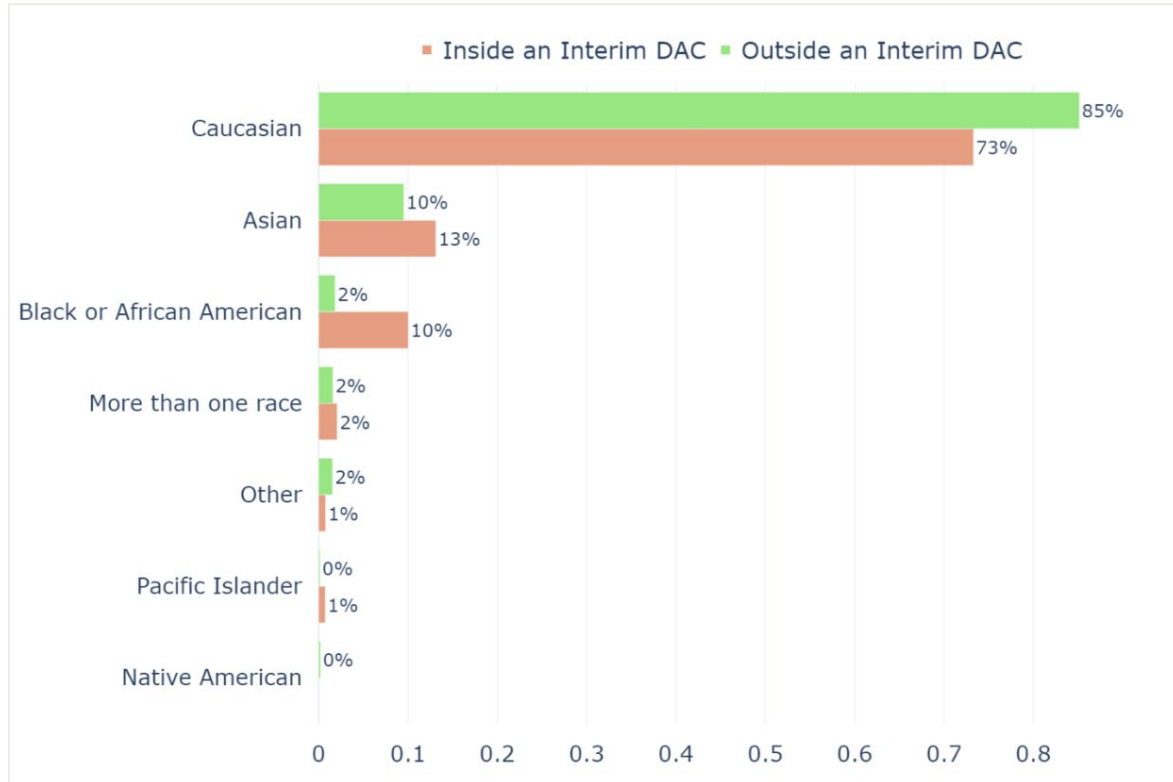


Figure 38. “How Do You Prefer to Describe Your Racial/Ethnic Identity?” within Interim DAC Status

Responses from PHEV and BEV consumers are significantly different (chi-squared test: $\chi^2=56$, $p<0.01$, $n=2778$).

Several categories are condensed for ease of reporting. East Asian and South Asian are included in Asian. Middle Eastern is included in Caucasian. Any respondent who selected two or more races is included in “More than one race.”



3 Discussion

The Ownership Survey results provide multiple indications that participants continue to be satisfied with their electric cars. Almost all respondents (93%) said they were very or extremely satisfied and the same percentage said they would “probably” or “definitely” recommend EV ownership to others. Most respondents reported a high likelihood of purchasing an electric car again, with 83% of participants assigning a probability of 80% or higher to a repeat purchase.

While the overall satisfaction with electric car ownership was high, the survey did highlight some challenges faced by electric car drivers. Issues related to charging infrastructure were frequently experienced by participants: 69% reported that access to public charging stations was one of the top challenges they’ve faced, and only 9% thought there were enough public chargers. Similarly, only 12% of respondents agreed that there are public charging stations where they need them.

In addition to a perceived lack of charging infrastructure, another concern was how electric cars perform in cold weather. This issue was selected as a challenge by 36% of respondents—and 41% of BEV respondents.

Charging behaviors have changed somewhat since the 2017–2018 survey. BEV drivers seem to have shifted to more frequent charging at home and less usage of public chargers. The percent of BEV drivers who charge at home daily increased from 22% to 68%, while the percent of BEV drivers who never use public chargers increased from 30% to 58%. PHEV drivers are charging more both at home and in public. The percent of PHEV drivers who never charge at home fell from 28% to 8%, and the percent of PHEV drivers who never use public chargers decreased from 62% to 23%.

The survey provided insight into the electric car ownership experience of respondents and provided a first look at electric car owners in Interim DAC areas. Charging behavior continues to evolve among both BEV and PHEV drivers as battery capacities change and the EV market matures.

Appendix A. Ownership Survey Questionnaire

A.1 Introduction

A.1.1 Welcome to NYSERDA's Drive Clean Rebate "Electric Car Ownership Survey"

Your participation in this survey is voluntary. However, your input is valuable for enhancing the electric car experience for all New Yorkers, and it is important that you try to answer all of the questions. The information you provide will be **kept private** to the extent permitted by law. The analysis will only use summary level data; no individual respondents will be identified.

The survey should be completed by the primary driver of the car. If you aren't the primary driver, we encourage you to have the primary driver complete the survey.

If you have any questions about this research project or if you experience any technical difficulties, you may contact the Center for Sustainable Energy (CSE), the Drive Clean Rebate Program Administrator for NYSERDA, at:

Phone: (866) 595-7917

Email: NYDriveClean@energycenter.org

Car Status

Page exit logic: Skip / Disqualify LogicIF: #1 Question "According to our records, you received a rebate for a [question('value'), id='17'] [question('value'), id='18']. Does your household still have this electric car?" is one of the following answers ("No, but my household has a different electric car", "No, my household no longer owns an electric car") **THEN:** Jump to [page 11 - Disqualification - rebated car no longer in use](#)

Logic: Show/hide trigger exists.

(1) According to our records, you received a rebate for a [question('value'), id='17'] [question('value'), id='18']. Does your household still have this electric car?*

Yes

No, but my household has a different electric car

No, my household no longer owns an electric car

Logic: Hidden unless: #1 Question "According to our records, you received a rebate for a [question('value'), id='17'] [question('value'), id='18']. Does your household still have this electric car?" is one of the following answers ("Yes", "No, but my household has a different electric car")

(2) Are you the primary driver of your electric car?

Yes

No

Logic: Hidden unless: #1 Question "According to our records, you received a rebate for a [question('value'), id='17'] [question('value'), id='18']. Does your household still have this electric car?" is one of the following answers ("No, but my household has a different electric car", "No, my household no longer owns an electric car")

(3) Please describe what happened to your rebated [question("value"), id="17"] [question("value"), id="18"].

I sold it or traded it in

I donated it or gave it to someone else

It was damaged or stolen

Other, please specify: _____

Household Cars

(4) Please tell us how many of each of the following cars your household currently owns (exclude motorcycles, RVs, and non-highway-capable cars).

	0	1	2	3 or more
Gasoline car:	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____
Conventional hybrid car (fueled with gasoline only):	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____
Plug-in hybrid electric car (recharged with electricity and/or fueled with gasoline):	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____
All-battery electric car (recharged with electricity only):	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____
Hydrogen fuel-cell electric car:	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____
Diesel car:	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____

Compressed natural gas car:	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
Flex-fuel (E85 ethanol) car:	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
Other alternatively fueled car:	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____

Satisfaction with Electric Car Ownership

(5) Overall, how satisfied are you with your experience owning an electric car?

- () Not at all satisfied
- () Slightly satisfied
- () Moderately satisfied
- () Very satisfied
- () Extremely satisfied

(6) On a scale of 1 to 5 (with 1 representing "Not at all important" and 5 representing "Extremely important"), please indicate how important the following aspects of electric car ownership are to you.

	Not at all important (1)	Slightly important (2)	Moderately important (3)	Very important (4)	Extremely important (5)
Saving money on fuel costs.	()	()	()	()	()
Saving money overall.	()	()	()	()	()
Reducing environmental impacts.	()	()	()	()	()
Carpool or High Occupancy Vehicle (HOV) lane access.	()	()	()	()	()
Increased energy independence.	()	()	()	()	()
Convenience of charging.	()	()	()	()	()
Speed of refueling.	()	()	()	()	()
Car performance.	()	()	()	()	()
Car styling, finish, and comfort.	()	()	()	()	()
Owning the newest technology	()	()	()	()	()

Logic: Hidden unless: (nyfueltype matches regex pattern "BEV" OR nyfueltype matches regex pattern "PHEV")

(7) What are the three greatest challenges to owning an electric car in New York State?

[SELECT ONLY UP TO THREE]

- Cost of charging
- Cost of hydrogen fueling
- Overall cost of ownership
- Car performance in cold/inclement weather
- Car maintenance
- Overall car performance
- Charging at home
- Access to public charging stations
- Speed of car charging
- Access to fueling stations
- Functionality of fueling stations
- Range limitations
- Other

Logic: Hidden unless: nyfueltype matches regex pattern "FCEV"

(8) What are the three greatest challenges to owning an electric car in New York State?

- Cost of charging
- Cost of hydrogen fueling
- Overall cost of ownership
- Car performance in cold/inclement weather
- Car maintenance
- Overall car performance
- Charging at home
- Access to public charging stations
- Speed of car charging
- Access to fueling stations
- Functionality of fueling stations
- Range limitations
- Other

(9) If you selected "Other" in the previous question, please describe what challenge you face as an electric car driver in New York State.

Electric Car Driving

(10) How often do you use your electric car to do the following?

	Never	A few times per month or less	About once per week	A few times per week	Daily or almost daily	Not applicable
Commute all the way to and from work.	()	()	()	()	()	()
Commute partway to or from work (e.g., driving to a park-and-ride lot).	()	()	()	()	()	()
Run local errands (< 10 miles from home).	()	()	()	()	()	()
Take long trips (>50 miles from home).	()	()	()	()	()	()
As a car for ride sourcing services (e.g., Uber, Lyft).	()	()	()	()	()	()

(11) About how many miles do you drive your electric car per day?

(12) How many total miles have you driven your electric car so far?

Logic: Hidden unless: nyfueltype matches regex pattern "PHEV"

(13) What percent of your total miles driven have been **electric** miles?

0 _____ [] _____ 100

(14) Please list the 5-digit ZIP code of your place of employment, if applicable.

Logic: Show/hide trigger exists.

ZIP code:: _____

Logic: Show/hide trigger exists. Hidden unless: Question "ZIP code:"

OR select one of the following:

I don't work

I work at home

My work location varies

Page entry logic: This page will show when: (nyfueltype matches regex pattern "PHEV" OR nyfueltype matches regex pattern "BEV")

Charging

Logic: Show/hide trigger exists. Hidden unless: Question "OR select one of the following:" is not one of the following answers ("I don't work", "I work at home", "My work location varies")

(15) Do you have access to charging at your place of work?

Yes, and I can charge for free.

Yes, and I must pay to charge.

No

I don't know

(16) How often do you charge at each of the following locations?

	Never	A few times a month or less	About once per week	A few times per week	Daily or almost daily
At my home:	()	()	()	()	()
Onsite at my workplace:	()	()	()	()	()
Where I park during work (I don't park onsite at work):	()	()	()	()	()
At other public charging stations:	()	()	()	()	()

(17) Which of the following do you use to charge your car at home? [select all that apply]

- 120V outlet (typical wall outlet)
- 240V outlet (e.g., clothes dryer outlet)
- Level 2 (240V) charging station
- Other
- None of the above

(18) How much do you disagree or agree with the following statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
There are enough public chargers.	()	()	()	()	()
Public charging stations are often in use by others when I want to charge.	()	()	()	()	()
There are public charging stations in the places where I need them.	()	()	()	()	()
Public charging stations are often not working when I want to use them.	()	()	()	()	()
I frequently see gasoline-fueled cars parked in spaces with public electric car chargers.	()	()	()	()	()

Logic: Hidden unless: #15 Question "Do you have access to charging at your place of work?" is one of the following answers ("Yes, and I can charge for free.," "Yes, and I must pay to charge.")

(19) How much do you disagree or agree with the following statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
There are enough workplace chargers.	()	()	()	()	()
Workplace charging stations are often in use by others when I want to charge.	()	()	()	()	()
Workplace stations are often not working when I want to use them.	()	()	()	()	()
I frequently see gasoline-fueled cars parked in spaces with workplace electric car chargers.	()	()	()	()	()

Page entry logic: This page will show when: nyfueltype matches regex pattern "FCEV"

Fueling

(20) How often do you refuel your fuel-cell electric car?

- Less than once per month
- About once per month
- A few times per month
- About once per week
- A few times per week
- Daily or almost daily

(21) When you visit a fueling station, how often is it out of order?

- I have never encountered a station that was out of order
 - Rarely
 - Sometimes
 - Frequently
 - Almost always
-

Program Performance/Efficacy

Logic: Show/hide trigger exists.

(22) Would you recommend electric car ownership to other people?

- Definitely would not recommend
- Probably would not recommend
- Not sure
- Probably would recommend
- Definitely would recommend

(23) Have any of your friends or family purchased/leased an electric car since you bought your electric car?

Yes

No

I don't know

Logic: Hidden unless: #22 Question "Would you recommend electric car ownership to other people?" is one of the following answers ("Definitely would not recommend," "Probably would not recommend")

(24) Please share the main reason(s) why you wouldn't recommend an electric car.

(25) How likely are you to purchase/lease another electric car in the future?

0 _____ [] _____ 100

(26) Would you purchase or lease another electric car if the New York State electric car rebate (Drive Clean Rebate) were not available?

Yes

No

Household and Demographic Characteristics

(27) Do you own or rent your residence?*

Own

Rent

Prefer not to answer

(28) What type of residence do you live in?*

Detached house (single-family home)

Attached house (e.g., townhome, duplex, triplex)

Apartment/condominium

Other, please specify: _____ *

Prefer not to answer

(29) Do you have solar electric panels at your residence?

Yes, I have solar electric panels installed.

No, but I am considering installing them.

No, I am able to but I have no plans to install them.

No, I am unable to install solar panels.

Other, please specify: _____

(30) How many people live in your household, including yourself?*

1

2

3

4

5

6

7

8

9 or more

Prefer not to answer

(31) What is your age?*

- 16–20
- 21–29
- 30–39
- 40–49
- 50–59
- 60–69
- 70–79
- 80+
- Prefer not to answer

(32) How do you prefer to describe your gender?*

- Female
- Male
- Not listed:: _____
- Prefer not to answer

33) What is the highest level of education you have completed?*

- High school graduate or less
- Some college, no degree
- Associate degree
- Bachelor's degree
- Graduate degree
- Prefer not to answer

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

- Less than \$25,000
- \$25,000 to \$49,999
- \$50,000 to \$74,999
- \$75,000 to \$99,999
- \$100,000 to \$149,999
- \$150,000 to \$199,999
- \$200,000 to \$249,999
- \$250,000 to \$299,999
- \$300,000 to \$349,999
- \$350,000 to \$399,999
- \$400,000 or more
- Prefer not to answer

(35) How do you prefer to describe your racial/ethnic identity? [select all that apply]*

- Black or African American
- East Asian
- Latino/a or Hispanic
- Middle Eastern
- Native American or Alaska Native
- Native Hawaiian or Pacific Islander
- South Asian
- White or Caucasian
- Other (please specify):

*

-
- Prefer not to answer
-

Other comments

Page exit logic: Skip / Disqualify LogicIF: #1 Question "According to our records, you received a rebate for a [question('value'), id='17'] [question('value'), id='18']. Does your household still have this electric car?" is one of the following answers ("Yes")
THEN: Jump to [page 12 - Thank You!](#) Flag response as complete

(36) Please share any additional comments about your electric car ownership experience or this survey in the box below.

Please be sure to click "Next" at the bottom of the page to complete the survey.

Disqualification—Rebated Car No Longer in Use

(37) Please share any comments in the box below.

Thank You!

Endnotes

- ¹ Program participants are invited to take the Ownership Survey once per quarter. Therefore, the time since they have acquired their vehicle ranges from 10.5–13.5 months.
- ² Defined as using their vehicle a few times per week or more.
- ³ Program participants are defined as applicants who applied for and received a rebate for an electric car through NYSERDA’s Drive Clean Rebate program.
- ⁴ For example, participants who purchased their vehicle anytime during Q1 2018 receive the survey invitation in the middle of Q1 2019. Therefore, they may have been in possession of their vehicle anywhere from 10.5 – 13.5 months.
- ⁵ Of the survey sample. Note that the last rebate approval date occurs over four months after the last vehicle purchase in this data set. While dealers are required to submit applications within 90 days of the date of sale, NYSERDA occasionally grants exceptions so that dealers can submit applications outside of this eligibility window.
- ⁶ Of the survey sample.
- ⁷ The weighting approach was developed in 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, Center for Sustainable Energy (CSE), San Diego CA, 2017. <https://cleanvehiclerebate.org/eng/content/summary-documentation-electric-vehicle-consumer-survey-2013-2015-edition> (accessed February 5, 2020).
- ⁸ Raking, also known as iterative proportional fitting, is a technique used to match a distribution from one data set to another, generally more comprehensive, data set.
- ⁹ Similar segmentation methodology is used in B.D. Williams, J. Orose, M. Jones, J.B. Anderson, Summary of Disadvantaged Community Responses to the Electric Vehicle Consumer Survey, 2013–2015 Edition | Clean Vehicle Rebate Project, Center for Sustainable Energy (CSE), San Diego CA, 2018. <https://cleanvehiclerebate.org/eng/content/summary-disadvantaged-community-responses-electric-vehicle-consumer-survey-2013-2015-edition> (accessed July 1, 2020).
- ¹⁰ Rao, J. N. K., and A. J. Scott. 1984. On chi-squared tests for multiway contingency tables with cell proportions estimated from survey data. *Annals of Statistics* 12: 46–60.
- ¹¹ The NHTS does not report whether a vehicle was purchased new or used. Information on the age of the car and the odometer reading are used to infer the new or used vehicle status.
- ¹² Note that multiple options could be selected, so percentages do not add to 100%.
- ¹³ The interim criteria identified for a disadvantaged community as defined by New York State. <https://www.nysesda.ny.gov/ny/disadvantaged-communities>

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