Consumer Preferences of LMI in CVRP

A Review of Survey Responses from 2017-2020

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July 2024

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Background

This report examines the preferences of Clean Vehicle Rebate Project (CVRP) participants by analyzing CVRP Consumer Survey Responses from 2017-2020. All participants of the CVRP are routinely asked to participate in a survey after they purchase or lease. In the past, CSE has analyzed Consumer Survey data within discrete points in time.[1,2] In this present analysis, we study (1) how responses have changed over four years, from 2017 to 2020 and (2) how Increased Rebate or low- and moderate-income (LMI)[3] CVRP participants have responded in comparison to Standard Rebate individuals. A focus is placed on comparing those who have purchased or leased Teslas compared to those who pursued other vehicle models. This study focuses on the following topics regarding consumer behavior.

- **Adoption Concerns:** Participants are asked what barriers they experience when considering purchasing or leasing electric vehicles. For example, previously held focus groups have found that costs and charging are main concerns, particularly of LMI participants.[4] Range follows as a distant third concern.
- **Home Charging:** Participants are asked about ease of access to charging at home and whether the charging is adequate. Prior studies found that over half of CVRP participants report that they do not charge at home because they rent or have a homeowners association and, therefore cannot make changes.[5]
- **Information Sources:** Participants are asked how they learn about cars. Focus group discussions found that LMI consumers prefer to learn about EVs through online resources.[6]
- **Home Ownership Status:** Participants are asked if they rent or own where they live. CVRP participants who charge at home are often older and homeowners whereas those who do not charge at home tend to be more frequently renters as well as homes in low-income communities.[7]
- **Rebate Essentiality:** Participants are asked if the rebate was essential to buying or leasing their electric vehicle or if they would have pursued the vehicle without one. Knowing the essentiality of a rebate, especially among demographic groups, is key to understanding the importance of incentive programs. As such, CSE has completed several studies on this aspect. One study found

[1] Williams, B. D. H., Anderson, J. B., & Lastuka, A. (2020, June). Characterizing Plug-in Hybrid Electric Vehicle Consumers Who Found the US Federal Tax Credit Extremely Important in Enabling Their Purchase. In *Proceedings of the 33rd Electric Vehicle Symposium (EVS33); Electric Drive Transportation Association (EDTA), EVS33, Portland, OR, USA* (pp. 14-17).

[2] Williams, B. D., & Anderson, J. B. (2021). Strategically Targeting Plug-In Electric Vehicle Rebates and Outreach Using "EV Convert" Characteristics. *Energies*, *14*(7), 1899.

[3] Clean Vehicle Rebate Project. California Air and Resources Board. https://cleanvehiclerebate.org/en/eligibility-guidelines

[4] Gartner, J., Cain, N. J., MacNeille, B., & McCormack, R. (2021). Analysis of LMI CVRP Participation.

[5] Alvarez, F. & Gehrmann, A. (2023). Home Charging Accessibility Trends within the Clean Vehicle Rebate Project. 36th International Electric Vehicle Symposium and Exhibition (EVS36) Sacramento, California, USA, June 11-14, 2023.

[6] McCormack, R., Stafford, M., Good, C., Gartner, J. & Henkin, Z. (2022). Demographic Analysis of LMI Focus Groups: Supplemental Report to Analysis of LMI CVRP Participation.

[7] Alvarez, F. & Gehrmann, A. (2023). Home Charging Accessibility Trends within the Clean Vehicle Rebate Project. 36th International Electric Vehicle Symposium and Exhibition (EVS36) Sacramento, California, USA, June 11-14, 2023.

that consumers who found the CVRP rebate essential were more likely to be focused on the financial aspects of EV adoption, to face greater barriers to adoption, and to have less access to information. They also tended to be less motivated by the environmental benefits of EVs.[8] A different CSE study looked at the characteristics of those who rebated a Plug-in Hybrid Electric Vehicle (PHEV) and found the Federal Tax Credit "extremely important." This group was primarily motivated to purchase a PHEV by financial savings, carpool-lane access and charging availability. The environmental benefits of a PHEV were less important to this group.[9] Additionally, between Q1 2013 and Q1 2015, the essentiality of the CVRP rebate increased between just over 30% of respondents to just over 50% of respondents.[10]

Methodology

The EV market has grown over the past several years, and because we have surveyed CVRP participants over several years, we use this data to examine trends in consumer behavior. We have improved survey questions over time, adjusting questions as the market has matured. While we have surveyed participants since 2013, questions have been consistent since 2017. We focus on survey results between 2017 and 2020 because they are easily examined over several years, and we selected the following questions to study.[11]

Adoption Concerns:

- **Question:** Regardless of what you think now, when you were shopping for your EV, please rank the top three perceptions about all-battery electric vehicles that gave you concern about choosing one.
    - ***Answer Options:*** *vehicle is too expensive, vehicle range on a single charge is too limited, technology is too new and still developing, battery life is uncertain and replacement cost is too high, vehicle safety record is too short, variety of vehicle models and body styles is too limited/unappealing, time required for charging is too long, charging at home is too difficult and installing charging equipment is too expensive, cost of electricity for charging at home is too high, too few opportunities for charging away from home, other – please specify below*
- **Question:** Regardless of what you think now, when you were shopping for your FCEV, please rank the top three perceptions about all-battery electric vehicles that gave you concern about choosing one.

[8] Center for Sustainable Energy (2017). CVRP Infographic: Characterizing California Electric Vehicle Consumer Segments - TRB Poster. Retrieved [4/12/2022] from https://cleanvehiclerebate.org/eng/program-reports
[9] Williams, B. D. H., Anderson, J. B., & Lastuka, A. (2020, June). Characterizing Plug-in Hybrid Electric Vehicle Consumers Who Found the US Federal Tax Credit Extremely Important in Enabling Their Purchase. In Proceedings of the 33rd Electric Vehicle Symposium (EVS33); Electric Drive Transportation Association (EDTA), EVS33, Portland, OR, USA (pp. 14-17).
[10] Center for Sustainable Energy (2017). CVRP Infographic: Characterizing California Electric Vehicle Consumer Segments - TRB Poster. Retrieved [9/16/2022] from https://cleanvehiclerebate.org/en/content/infographic-characterizing-california-electric-vehicle-consumer-segments-trb-poster.
[11] Note results of surveys post 2020 are yet to be available.

- ***Answer Options:*** *vehicle is too expensive, vehicle range on a single fill is too limited, technology is too new and still developing, fuel cell durability is uncertain and replacement cost is too high, vehicle safety record is too short, variety of vehicle models and body styles is too limited/unappealing, too few hydrogen stations to accommodate my travel needs, reliability of hydrogen fueling stations working properly is uncertain, cost of hydrogen fuel is too high, environmental impact of producing hydrogen fuel is uncertain, other – please specify below*

Home Charging:

- **Question:** Are you or will you soon be able to easily charge at home?
  - ***Answer Options****: Yes, No*

Information Sources:

- **Question:** Please rank the top three most influential information sources when you were deciding whether to acquire an EV.
  - ***Answer Options:*** *News story, social media, another PEV driver, vehicle test drive, dealer/salesperson, manufacturer website, online discussion forum, third-party vehicle review or car-buying website, My employer, electric utility, non-profit organization, other*

Home Ownership Status:

- **Question:** Do you own or rent your residence?
  - ***Answer Options:*** *Rent, Own, Prefer Not to Answer*

Rebate Essentiality:

- **Question:** If the state vehicle rebate (CVRP) were not available, what do you think you would have done?
  - ***Answer Options:*** *purchased/leased this exact vehicle anyway; purchased/leased a less expensive version of the same model; purchased/leased a different new PEV; purchased/leased a used PEV; purchased/leased a new non-PEV instead; purchased/leased a used non-PEV instead; not made any purchase/lease at all*

Regressions were conducted on each of the questions for each of the years 2017 to 2020, comparing LMI and non-LMI responses. Chi-square tests were performed for each of the regressions to determine significant relationships between income populations and the topic analyzed (e.g., concerns about adoption, home charging, information sources, home ownership status, and rebate essentiality). Tests were not performed to determine relationships between income populations and response options (e.g., specific concerns, renters, specific information sources, etc.).

Findings

Concerns About EV Adoption

For both income groups and throughout all years, MSRP and range are the most significant barriers to EV adoption. After these concerns, battery lifespan, cost, charging time, and public charger access consistently make up the most common concerns. Note that no concern had a statistically significant relationship to LMI status for over two survey years. For graphs depicting the findings, please see Appendix: Concerns about EV Adoption.

Concerns About FCEV Adoption

For all years and income groups, the greatest concern is that there are too few fuel stations for FCEVs. Other notable concerns are station reliability, fuel costs, and MSRP. Station reliability will become an increasingly major issue for both groups from 2018 onwards. Fuel costs were a major issue for LMI participants in 2020 but not for non-LMI participants. Conclusions about concerns within the LMI population are difficult to make because the LMI results fluctuate a fair amount due to the small sample size. No more than 30 LMI participants rebate an FCEV in the years of this study. As such, no statistically significant relationship exists between any of the concerns and LMI status. For graphs depicting the findings, please see Appendix: Concerns about FCEV Adoption.

Home Charging

Easy access to home charging has stayed relatively consistent over the years. Non-LMI participants report a bit more access to home charging. This population's access made some gains in 2018 and maintained this level throughout the years. Home charging access tends to be in the 80-90% range for both groups. There is a statistically significant relationship between LMI status and access to home charging for all years. For graphs depicting the findings, please see Appendix: Home Charging.

Information Sources

Third-party car websites, test drives, and other EV owners are the top three information sources for both LMI and non-LMI populations across all years. Non-LMI consumers tended to have a slightly higher preference for each of these sources than LMI consumers; LMI consumers tended to put more faith in dealers across all years. However, the importance of dealers is shrinking for both groups over time. The importance of test drives, other EV owners, and social media is increasing. Social media and news stories are also common sources of information for both groups but to a much lesser extent than test drives, other EV owners, and car websites. Other EV owners' and manufacturers' websites were the only information sources that maintained a statistically significant relationship to LMI status throughout all years. For graphs depicting the findings, please see Appendix: Information Sources.

Home Ownership Status

The ratio of renting to owning stayed largely consistent through all years, with about 80% of non-LMI respondents owning their residence and about 60% of LMI respondents owning their residence. The one expectation is that in 2017, only 49% of LMI respondents owned their residences. There is a statistically significant relationship between LMI status and home ownership for all years. For graphs depicting the findings, please see Appendix: Home Ownership Status.

Rebate Essentiality

All Vehicle Models

Rebate essentiality was highest for the lower income groups and decreased as income rose throughout all the years. In 2017, rebate essentiality was above 50% for all income groups and did not decline to 50% until the $350,000-$400,000 income group. Rebate essentiality in 2018 and 2019 was above or around 50% until income reached $200,000. Beyond this point, rebate essentiality decreased, reaching 30% for the highest income groups. In 2020, rebate essentiality only surpassed 50% for participants earning less than $50,000, dropping to as low as 24% for higher-income groups. A statistically significant relationship existed between rebate essentiality and income status for all vehicle types. For graphs depicting the findings, please see Appendix: Rebate Essentiality Among All Vehicle Models.

Tesla Models

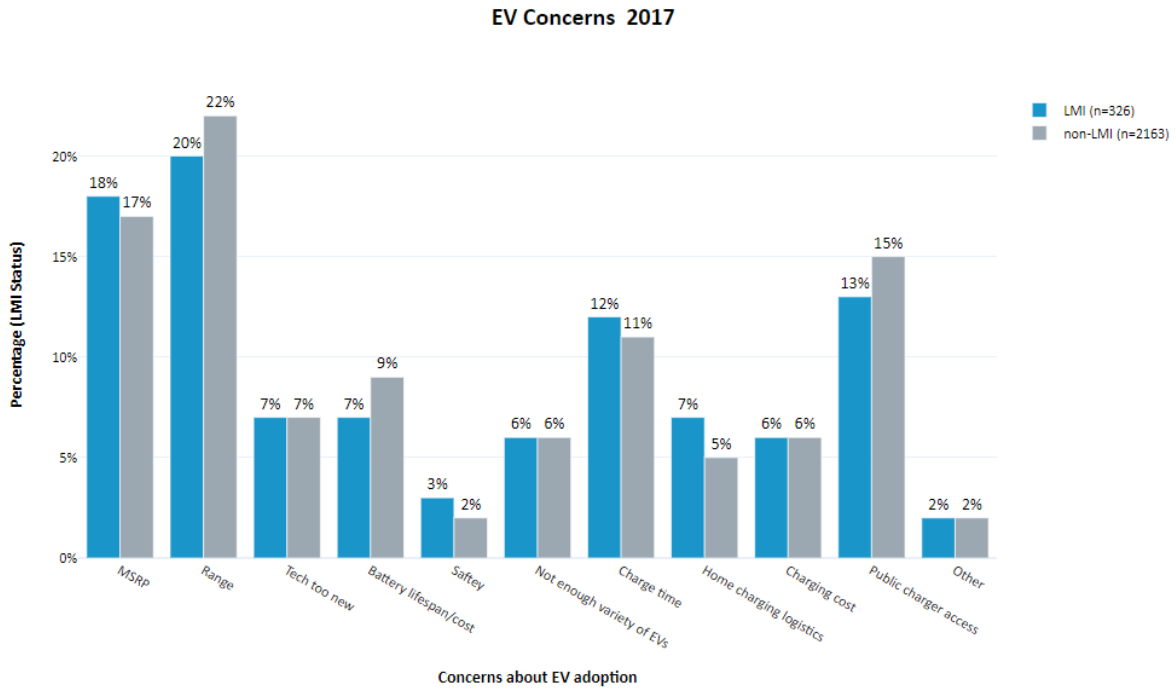
Compared to the general CVRP Consumer Survey population, those who rebated Teslas found the rebates less essential. Similar to the general population, rebate essentiality tended to decrease with income for all years. Notably, the year 2017 stood out due to its smaller sample size compared to other years. In 2018, rebate essentiality was only greater than 50% for the less than $25,000 income group. For all other groups, rebate essentiality was less than 50% and fell as income rose. The $400,000-$450,000 had the lowest level of rebate essentiality at 18%. In 2019, rebate essentiality significantly increased and did not drop consistently below 50% until the $200,000-$250,000 income group. Rebates were less important in 2020, rebate essentiality was only greater than 50% in the $25,000-$50,000 income group. Rebate essentiality reached a low of 15% for the $300,000-$350,000 income group. A statistically significant relationship existed between Tesla rebate essentiality and LMI status for all years. For graphs depicting the findings, please see Appendix: Rebate Essentiality Among Tesla Models.

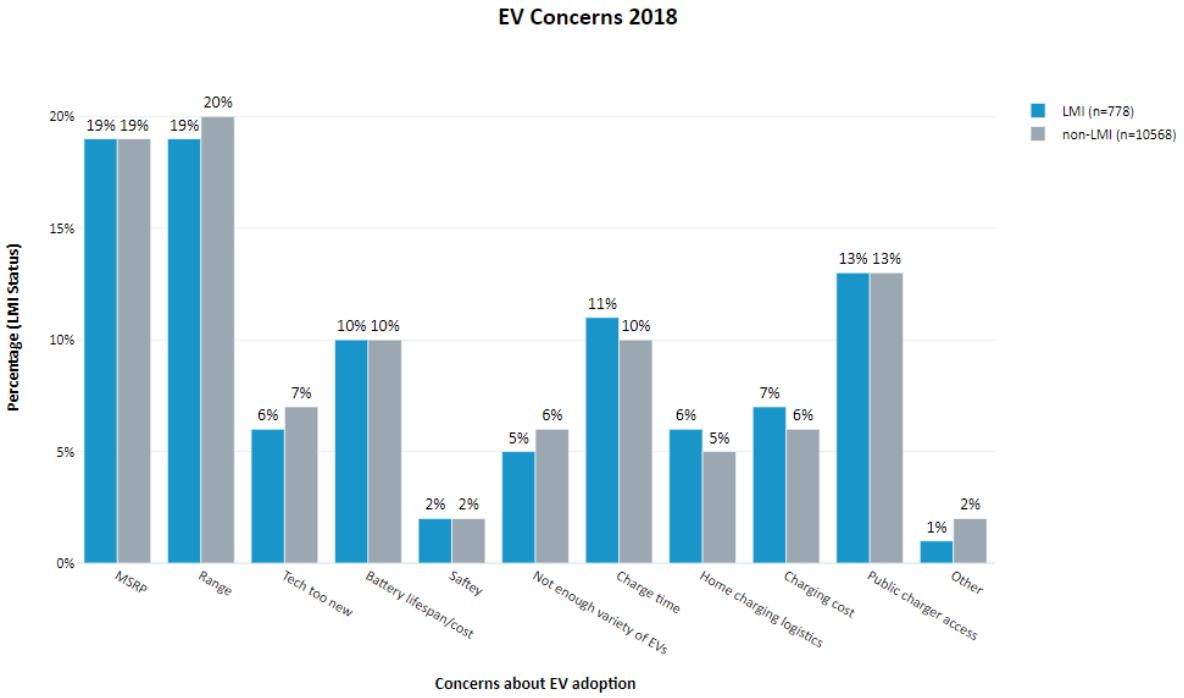
Non-Tesla Models

Compared to the general CVRP Consumer Survey population, those who rebated non-Tesla vehicles found the rebate more essential. Like the general population, rebate essentiality tended to decrease with income and in later survey years. For the 2017 survey, rebate essentiality only fell to 50% in the $350,000-$400,000 income group. In 2018, fewer consumers listed the rebate as essential, falling to 50% in the $250,000-$300,000 income group. While in the 2019 survey rebate essentiality didn't fall below 50% until the $300,000-$350,000 income group, it remained only a few percentage points above 50% for all incomes, nearly all incomes about $75,000. The rebate was less important in 2020 than in 2019. The level of rebate essentiality hovered around 50% for most incomes greater than $50,000 but

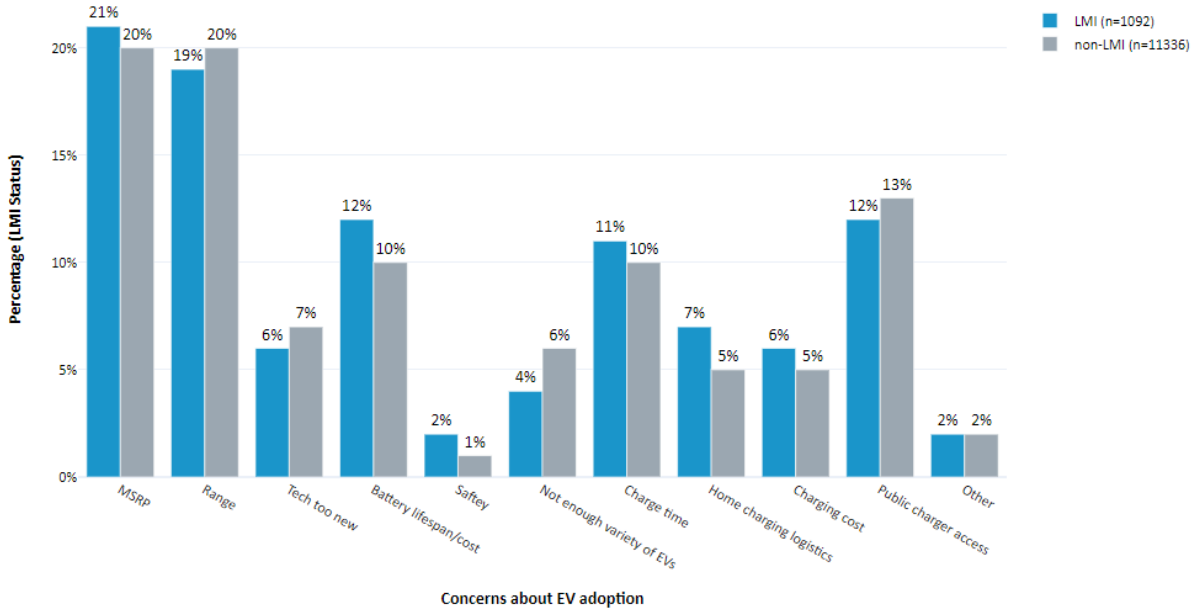
tended to be lower than in 2019. There was a statistically significant relationship between non-Tesla rebate essentiality and LMI status for all years, regardless of vehicle type. For graphs depicting the findings, please see Appendix: Rebate Essentiality Among Non-Tesla Models.

Appendix: Concerns about EV Adoption

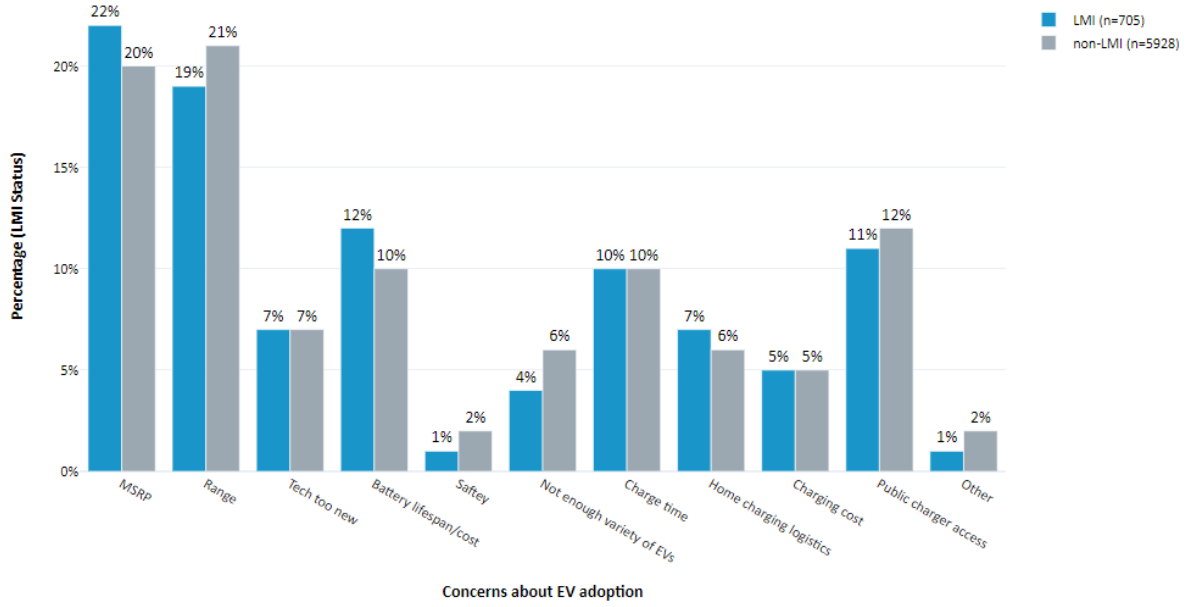




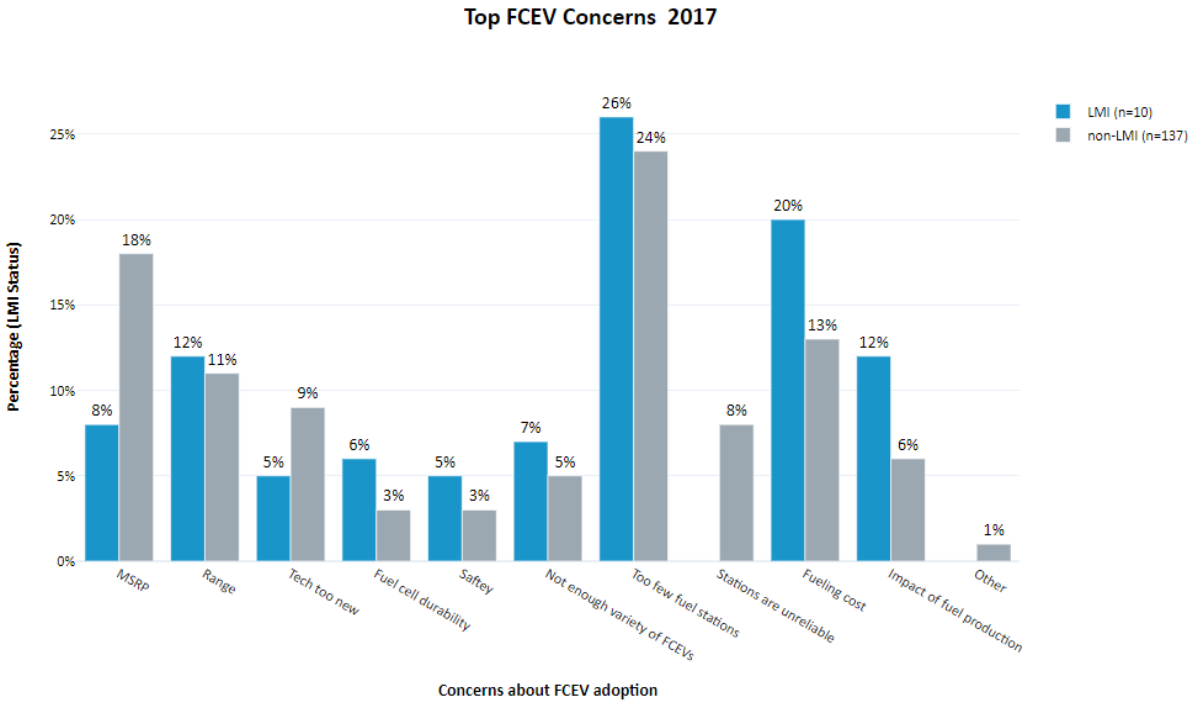
EV Concerns 2019

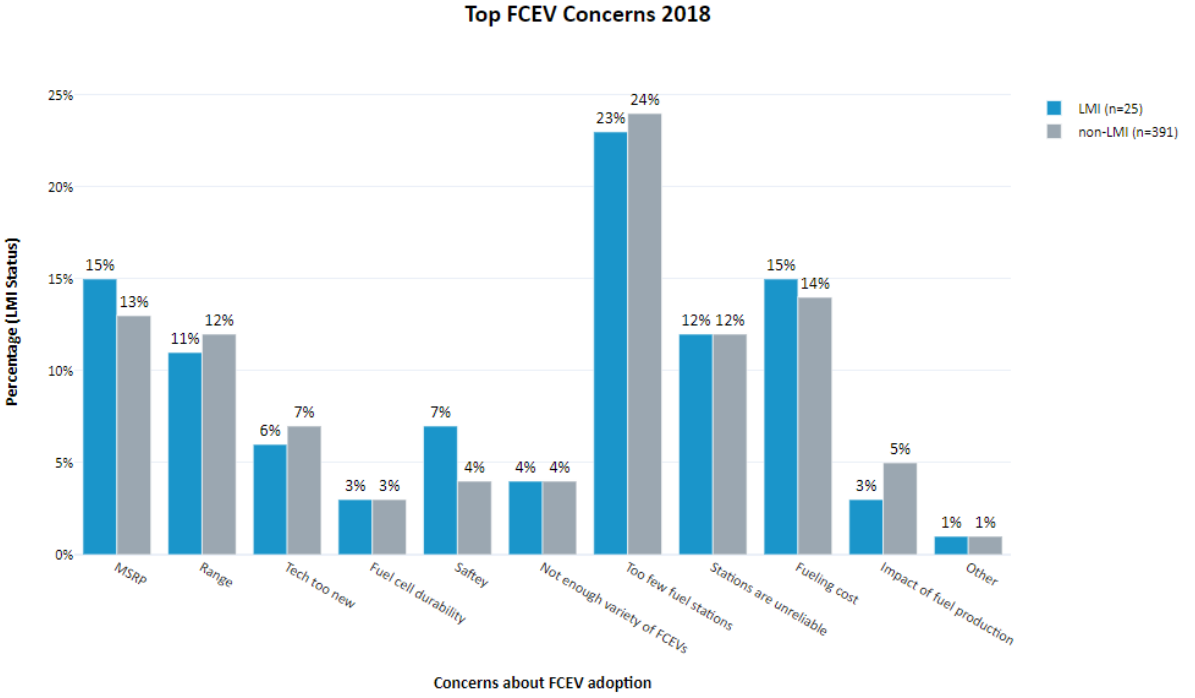


EV Concerns 2020

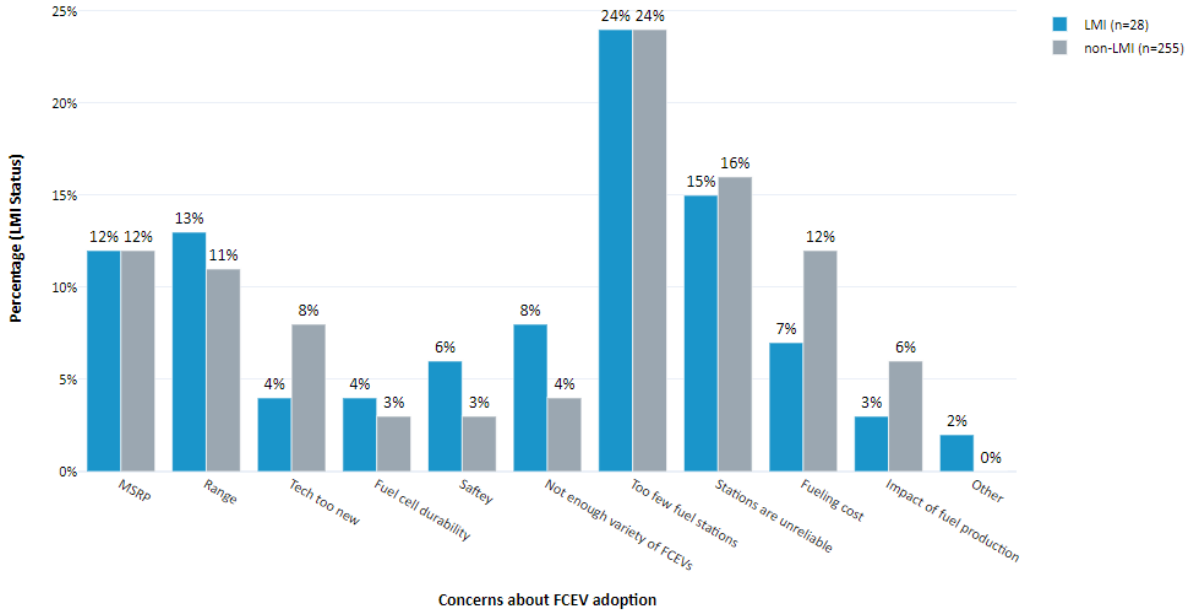


Appendix: Concerns about FCEV Adoption

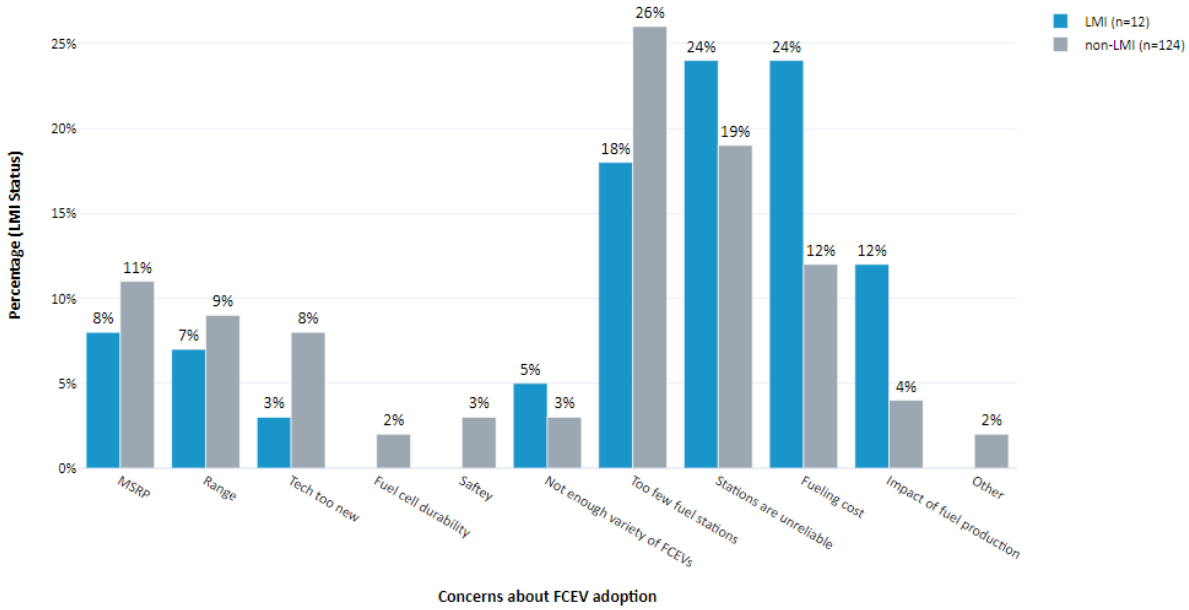




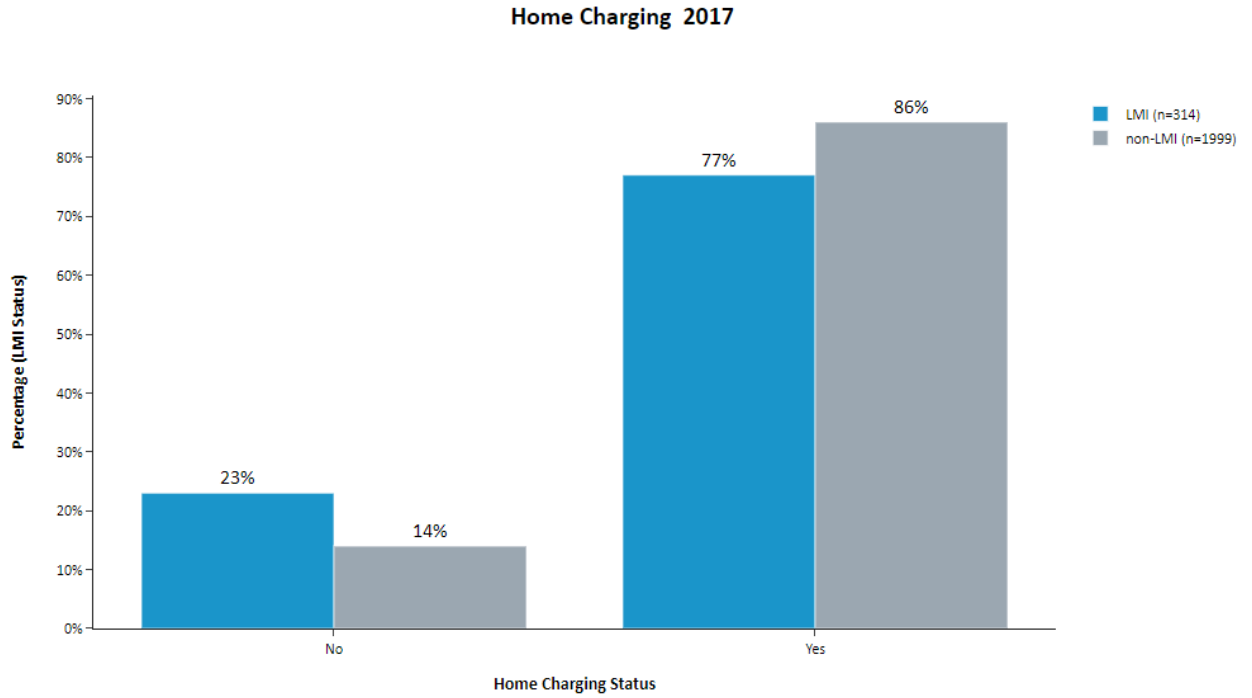
Top FCEV Concerns 2019

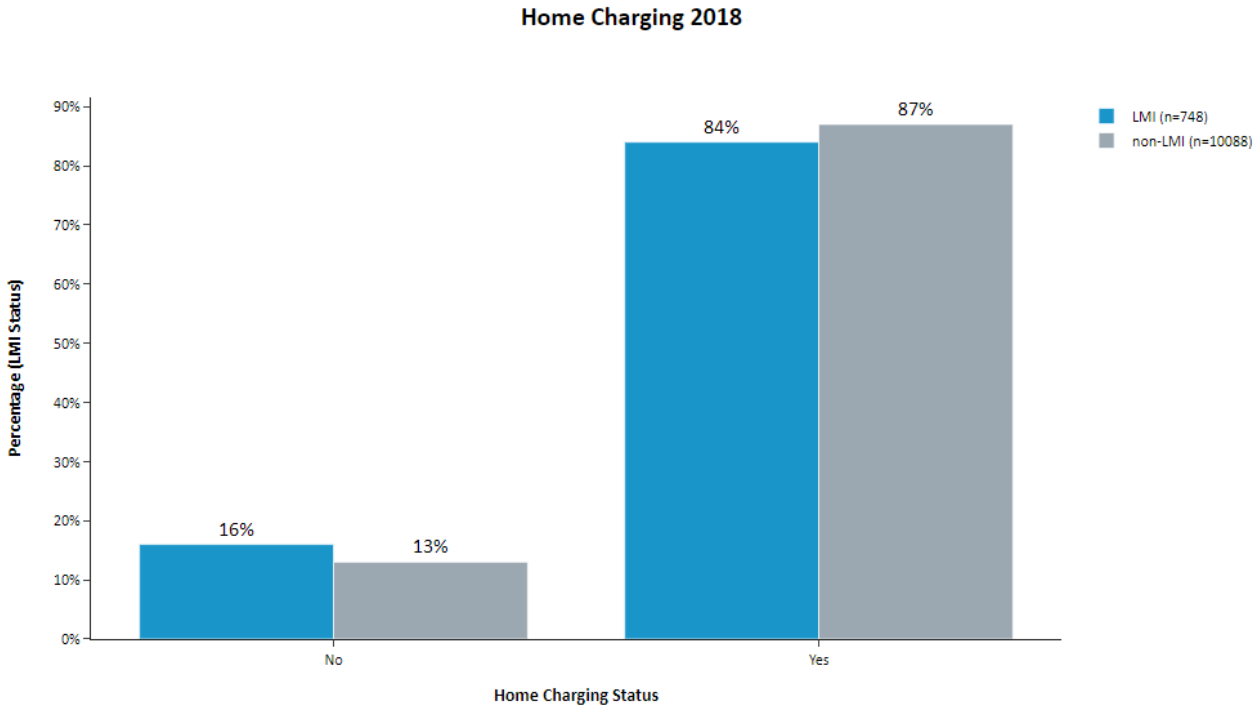


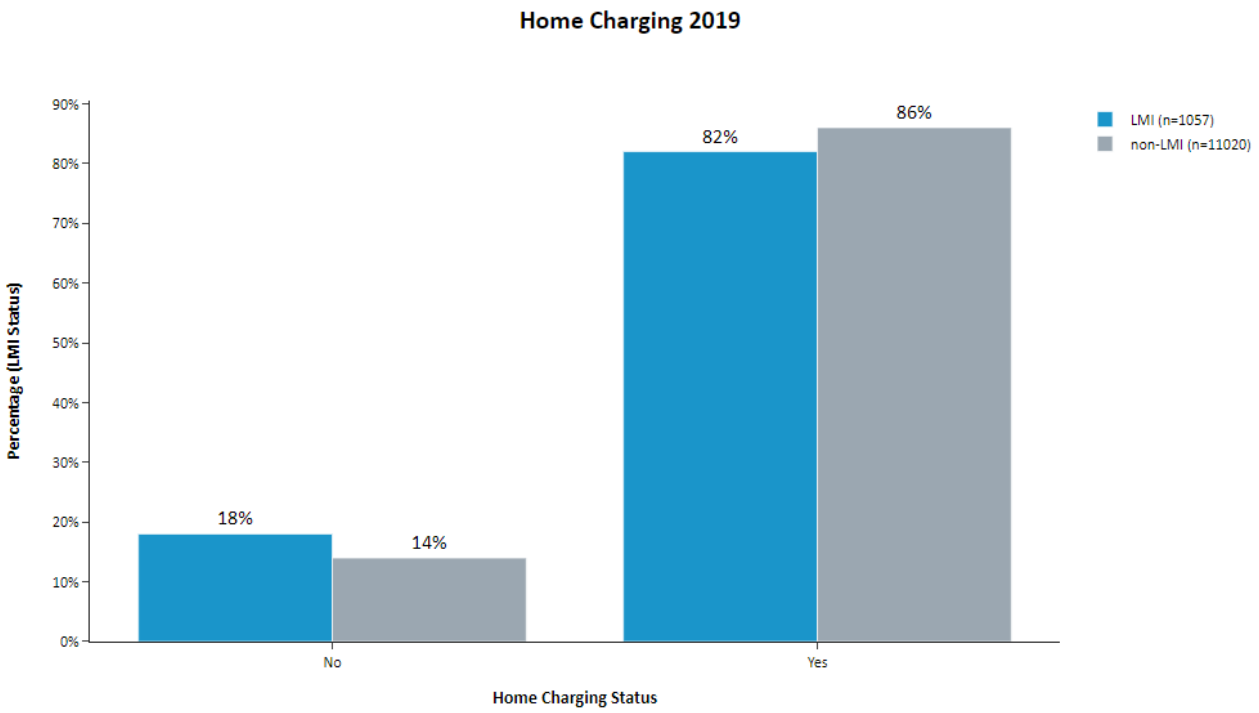
Top FCEV Concerns 2020

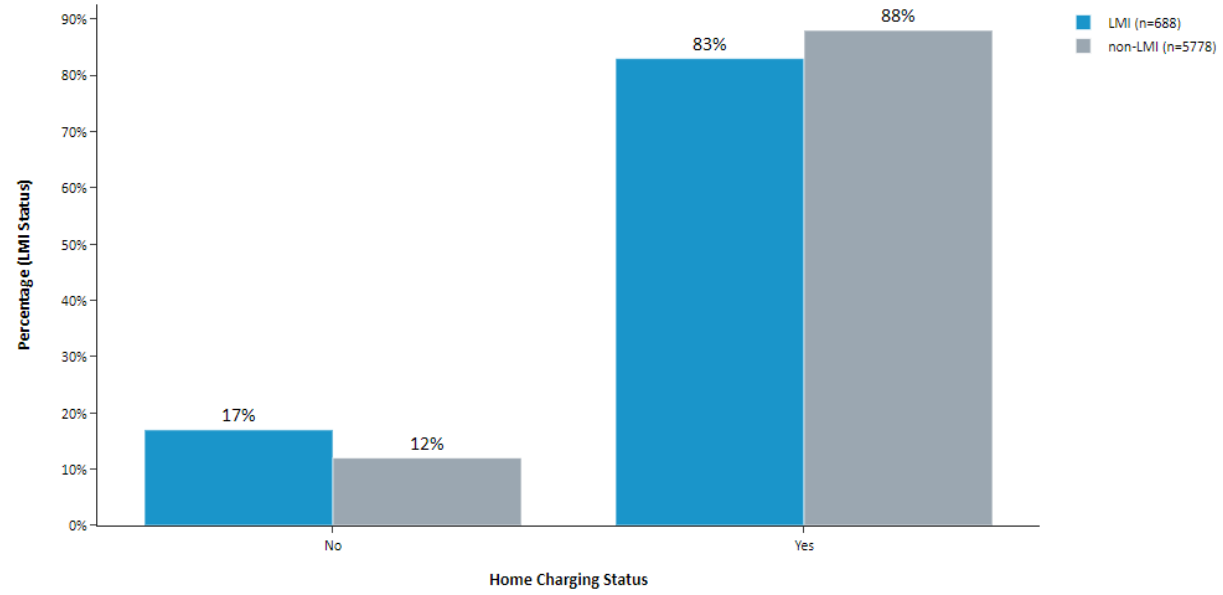


Appendix: Home Charging

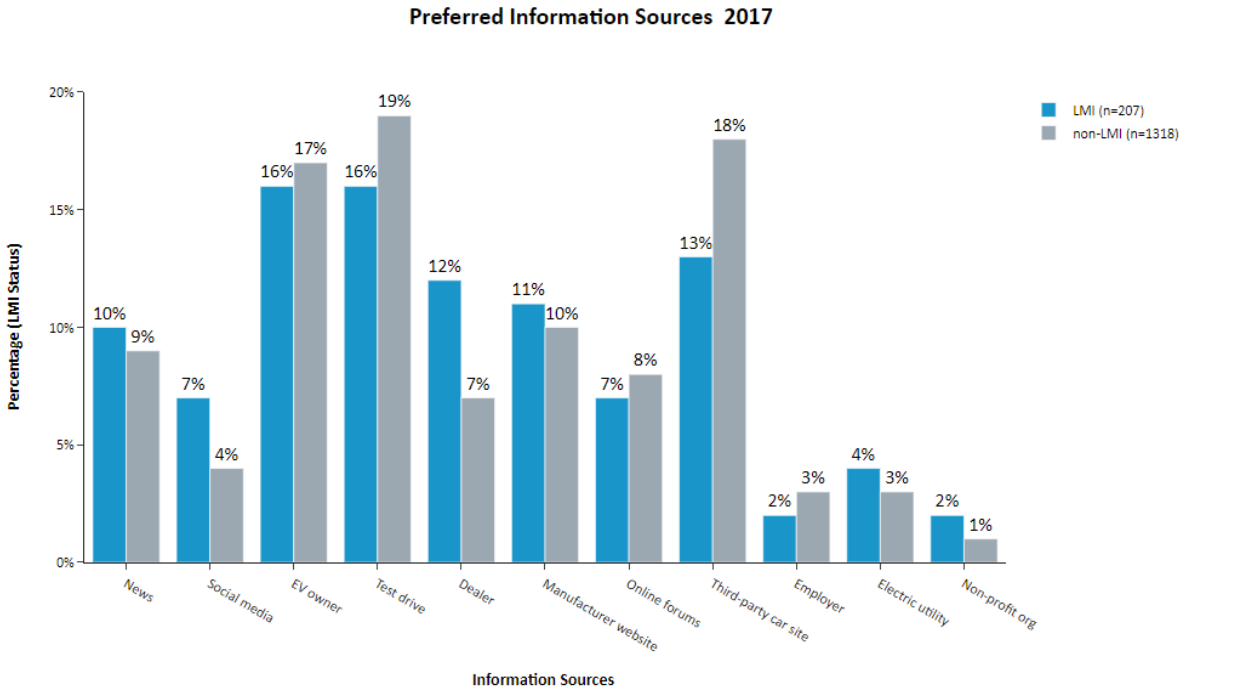


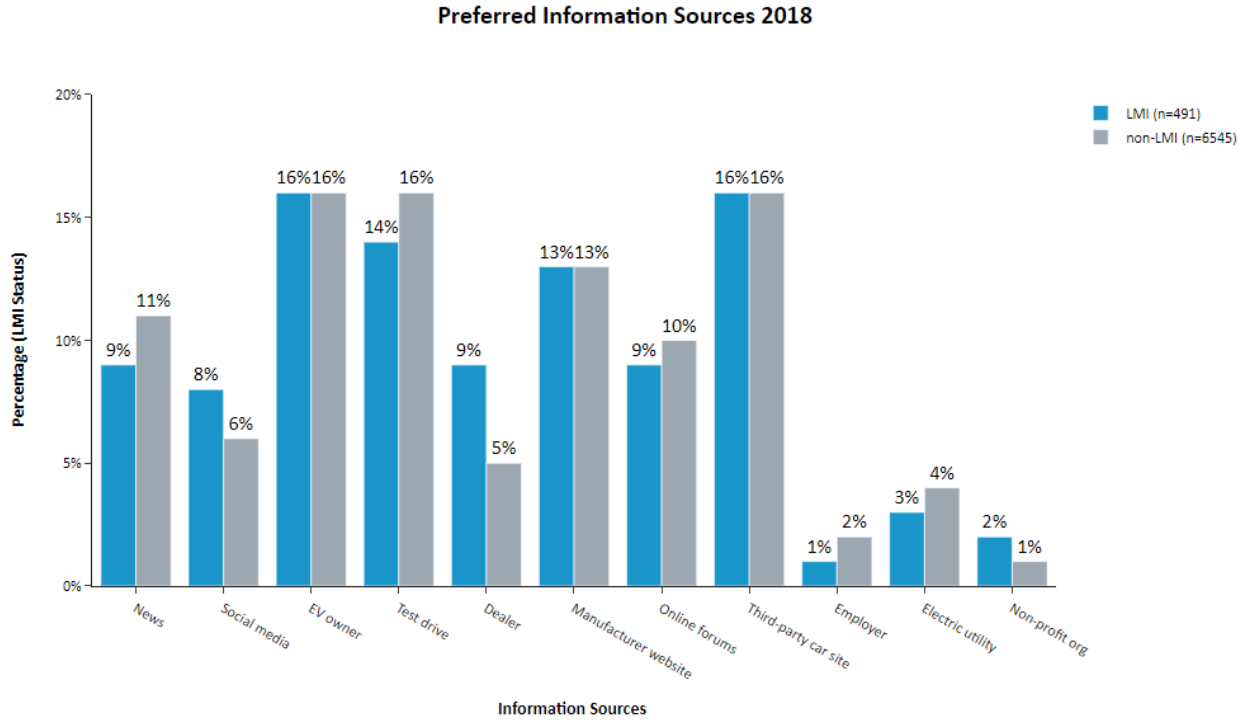



Home Charging 2019
Percentage (LMI Status)
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
18%
14%
82%
86%
No
Yes
Home Charging Status
LMI (n=1057)
non-LMI (n=11020)

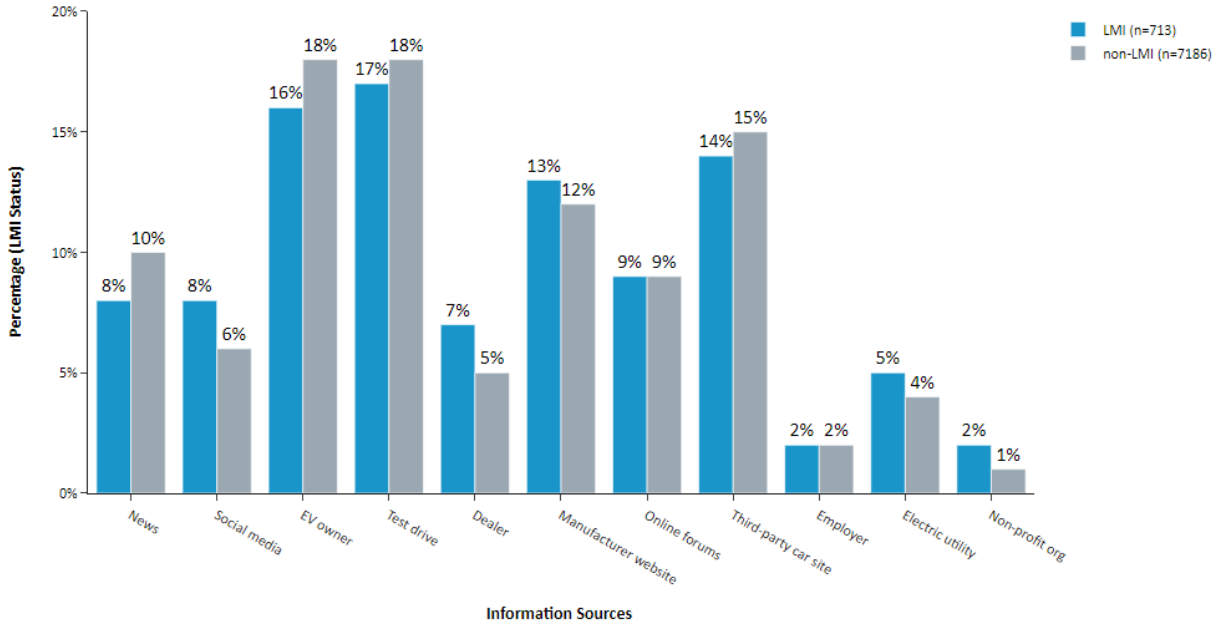

Home Charging 2020
Percentage (LMI Status)
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
17%
12%
83%
88%
No
Yes
Home Charging Status
LMI (n=688)
non-LMI (n=5778)

Appendix: Information Sources

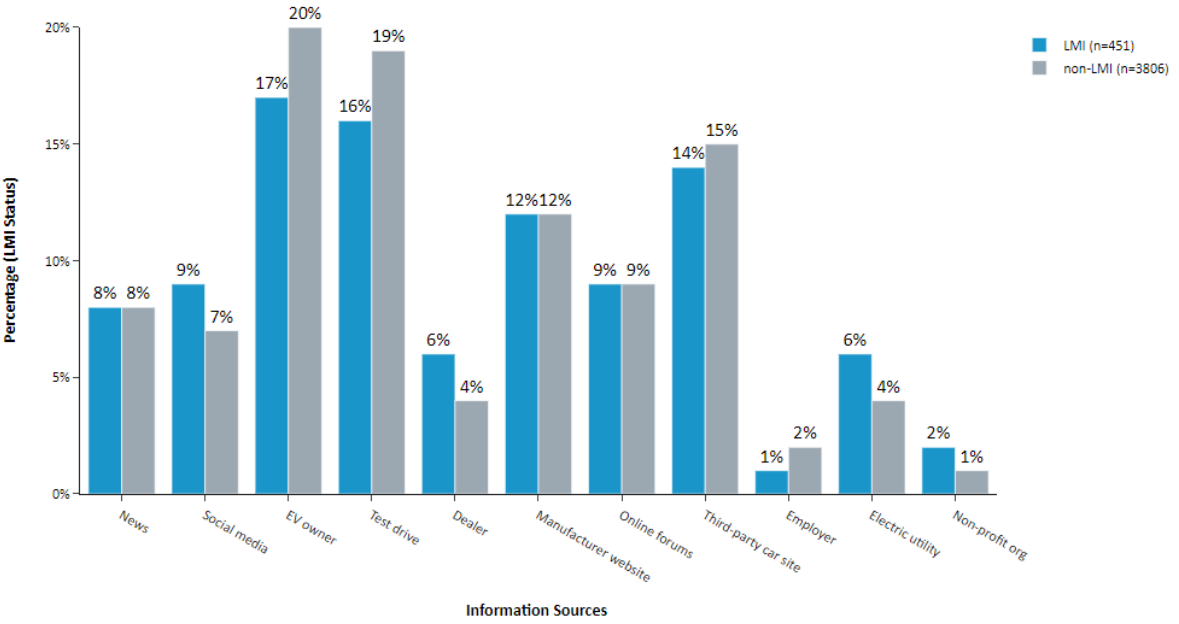




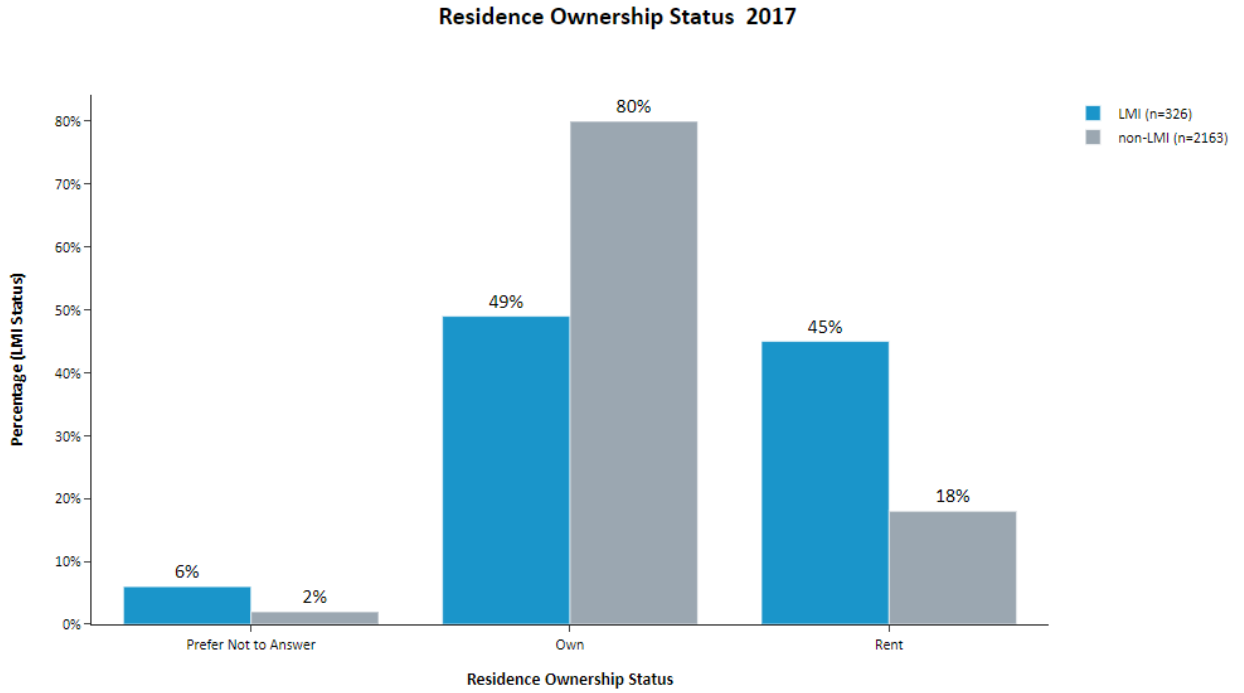
Preferred Information Sources 2019

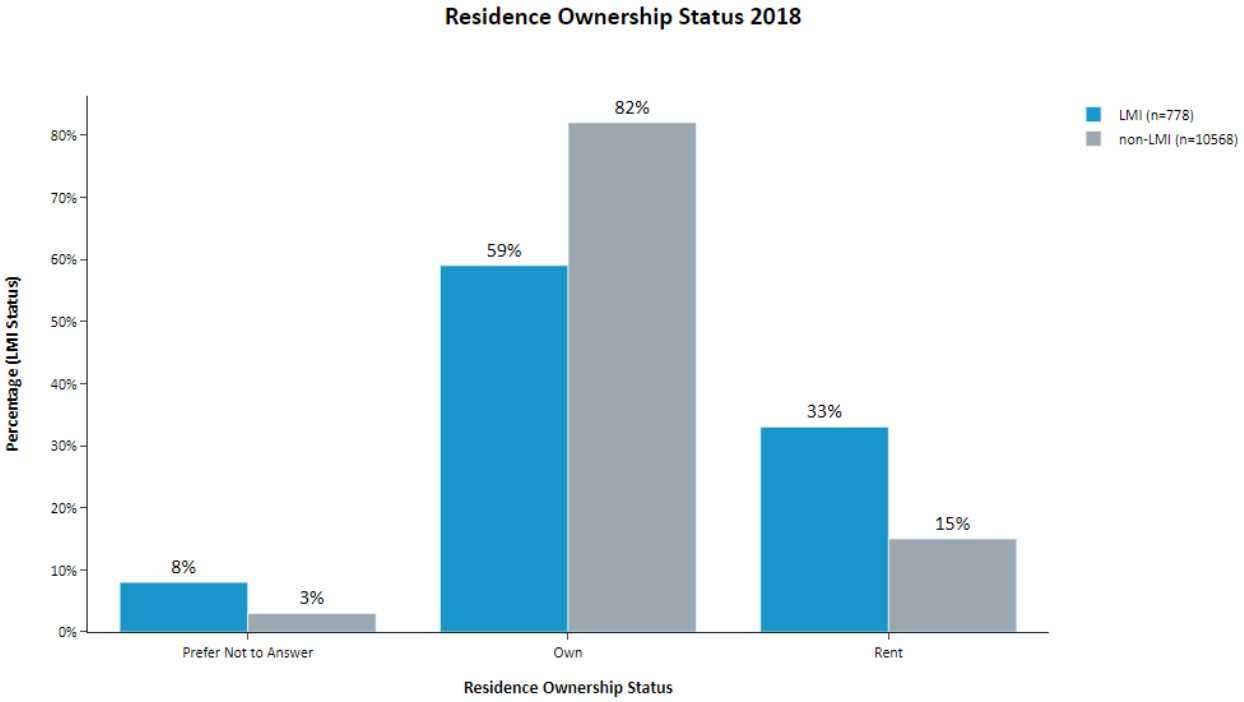


Preferred Information Sources 2020

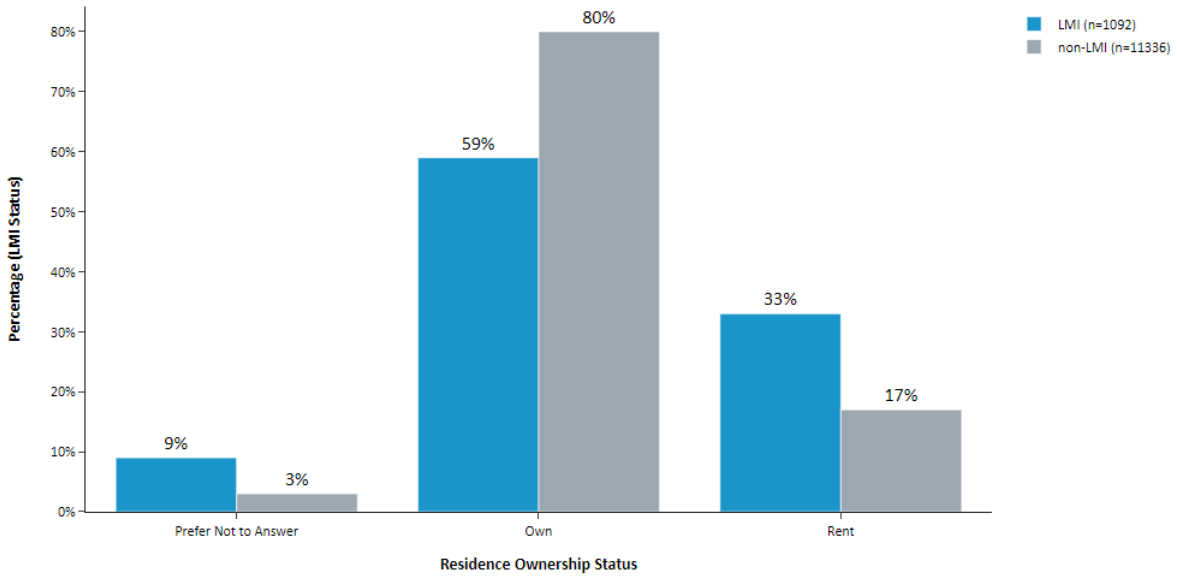


Appendix: Home Ownership Status

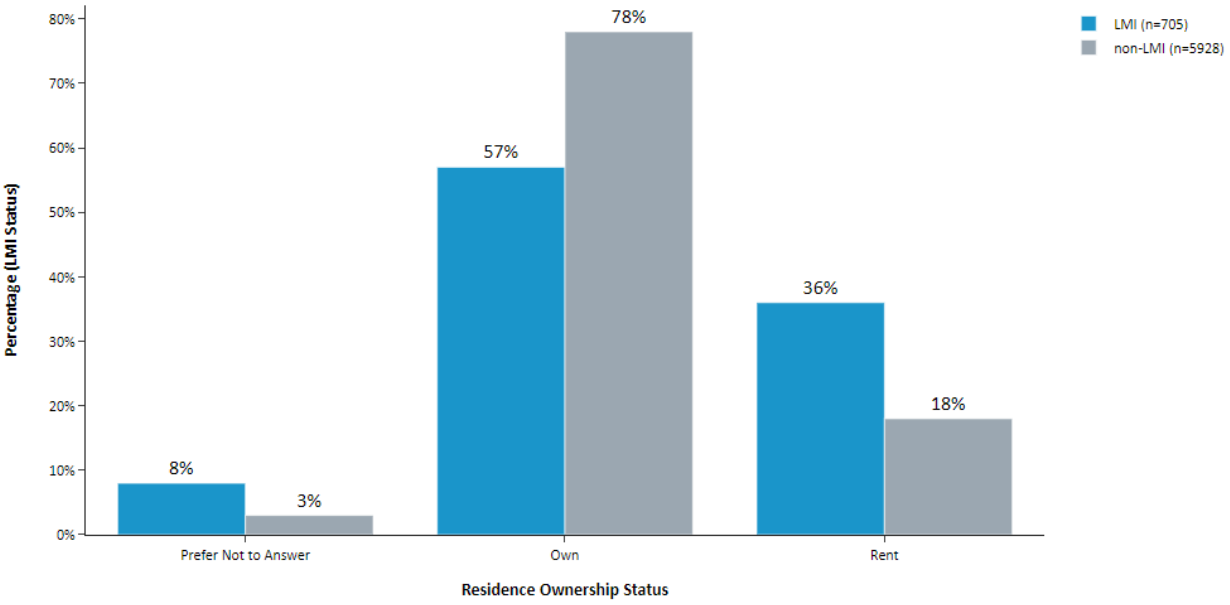




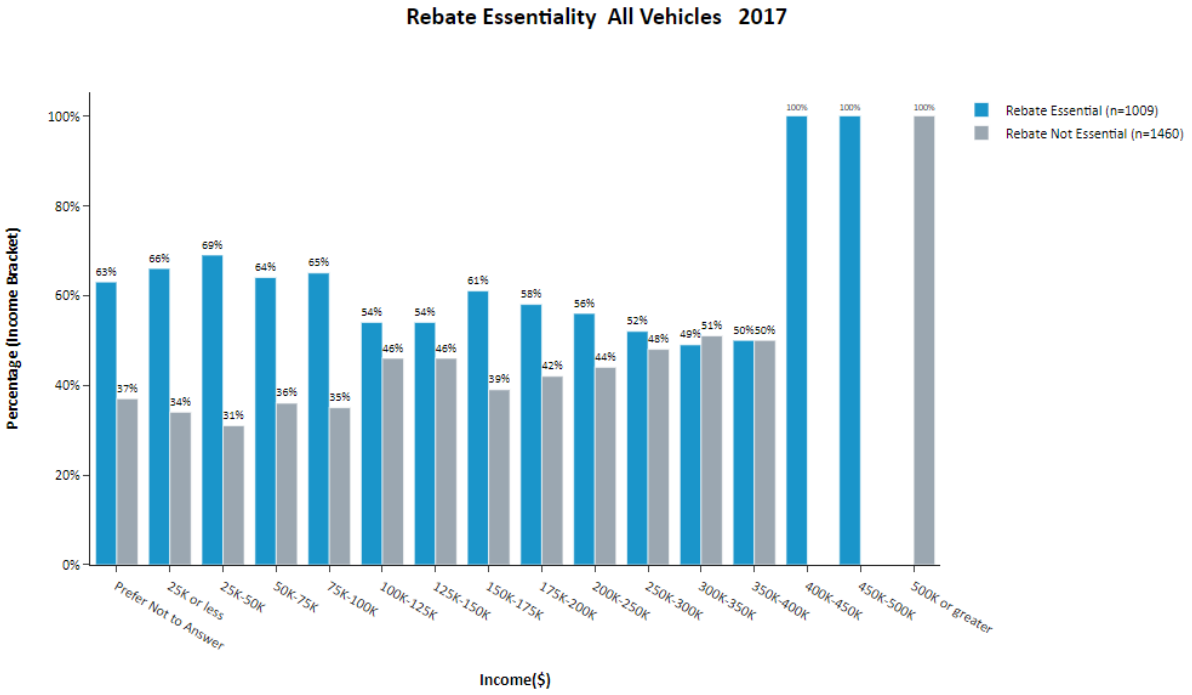
Residence Ownership Status 2019

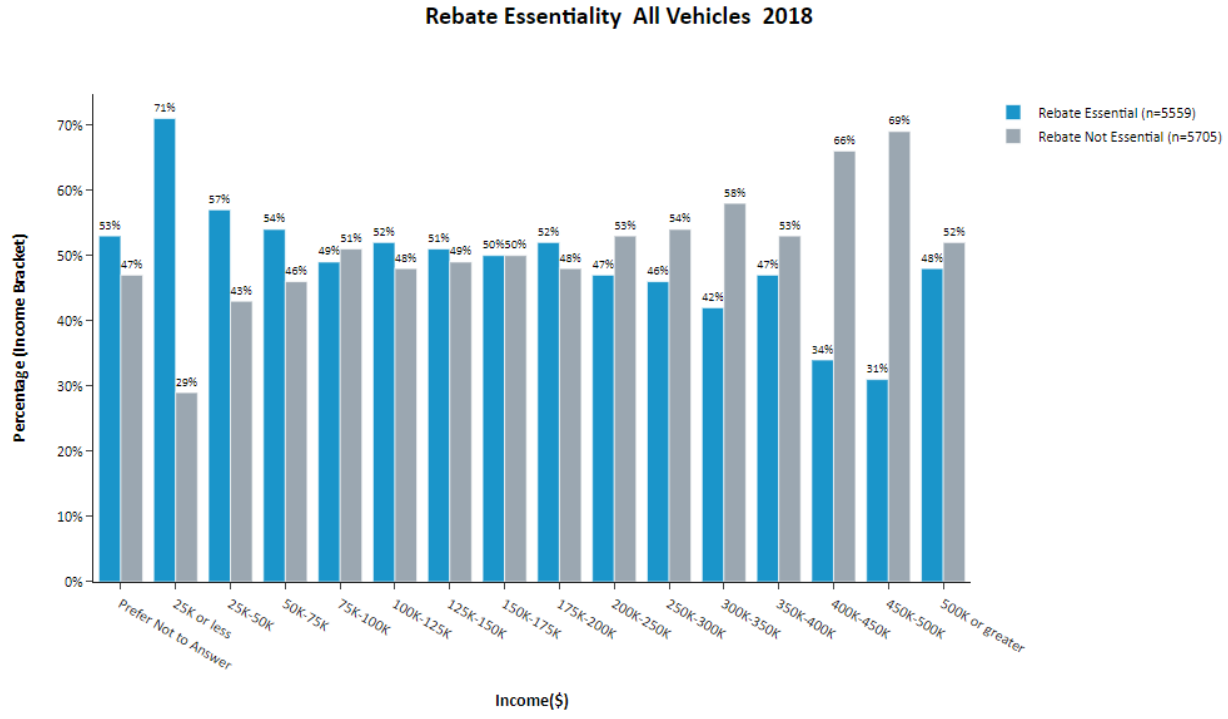


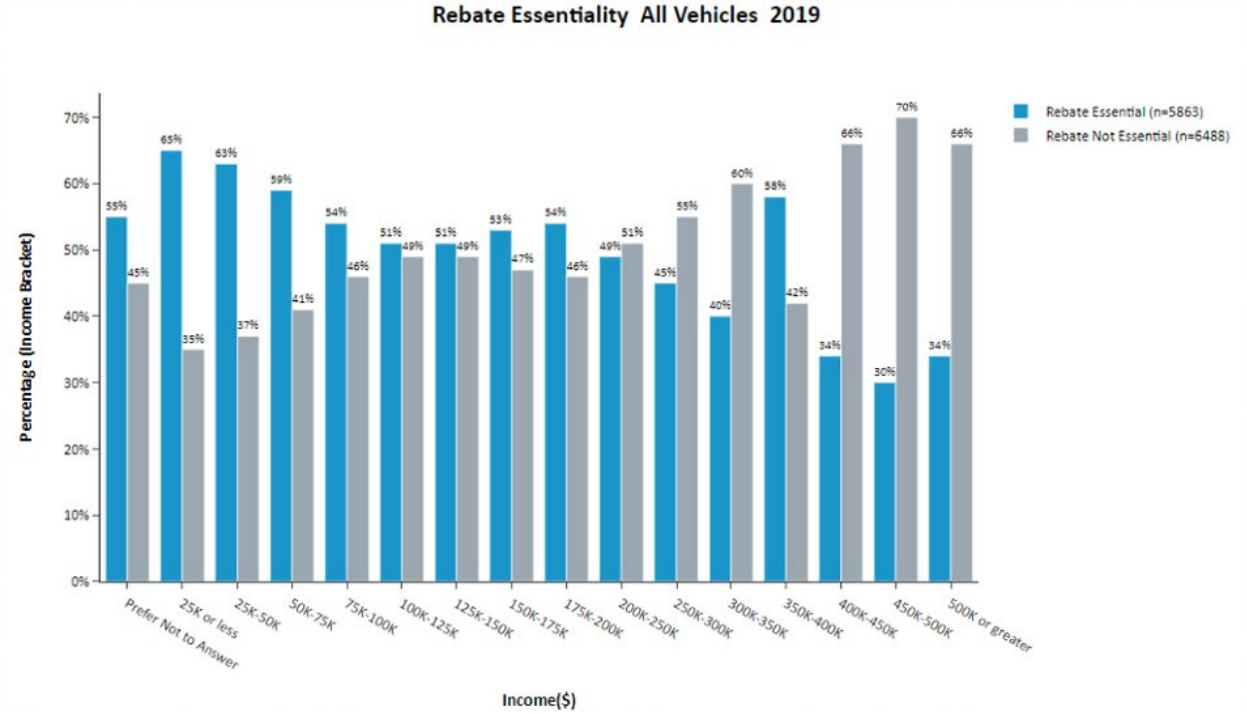
Residence Ownership Status 2020

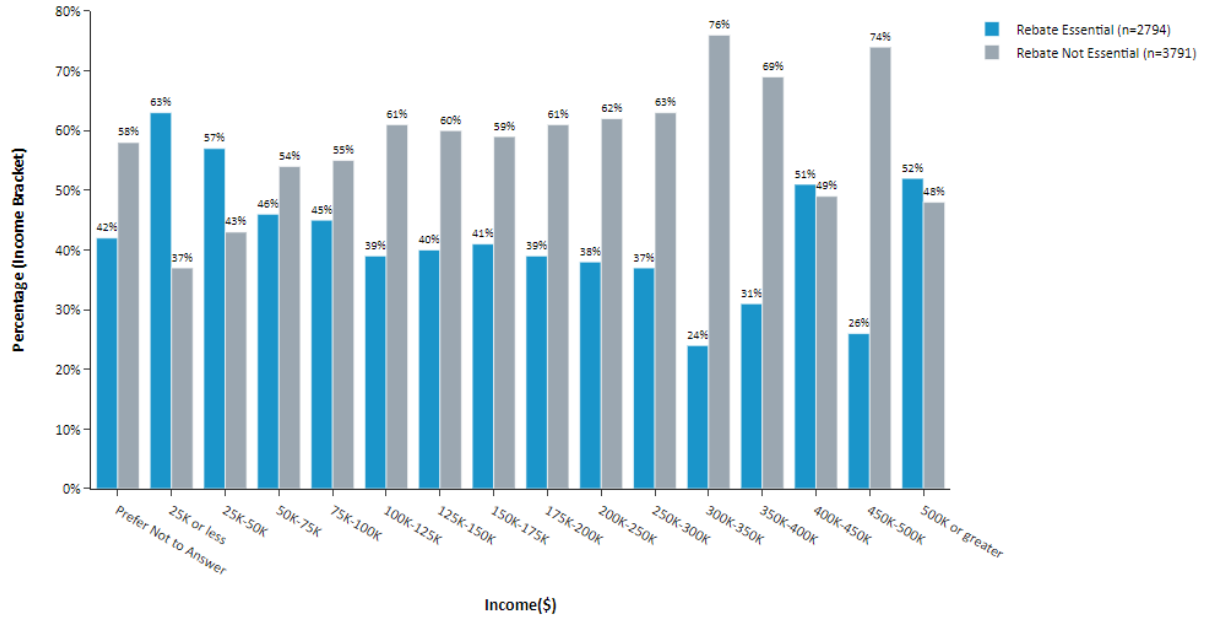


Appendix: Rebate Essentiality Among All Vehicle Models

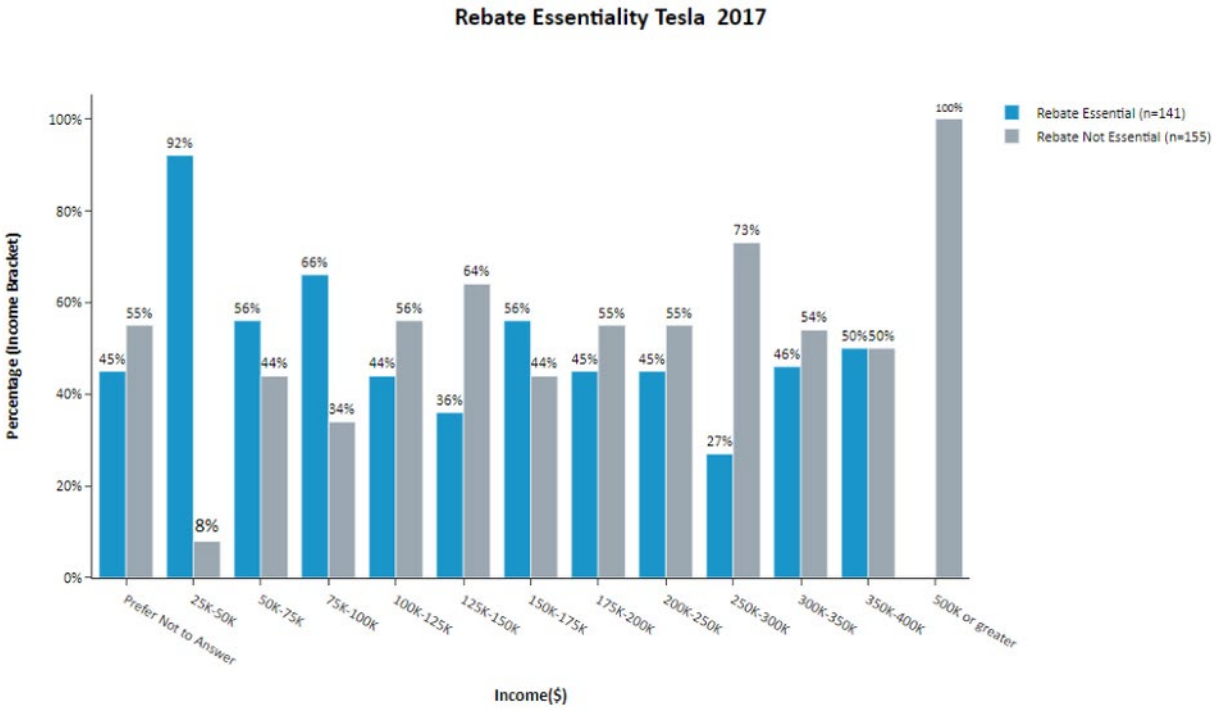


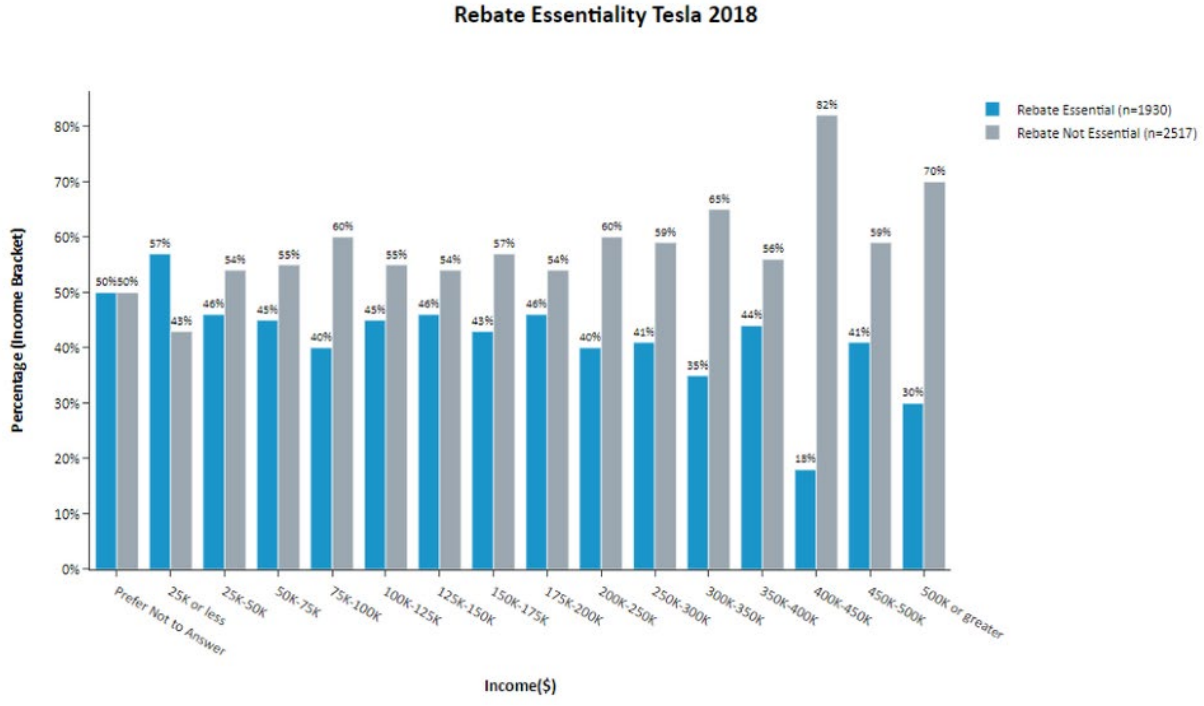


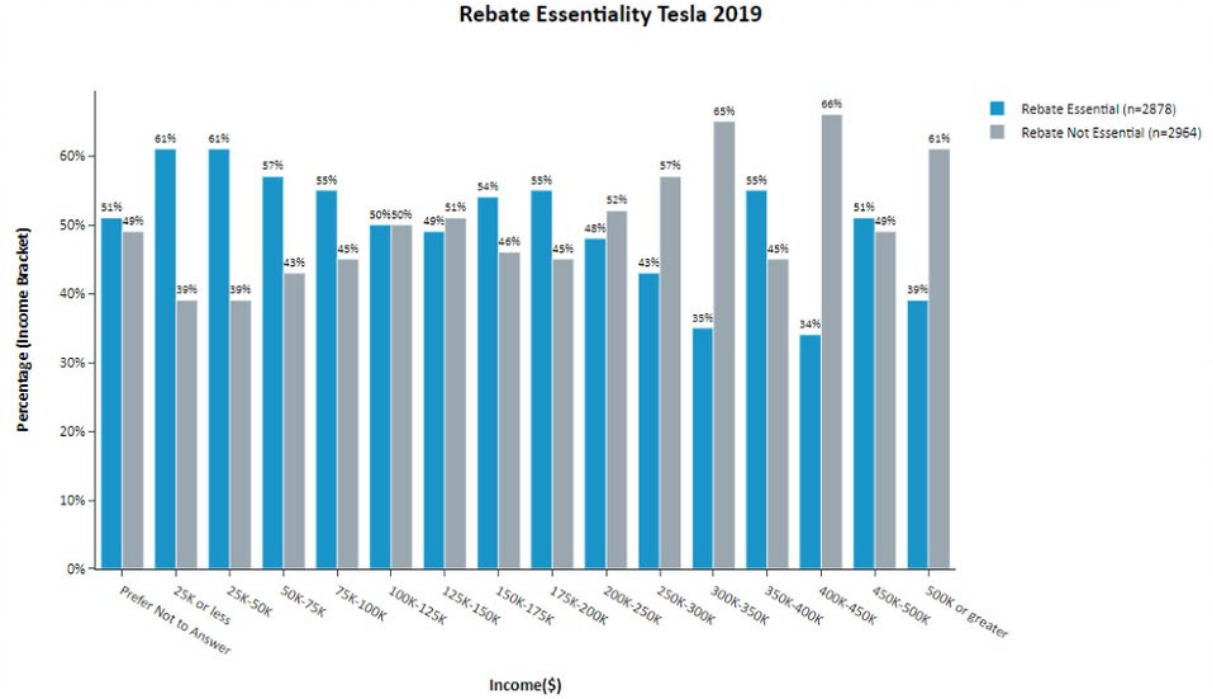

Rebate Essentiality All Vehicles 2019
Rebate Essential (n=5863)
Rebate Not Essential (n=6488)
Percentage (Income Bracket)
70%
60%
50%
40%
30%
20%
10%
0%
55% 45%
65% 35%
63% 37%
59% 41%
54% 46%
51% 49%
51% 49%
53% 47%
54% 46%
49% 51%
45% 55%
40% 60%
58% 42%
34% 66%
30% 70%
34% 66%
Prefer Not to Answer
25K or less
25K-50K
50K-75K
75K-100K
100K-125K
125K-150K
150K-175K
175K-200K
200K-250K
250K-300K
300K-350K
350K-400K
400K-450K
450K-500K
500K or greater
Income($)

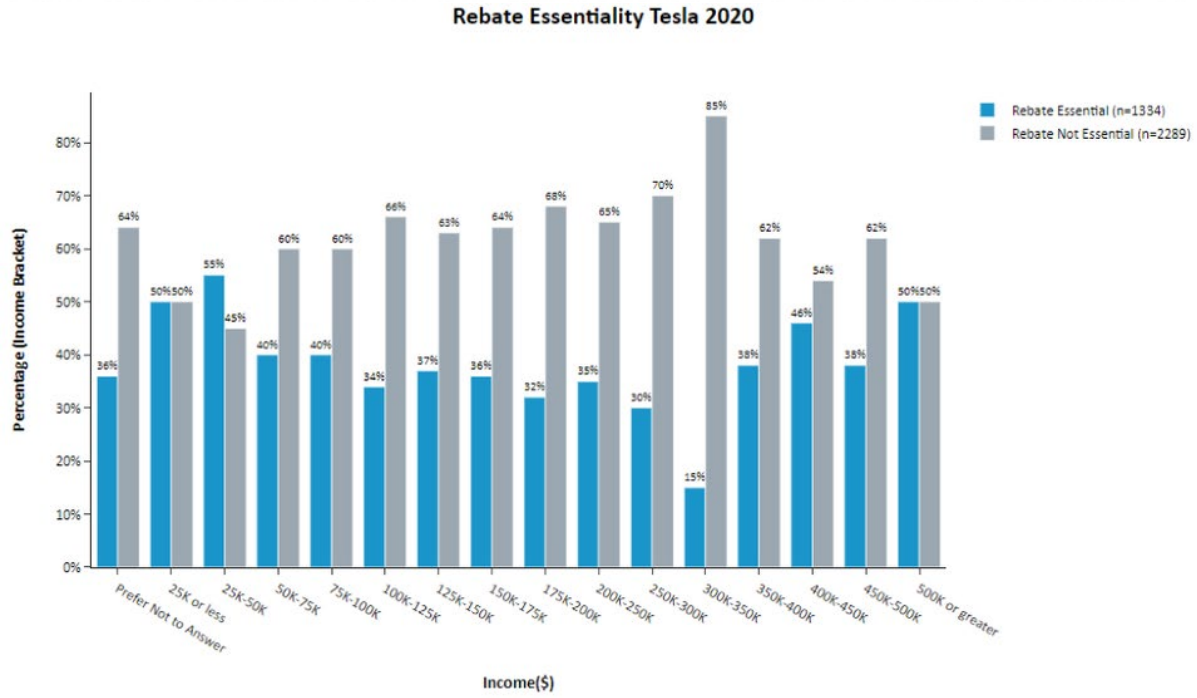

Rebate Essentiality All Vehicles 2020
Rebate Essential (n=2794)
Rebate Not Essential (n=3791)
Percentage (Income Bracket)
80%
70%
60%
50%
40%
30%
20%
10%
0%
42% 58%
63% 37%
57% 43%
46% 54%
45% 55%
39% 61%
40% 60%
41% 59%
39% 61%
38% 62%
37% 63%
24% 76%
31% 69%
51% 49%
26% 74%
52% 48%
Prefer Not to Answer
25K or less
25K-50K
50K-75K
75K-100K
100K-125K
125K-150K
150K-175K
175K-200K
200K-250K
250K-300K
300K-350K
350K-400K
400K-450K
450K-500K
500K or greater
Income($)

Appendix: Rebate Essentiality Among Tesla Models

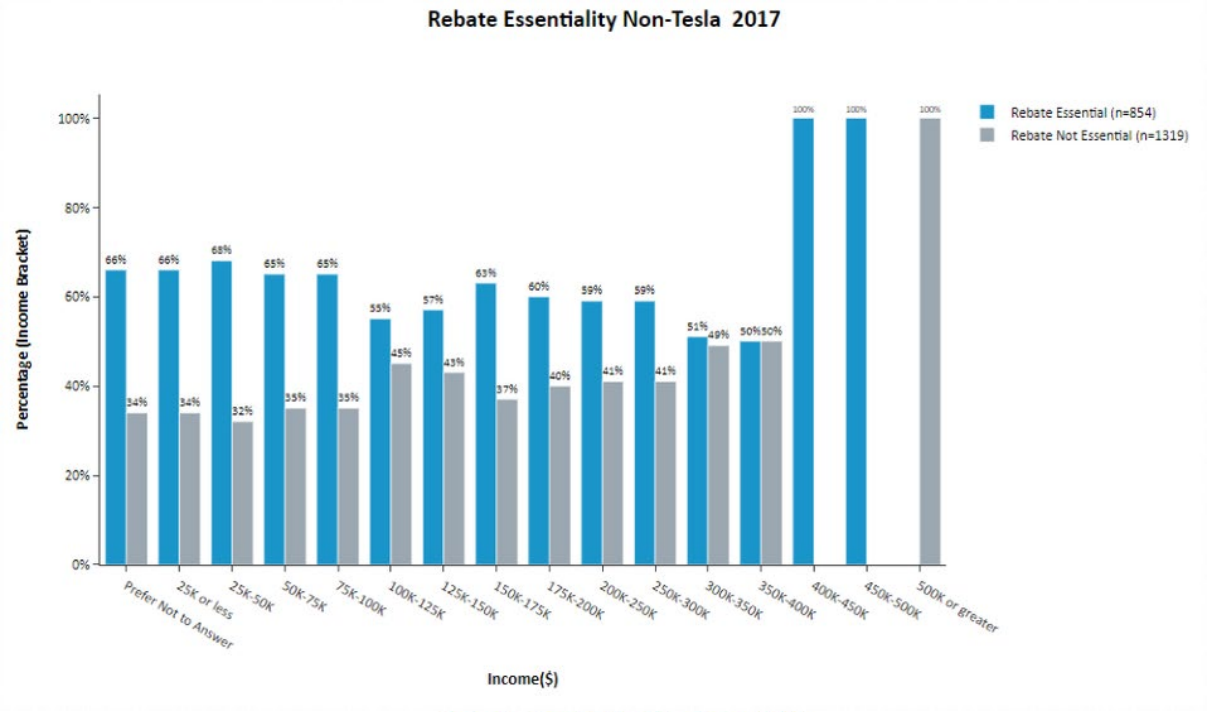


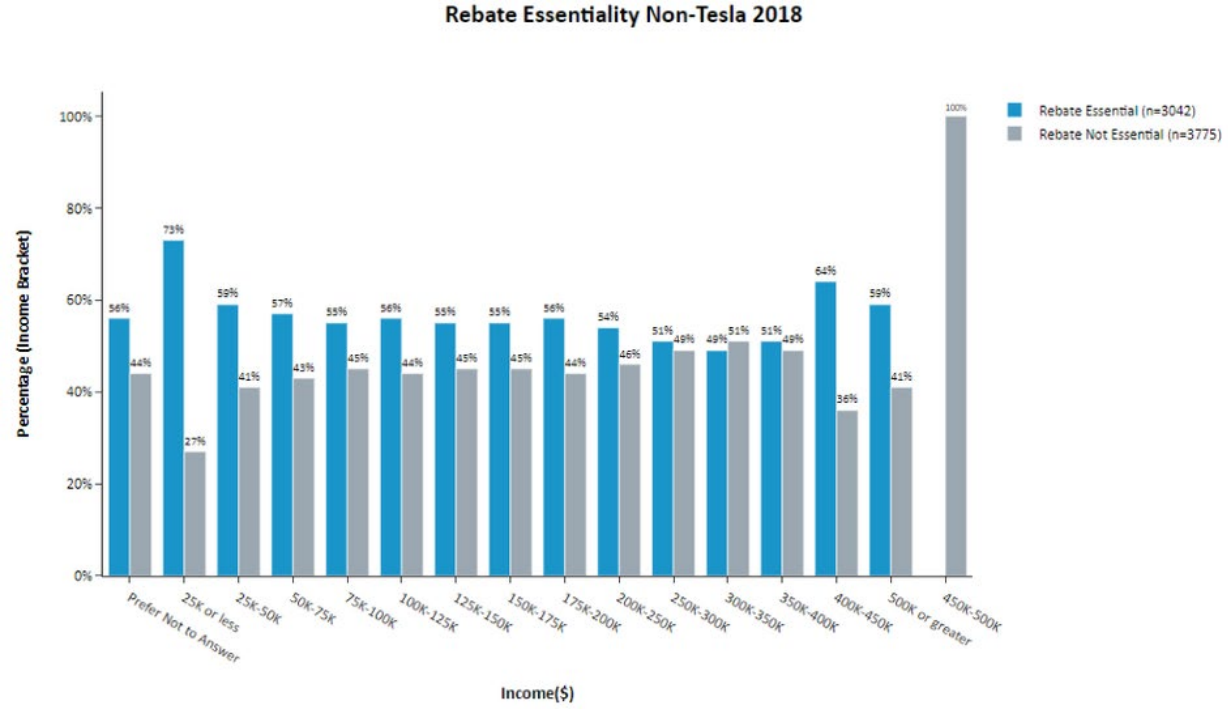



Rebate Essentiality Tesla 2019
Rebate Essential (n=2878)
Rebate Not Essential (n=2964)
Percentage (Income Bracket)
0%
10%
20%
30%
40%
50%
60%
51% 49%
61% 39%
61% 39%
57% 43%
55% 45%
50% 50%
49% 51%
54% 46%
55% 45%
48% 52%
43% 57%
35% 65%
55% 45%
34% 66%
51% 49%
39% 61%
Prefer Not to Answer
25K or less
25K-50K
50K-75K
75K-100K
100K-125K
125K-150K
150K-175K
175K-200K
200K-250K
250K-300K
300K-350K
350K-400K
400K-450K
450K-500K
500K or greater
Income($)

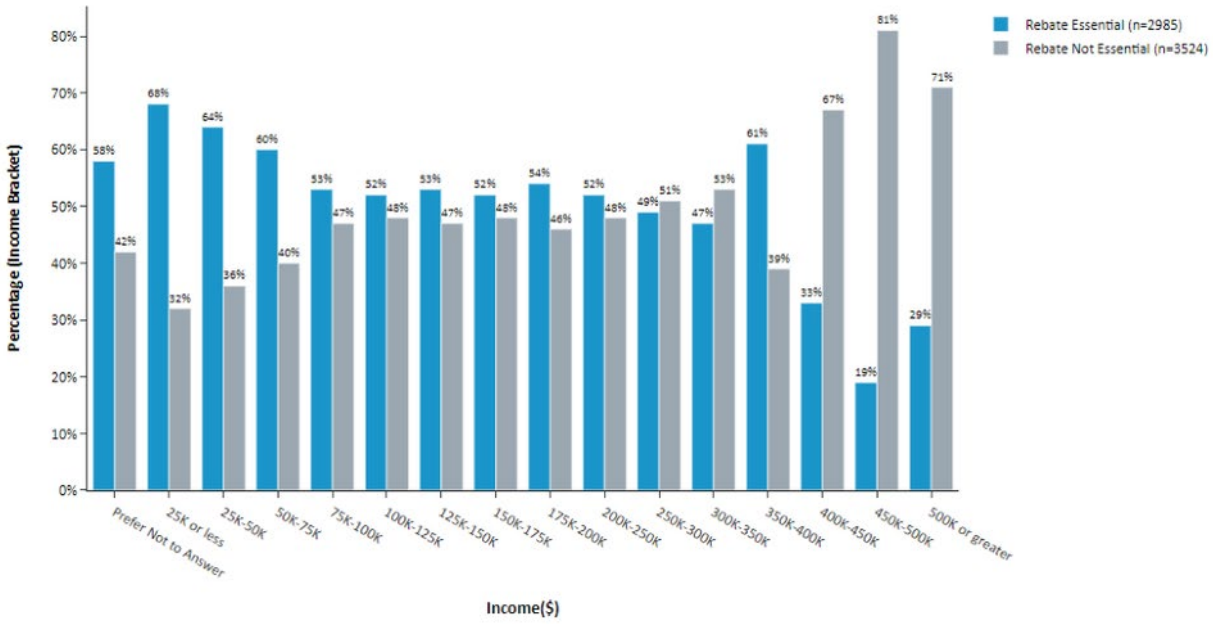

Rebate Essentiality Tesla 2020
Rebate Essential (n=1334)
Rebate Not Essential (n=2289)
Percentage (Income Bracket)
0%
10%
20%
30%
40%
50%
60%
70%
80%
36% 64%
50% 50%
55% 45%
40% 60%
40% 60%
34% 66%
37% 63%
36% 64%
32% 68%
35% 65%
30% 70%
15% 85%
38% 62%
46% 54%
38% 62%
50% 50%
Prefer Not to Answer
25K or less
25K-50K
50K-75K
75K-100K
100K-125K
125K-150K
150K-175K
175K-200K
200K-250K
250K-300K
300K-350K
350K-400K
400K-450K
450K-500K
500K or greater
Income($)

Appendix: Rebate Essentiality Among Non-Tesla Models

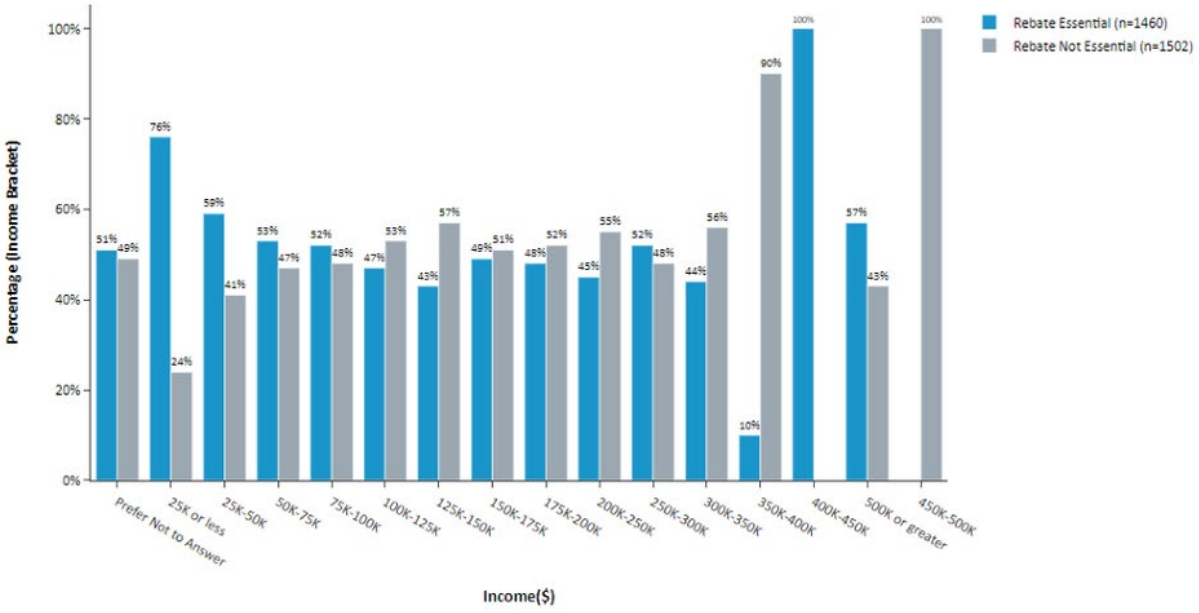




Rebate Essentiality Non-Tesla 2019



Rebate Essentiality Non-Tesla 2020



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