Resilience in the EV Market during COVID-19

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Glossary

BEV	Battery Electric Vehicle
EV	Electric Vehicle
CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
CCI	California Clean Investments
CVRP	Clean Vehicle Rebate Project
DAC	Disadvantaged Community
EC	Economic Conditions
EPA	Environmental Protection Agency
EVI	electric vehicle infrastructure
FCEV	Fuel Cell Electric Vehicles
FPL	Federal Poverty Level
ICEV	Internal Combustion Engine Vehicles
LIC	Low-Income Community
MSRP	Manufacturer Suggested Retail Price
PHEV	Partial Hybrid Electric Vehicles
SAFE	Safer, Affordable Fuel Efficiency
UDDS	Urban Dynamometer Driving Schedule
YOY	Year-over-year

1. Executive Summary

COVID-19 caused economic stress among the zero emission vehicle (ZEV) industry; however, while the Clean Vehicle Rebate Project (CVRP) applicants were reduced during the height of COVID-19 and sales slowed, as time went on, CVRP applications recovered, revealing resilience within CVRP and the industry. Several analyses were conducted throughout the pandemic period, defined as March 1, 2020 to June 15, 2021. Applicant and survey data of the CVRP were analyzed for behaviors among the general population, the low-to-moderate (LMI) population and priority populations. A survey of Californians was conducted to understand purchasing and travel preferences during the pandemic. A summary of each analysis is as follows.

- **Understanding the Resiliency and Trends of the EV Market During COVID-19**: This literature review explores consumer behaviors and sentiments throughout the pandemic. While Europe and China implemented EV policies that aided the industry during the pandemic, the US did not. Though the US industry suffered during the height of the pandemic, sales largely recovered in 2021.
- **CVRP Market Segmentation Before and During COVID-19**: This analysis identified CVRP behaviors before and during COVID-19 and found that among CVRP applicants, purchases as opposed to leases increased in popularity. During COVID-19, while the number of applicants fluctuated, the average price of the vehicle rebated remained between $44,000 and $45,000.
- **ZEV versus Non-ZEV Primary Driver Population Differences**: The analysis revealed that although COVID-19 reduced both ZEV and non-ZEV drivers' preference to acquire a vehicle, reduced long-distance travel and commute to work, it also showed that non-ZEV drivers are more likely to consider an EV since lockdown.
- **CVRP Lease Behavior During COVID-19:** Year-over-year comparisons show that CVRP participants increased their utilization of leases slightly since COVID-19, especially among the Increased Rebate population. LMI demographics that increased leasing were ages 16-20, 60-69 and 70-79 as well as Middle Eastern or North African and White or Caucasian individuals.
- **CVRP Priority Population Participation During COVID-19:** Applications among priority populations[1] initially decreased during the onset of COVID-19, but year-over-year comparisons showed that applications ultimately increased during the COVID-19 period. The negative economic impacts to the groups examined in this report may be offset by programmatic policies focused on increasing their participation.

[1] Priority populations are defined by California Climate Investments (CCI) as those that are economically disadvantaged, exposed to multiple sources of pollution or are especially vulnerable to the effects of pollution and a changing climate.

- **CVRP Composition Summary: Changes during COVID-19:** This analysis found a 43% decrease in total CVRP applications during COVID-19. However, most demographics saw little or no change in their share of applications, suggesting that while the total volume of applications decreased, there was no significant change in who was buying EVs.
- **CVRP LMI Composition Summary: Changes during COVID-19:** Similar findings of CVRP composition were found when focusing on LMI populations. We found that there was a 33% decrease in the total LMI CVRP applications during COVID-19, but decreases were not associated with any specific demographic.
- **COVID-19 Survey:** Survey participants reported that COVID-19 reduced their travel in general, commuting to work and air travel. Approximately 29% of participants also reported that COVID-19 affected their vehicle purchases. Of this group, about two thirds delayed their purchase. This contributed to the decrease in sales in 2020 as well as pent up demand and the early 2021 sales surge.

Common among these analyses are findings that show an initial impact to trends at the onset of COVID-19 followed by a recovery or increase in participation in around Q1 2021. CVRP participation demonstrated resilience during this time, likely due to policy consistency and consumer choice as well as consumer demand. For example, consumers maintained the need to use rebates in order to purchase or lease ZEVs and increased their interest in using personal vehicles above other forms of transportation. Interest in leasing also helped, indicating that consumer choice within policies is ideal for maintaining resilience. Lessons can be learned for future economic uncertainty: maintain consistency, offer choice, and make sure the needs of customers are being met.

2. Understanding the Resiliency and Trends of the EV Market During COVID-19

Charlie Good

2.1 Summary

This literature review examines trends in electric vehicle (EV) markets within the context of COVID-19. It focuses on California's EV markets and that of the United States, in addition to the global market. This report looks at the factors that allowed some nations' EV markets to recover faster than others. This review addresses consumer sentiment and behavior changes that resulted from the pandemic and affected EV sales. Reduced supply and higher prices are discussed as other impacts of the pandemic. This paper explores changes in the auto leasing, financing and insurance industry related to the US auto industry and the California CVRP. Data from the CVRP is used to understand changes in the makeup of EV purchasers within California. Lastly, this report details the rise of online car shopping and how it may affect auto dealers and automakers in the future.

This review relies on industry reports for insight. The information in these reports comes from expert opinion, consumer surveys and studies that utilized quantifiable data. Publication of academic research on this topic is sparse and thus rarely discussed in this review. Analysis of EV trends in California almost entirely came from reports prepared by the Center for Sustainable Energy.

This report focuses on events and trends within the timeframe of COVID-19. However, the timeline of the pandemic varied across nations. In general, this review focuses on the pandemic as it relates to the United States, which refers to the time between March 2020 and June 2021. This timeframe is similar to what was observed in Europe. With regards to China, the pandemic timeline began earlier, starting closer to January 2020.

2.2 Findings

Key findings of this review are characterized in the points listed below. Common among these points is that the pandemic has changed consumer behavior and sentiment to the benefit of EVs. Strong public policy is also recurrent as the means to foster a resilient EV market in the face of crisis.

- As the result of strong policy support, Europe's and China's EV markets performed well and continued to grow throughout the pandemic.
- The US passed no new EV policies and, as a result, saw declining EV sales during 2020 before the market recovered in 2021.

- The pandemic forced consumers to adjust their travel patterns away from public transit and toward personal vehicles.
- Despite higher prices, the end of the pandemic brought renewed interest in car and EV ownership.
- The value of auto loans and the share of loans to low-risk individuals increased throughout the pandemic.
- There were no significant changes in the makeup of people who applied to the CVRP in 2020.
- The pandemic provided consumers with more online car purchasing options than ever before, and many want to see these practices continue after the pandemic.

2.3 Global, National and Local EV Sales Trends

Global EV sales fared better than internal combustion engine vehicles (ICEVs) and have recovered significantly since the first wave of the pandemic. The global EV market is primarily composed of China, Europe and the United States, which accounted for 94% of all sales in 2020.[2] In the first half (H1) of 2020, global EV sales dropped 14% compared to sales in H1 2019. During the same period, all car sales saw a 28% decline.[3] Driven by policies in China and Europe, global EV sales began to recover after June 2020. By December 2020, EV sales were double what they had been in December 2019.[4] In 2020, global EV sales increased by 39% year-on-year, to 3.1 million units. At the same time, all car sales fell by 14%.[5] These trends were reflected in the growth of EV market share, which went from 2.5% in 2019 to 4.2% in 2020.[6] During H1 2021, global EV sales increased 168% from H1 2020. This massive growth is partially the result of a relatively low starting point in H1 2020. Through 2020 and H1 2021, Tesla continued to lead global sales, with Volkswagen and GM following at second and third, respectively. In H1 2021, the

[2] Gersdorf, T. Hensley, R., Hertzke, P. & Schaufuss, P. (2020, September 16*). Electric mobility after the crisis: Why an auto slowdown won't hurt EV demand.* McKinsey & Company. Retrieved November 9, 2021, from https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/electric-mobility-after-the-crisis-why-an-auto-slowdown-wont-hurt-ev-demand.

[3] Irle, R. (n.d.). *Global EV sales for 2021 H1.* EV Volumes. Retrieved November 9, 2021, from https://www.ev-volumes.com/.

[4] Carrington, D. (2021, January 19). *Global sales of electric cars accelerate fast in 2020 despite pandemic.* The Guardian. Retrieved November 9, 2021, from https://www.theguardian.com/environment/2021/jan/19/global-sales-of-electric-cars-accelerate-fast-in-2020-despite-covid-pandemic.

[5] Jones, C. (2021, February 8). *Canalys: Global Electric Vehicle Sales up 39% in 2020 as overall car market collapses*. Business Wire. Retrieved November 9, 2021, from https://www.businesswire.com/news/home/20210208005423/en/Canalys-Global-Electric-Vehicle-Sales-up-39-in-2020-as-Overall-Car-Market-Collapses.

[6] Carrington, D. (2021, January 19). *Global sales of electric cars accelerate fast in 2020 despite pandemic*. The Guardian. Retrieved November 9, 2021, from https://www.theguardian.com/environment/2021/jan/19/global-sales-of-electric-cars-accelerate-fast-in-2020-despite-covid-pandemic.

Tesla Model 3 garnered the most sales of any EV model and the Tesla Model Y came in third.[7] As a result of policy in China and Europe, there were small gains in 2020 for global electric bus and heavy-duty truck registrations.[8] China continued to dominate the electric bus market, accounting for 98% of electric bus stock.[9]

The United States EV market is small relative to China and Europe and did not experience the recovery seen as the global market. China had EV registrations of about 4.5 million vehicles at the end of 2020 and Europe's had reached 3.2 million. Meanwhile, the US had about 1.4 million registered EVs at that time. The difference in market size is starker when looking at new EV registrations in 2020. China registered 1.3 million EVs, Europe registered 1.4 million and the US recorded 295,000 new registrations. While EV sales in China and Europe continued to grow during the pandemic, US EV sales fell in 2020.[10] The US EV market dropped 10% in year-on-year sales, from 327,000 sales in 2019 to 295,000 in 2020. However, the entire US car market fell 23% during this same time. In effect, EV market share went up 2% in the United States.[11] EV sales in the US increased nearly 200% from Q2 2020 to Q2 2021. EV market share hit its highest point during the pandemic in Q2 2021, at 3.6% of all car sales. While this growth is encouraging, US EV market share projections for 2022 remain lower than pre-crisis expectations.[12] Within the US, electric heavy-duty truck and bus sales almost exclusively occurred in California. These sales account for 820 new vehicle registrations in 2020, less than in 2019. Electric heavy-duty trucks represent less than 1% of trucks in the US.[13] In November of 2021, Oregon and Washington adopted California's Advanced Clean Trucks policy. This regulation requires that by 2035 zero emissions vehicles account for 40-75% of new medium and heavy-duty vehicles sales. The exact percentage of sales

[7] Irle, R. (n.d.). *Global EV sales for 2021 H1*. EV Volumes. Retrieved November 9, 2021, from https://www.ev-volumes.com/.
[8] *Global EV outlook 2021*. (n.d.). International Energy Agency. Retrieved November 9, 2021, from https://iea.blob.core.windows.net/assets/ed5f4484-f556-4110-8c5c-4ede8bcba637/GlobalEVOutlook2021.pdf.
[9] McBain, S., Birba, E., Teter, J., & Tattini, J. (2021, November 1). *Electric Vehicles – Analysis.* IEA. Retrieved November 30, 2021, from https://www.iea.org/reports/electric-vehicles.
[10] *Global EV outlook 2021.* (n.d.). International Energy Agency. Retrieved November 9, 2021, from https://iea.blob.core.windows.net/assets/ed5f4484-f556-4110-8c5c-4ede8bcba637/GlobalEVOutlook2021.pdf.
[11] Iea. (n.d.). *Trends and developments in Electric Vehicle Markets – Global EV outlook 2021 – analysis*. IEA. Retrieved November 9, 2021, from https://www.iea.org/reports/global-ev-outlook-2021/trends-and-developments-in-electric-vehicle-markets.
[12] Gersdorf, T., Hensley, R., Hertzke, P., & Schaufuss, P. (2020, September 16). *Electric mobility after the crisis: Why an auto slowdown won't hurt EV demand*. McKinsey & Company. Retrieved November 9, 2021, from https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/electric-mobility-after-the-crisis-why-an-auto-slowdown-wont-hurt-ev-demand.
[13] *Global EV outlook 2021*. (n.d.). International Energy Agency. Retrieved November 9, 2021, from https://iea.blob.core.windows.net/assets/ed5f4484-f556-4110-8c5c-4ede8bcba637/GlobalEVOutlook2021.pdf.

required by this policy varies depending on the class of truck. With this regulation in place, it is likely that electric heavy-duty truck adoption will increase in these states.[14]

California makes up the bulk of the US EV market and experienced similar trends to those of the national market. In 2020, 42% of all US EV registrations occurred in California, which was seven times higher than the second highest state, Florida.[15] CVRP applications provide a good proxy for California's entire EV market, and trends in CVRP applications are likely similar to trends in sales. From 2019 to 2020, there was a 43% decrease in applicants, from 57,941 to 33,119. Applications continued to decrease through March, April and May of 2020.[16] The California Energy Commission estimated that EV sales dropped 45% year-on-year during Q2 2020. This decline aligns with the timing of state and federal stay-at-home orders. Shortly after these orders had been issued, 34% of California dealerships reported a sales decline of 80-100% for all car types.[17] By June, CVRP applications began to increase but remained below 2019 levels until December, when they reached 2019 levels. June of 2020 was also when Tesla Model Y sales began, which resulted in a 13% increase in Tesla's share of CVRP applications from 2019 to 2020. Tesla was the only vehicle producer to see an increase in the percentage share of applications. Fuel Cell Electric Vehicles (FCEVs), Partial Hybrid Electric Vehicles (PHEVs) and non-Tesla battery electric vehicles (BEVs) all experienced a drop in their percentage share of applications. PHEVs took the most significant hit, losing 9% of their share of applications.[18]

2.4 Public Policy as the Driver of EV Market Resilience

Public policy was the key factor in determining EV market resilience during the pandemic. Despite low EV sales at the start of the pandemic, China and Europe still managed to see year-on-year growth in 2020. EV sales in China grew by 8% and Europe's stock of BEV's more than doubled in 2020. [19,20]

[14] Portillo, P., & Mui, S. (2021, November 30). *WA or Solidify West Coast Vehicle Electrification.* NRDC. Retrieved December 7, 2021, from https://www.nrdc.org/experts/patricio-portillo/wa-or-solidify-west-coast-vehicle-electrification.

[15] Fischer, M., Kramer, N., Maurer, I., & Mickelson, R. (2021, September 28). *A turning point for US Auto Dealers: The unstoppable electric car*. McKinsey & Company. Retrieved November 9, 2021, from https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/a-turning-point-for-us-auto-dealers-the-unstoppable-electric-car.

[16] See Section CVRP Composition Summary: Changes during COVID-19.

[17] Lampinen, M. (2020, September 24). *Federal policy and pandemic shape us electric vehicle outlook*. Automotive World. Retrieved November 9, 2021, from https://www.automotiveworld.com/articles/federal-policy-and-pandemic-shape-us-electric-vehicle-outlook/.

[18] See Section CVRP Composition Summary: Changes during COVID-19.

[19] McBain, S., Birba, E., Teter, J., & Tattini, J. (2021, November 1). *Electric Vehicles – Analysis.* IEA. Retrieved November 30, 2021, from https://www.iea.org/reports/electric-vehicles.

[20] Berkshire Hathaway. (2021, February 22). *Electric vehicle outlook: 2021 and beyond.* Business Wire. Retrieved November 30, 2021, from https://www.businesswire.com/news/home/20210222005461/en/Canalys-China%E2%80%99s-electric-vehicle-sales-to-grow-by-more-than-50-in-2021-after-modest-2020.

However, the US saw year-on-year EV sales decrease, falling from 327,000 in 2019 to 295,000 in 2020. The level of policy support for EVs is one of the primary differences between these markets.[21] In response to COVID-19, China renewed purchase subsidies that it had previously planned to cancel. Additionally, China put forward a policy to expand EV incentives in rural areas.[22] In Europe, new emissions standards went into effect in 2020, forcing automakers to expand the number of EV models they offered. As a result, the number of different EV models in Europe jumped from 27 in 2019 to 38 in 2020. Nations such as France, Germany and Italy also increased EV purchase incentives.[23] These incentives allowed the EV market to continue growing throughout the pandemic and Germany to pass California in EV sales.[24]

The US did not use policy to bolster the EV market during the pandemic. Since 2010, the US federal government has been offering a $2,500-$7,500 tax credit to individuals who buy a new EV. Once a manufacturer has sold 200,000 qualified EVs, the tax credit can no longer be applied to their vehicles. By 2018, Tesla and GM had reached their sales limits and their EVs were not eligible for the Federal tax credit. These credits were not renewed during the pandemic. In 2020, the Environmental Protection Agency (EPA) revised the Corporate Average Fuel Economy (CAFE) standard and rebranded it as the Safer, Affordable Fuel Efficiency (SAFE) standard. The new standard had significantly lower efficiency targets for model years 2021-2026 and removed incentives for automakers to expand their EV offerings.[25] At the state level, the SAFE policy nullified the 2013 Clean Air Act (CAA) waiver that had allowed California to enforce its own emissions standards for passenger cars and its zero-emission vehicles sales mandate. It also barred other states from adopting California's emissions standards. The SAFE standard effectively prevented states from enacting any new emissions standards or EV sales mandates during the pandemic, as doing so would have required a new waiver from the EPA. Under the Biden administration, the EPA is considering restoring California's CAA waiver, but this has not yet been

[21] Gorner, M., & Paoli, L. (2021, January 28). *How global electric car sales defied COVID-19 in 2020 – analysis*. IEA. Retrieved November 9, 2021, from https://www.iea.org/commentaries/how-global-electric-car-sales-defied-covid-19-in-2020.
[22] Wen, W., et al. Impacts of COVID-19 on the electric vehicle industry: Evidence from China. *Renewable and Sustainable Energy Reviews* (2021): 111024.
[23] Gorner, M., & Paoli, L. (2021, January 28). *How global electric car sales defied COVID-19 in 2020 – analysis.* IEA. Retrieved November 9, 2021, from https://www.iea.org/commentaries/how-global-electric-car-sales-defied-covid-19-in-2020.
[24] Wilkes, W. (2020, December 3). *Germany's Electric-Car Market Is Poised to Overtake California's*. Bloomberg.com. Retrieved November 16, 2021, from https://www.bloomberg.com/news/articles/2020-12-03/germany-s-electric-car-market-is-poised-to-overtake-california-s.
[25] IEA. (n.d.). *Policies to promote electric vehicle deployment – Global EV outlook 2021 – analysis*. IEA. Retrieved November 9, 2021, from https://www.iea.org/reports/global-ev-outlook-2021/policies-to-promote-electric-vehicle-deployment.

achieved.[26] No new policy was implemented surrounding electric vehicle infrastructure (EVI) in the US. EVI development experienced some delays as the result of the pandemic but was overall relatively unaffected.[27]

While the US's lack of EV policy response harmed EV sales, US gasoline tax policy helped make ICEVs more attractive. Oil prices declined significantly during the pandemic, even falling to negative prices during March 2020. However, the effects of this decline were more pronounced in the US than in other countries due to differences in tax policy. For example, a change in price from $60-$30 per barrel would result in 35% cheaper gas in the US. That same change would only translate to 15% cheaper gas in Europe.[28] As oil prices fell during the pandemic, these tax policies continued to help make ICEVs look more attractive than EVs on the basis of cost.

Despite a lack of supportive policy, the US EV market still fared better than the US car market. This is attributable to trends that have been ongoing since before the pandemic, such as declining battery costs, a wider selection of models, continued improvements in technology, expanding infrastructure and continued enthusiasm on the part of purchasers.[29]

2.5 Changes in Consumer Sentiments

During the pandemic, consumer sentiment has shifted to reveal an increased concern for the environment and contradictory feelings surrounding the advantages and disadvantages of EV adoption. In a 2021 Ernst and Young (EY) study, environmental concern emerged as the number one influence on people's interest in EVs, coming out 10% ahead of all other issues. Participants said that the pandemic heightened their level of environmental awareness. The study also showed significant overlap between the aspects of EVs that consumers cited as motivators for adoption and those that were noted as reasons against adoption. Cost, range and charging infrastructure were frequently cited as reasons for and against purchasing an EV among worldwide survey participants. When only looking at the US, the EY

[26] Environmental Protection Agency. (2021, April 26). *EPA Reconsiders Previous Administration's Withdrawal of California's Waiver to Enforce Greenhouse Gas Standards for Cars and Light Trucks.* EPA. Retrieved December 7, 2021, from https://www.epa.gov/newsreleases/epa-reconsiders-previous-administrations-withdrawal-californias-waiver-enforce.
[27] Lampinen, M. (2020, September 24). *Federal policy and pandemic shape us electric vehicle outlook. Automotive World.* Retrieved November 9, 2021, from https://www.automotiveworld.com/articles/federal-policy-and-pandemic-shape-us-electric-vehicle-outlook/.
[28] Gersdorf, T., Hensley, R., Hertzke, P., & Schaufuss, P. (2020, September 16). *Electric mobility after the crisis: Why an auto slowdown won't hurt EV demand*. McKinsey & Company. Retrieved November 9, 2021, from https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/electric-mobility-after-the-crisis-why-an-auto-slowdown-wont-hurt-ev-demand.
[29] Iea. (n.d.). *Policies to promote electric vehicle deployment – Global EV outlook 2021 – analysis*. IEA. Retrieved November 9, 2021, from https://www.iea.org/reports/global-ev-outlook-2021/policies-to-promote-electric-vehicle-deployment.

study showed a similar overlap in the reasons cited for and against EV adoption. Environmental concern, low maintenance costs, performance, and charging infrastructure were commonly cited as EV purchase motivators. Meanwhile, Americans were concerned about upfront costs, charging infrastructure, range, operating costs and performance. These seemingly contradictory findings may suggest that some consumers are just further along in embracing the advantages of EVs and that there may be a knowledge gap between some consumers.[30]

2.6 The Pandemic's Effect on Travel Patterns

Consumer travel patterns have changed to be more favorable towards personal vehicles. During the first waves of the pandemic, travel of all modes dropped significantly with EVs being more affected than ICEVs.[31, 32] A study in Utah found that EV travel was more sensitive to COVID-19 surges than that of ICEVs. EV drivers were more likely to listen to stay-at-home orders and decrease mobility in response to rising cases. As well, they were slower to resume driving as cases decreased. The study speculated that these findings may have resulted from EV drivers being more likely to work remotely.[33] Due to safety concerns, people shifted away from public transportation during the pandemic. Public transit ridership dropped 80% in the US during April of 2020. It remained more than 60% below 2019 levels for the rest of the year. It has slowly been recovering since the first wave but remained below 2019 levels through January 2021.[34] This decrease in public transit ridership was directly connected with an increase in private vehicle usage. A 2021 CarGurus survey found that 40% of participants expect to use their car more going forward, up from 33% in 2020.35 In an EY study conducted in 2021, people overwhelmingly stated their intention to drive more and utilize public transportation less. Travel volume has largely recovered since the early stages of the pandemic. Globally and in the US, non-work-related travel was nearly back to pre-pandemic levels by July 2021. At the same time, work-related travel in the US was still

[30] Goel, A., Miller, R. J., Cardell, M., & Batra, G. (2021, July 20). *How the pandemic could grow electric vehicle purchases.* EY. Retrieved November 9, 2021, from https://www.ey.com/en_gl/automotive-transportation/how-did-a-global-crisis-pave-the-way-for-ev-sales.
[31] Gersdorf, T., Hensley, R., Hertzke, P., & Schaufuss, P. (2020, September 16). *Electric mobility after the crisis: Why an auto slowdown won't hurt EV demand.* McKinsey & Company. Retrieved November 9, 2021, from https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/electric-mobility-after-the-crisis-why-an-auto-slowdown-wont-hurt-ev-demand.
[32] Palomino, A., Parvania, M., & Zane, R. (2021*).* Impact of COVID-19 on Mobility and Electric Vehicle Charging Load. *2021 IEEE Power & Energy Society General Meeting (PESGM),* 2021, pp. 01-05.
[33] Ibid.
[34] *The Impact of the COVID-19 Pandemic on Public Transit Funding Needs in the US.* (2021, January 27). EBP.
[35] *COVID-19 Sentiment Study.* (n.d.) Car Gurus. Retrieved March 21, 2022. from https://go.cargurus.com/rs/611-AVR-738/images/US-Covid19-Study.pdf.

20% less than it was in 2019.[36] As travel returns to normal levels, we will likely see more consumers than before opting to utilize personal vehicles.

2.7 The Effects of Increased EV Demand and Reduced Supply

EVs are poised to benefit from an increased interest in personal vehicle ownership. A 2021 survey of US car buyers found that 69% were confident that they could afford a new vehicle, up from 52% in June of 2020. Surveyed consumers cited major changes such as buying a new house, getting a new job and working from home as significant factors in their decision to buy a new car.[37] An EY survey conducted in July 2021, found that 50% of respondents intended to buy a car in the near future. This is up 17% from the first wave of the pandemic. They also found a 7% increase in intent to purchase a car among those who do not currently own one—much of this new interest in directed at EVs. In the same study, 42% of respondents said they would prefer to buy an EV or FCEV as their next vehicle, which is 12% higher than during the first wave of the pandemic. They found that two-thirds of surveyed global car buyers would pay a premium of up to 10% for an EV. Among people already intending to purchase an EV, 90% said they would pay a 10% premium for an EV.[38]

Enhanced interest in new cars occurred despite supply chain disruptions and rising prices. China is one of the world's top manufacturing centers for automobile parts. While ICEV production was quick to recover after the pandemic, EV battery production experienced significant setbacks. This was partially due to ongoing supply shortages of raw materials like cobalt and nickel, as well as an initial reduction in battery demand. Lockdowns in countries that export raw materials, like Australia and Chile, continued to hamstring the Chinese battery industry. For the first half of 2020, most Chinese battery manufacturers were producing at only 50% capacity.[39] In Europe COVID-19 related automaker shutdowns lasted 30 days on average and generated total car production losses of 2.4 million vehicles.[40] These production delays, the ongoing microchip shortage and increased consumer demand, have all driven up the price of

[36] Goel, A., Miller, R. J., Cardell, M., & Batra, G. (2021, July 20*). How the pandemic could grow electric vehicle purchases.* EY. Retrieved November 9, 2021, from https://www.ey.com/en_gl/automotive-transportation/how-did-a-global-crisis-pave-the-way-for-ev-sales.
[37] *COVID-19 Sentiment Study.* (n.d.) Car Gurus. Retrieved March 21, 2022, from https://go.cargurus.com/rs/611-AVR-738/images/US-Covid19-Study.pdf.
[38] Goel, A., Miller, R. J., Cardell, M., & Batra, G. (2021, July 20*). How the pandemic could grow electric vehicle purchases.* EY. Retrieved November 9, 2021, from https://www.ey.com/en_gl/automotive-transportation/how-did-a-global-crisis-pave-the-way-for-ev-sales
[39] Wen, W., et al. Impacts of COVID-19 on the electric vehicle industry: Evidence from China. *Renewable and Sustainable Energy Reviews* (2021): 111024.
[40] Cornago, E., Gaffney , K., & Oppermann, M. (2020, November 23). *Promoting vehicle efficiency and electrification through stimulus packages – analysis.* IEA. Retrieved November 9, 2021, from https://www.iea.org/articles/promoting-vehicle-efficiency-and-electrification-through-stimulus-packages.

EVs. [41] Since January 2021, the Tesla Model Y Long Range has seen a Manufacturer Suggested Retail Price (MSRP) increase of $9,000 and the MSRP of the Tesla Model 3 Rear-Wheel Drive has increased by $8,000, which is a 21% increase over its price at the beginning of the year.[42] The used EV market is also experiencing the effects of rising demand and short supply. Between March and May of 2021, the average price of a used EV jumped $1,500. Used-vehicle retail prices rose 10% from January to April 2021, according to J.D. Power. Used EV prices are lower than average in California, perhaps due to the state having a substantially higher number of registered EVs than any other state. Looking at the entire used car market, dealers had an average of a 29-day inventory in May of 2021, which is down from normal level of 44 days.[43]

2.8 Changes in EV Financing and Leasing

While many of the trends in automotive financing have returned to pre-pandemic levels, there was an increase in the proportion of low-risk loans and a rise in loan value. An Experian report found that creditor makeup has largely remained unchanged by the pandemic. As well, banks and captive finance remain the primary auto lenders. The pandemic did allow captive finance to increase its share of auto loans in 2020. However, by 2021, these changes had largely reverted to pre-pandemic levels. The report also showed that the distribution of risk for loans and leases did not change appreciably from 2019 to 2020. However, in 2021 Prime and Super-Prime financing increased across all transaction types, while Subprime financing remained at near-record lows. This can also be seen in the drop in 60-day delinquency in 2020, which continued to fall in 2021. Average lease and loan payments have increased throughout the pandemic, reaching near-record highs in 2021.[44]

Automakers and auto insurance companies have largely rolled back the pandemic-related incentives that were offered during 2020. To combat declining sales in 2020, automakers offered deals such as low or 0% interest rates, loan lengths of up to 7 years and 90-day payment deferral.[45] Because consumers

[41] Jin, H., Balu, N., & Mathews, E. (2021, July 28). *Analysis: Tesla Hikes Electric Car Prices in U.S.; holds line in China.* Reuters. Retrieved November 9, 2021, from https://www.reuters.com/business/autos-transportation/tesla-hikes-electric-car-prices-us-holds-line-china-2021-07-28/.

[42] Lambert, F. (2021, November 4). *Tesla increases model 3 and model Y prices across the board again, adds New Standard Paint.* Electrek. Retrieved December 7, 2021, from https://electrek.co/2021/11/04/tesla-increases-model-3-y-prices-again-new-standard-paint/.

[43] Halvorson, B. (2021, May 5). *Used EV prices surge in the US and vary widely by model, region.* Green Car Reports. Retrieved November 9, 2021, from https://www.greencarreports.com/news/1132152_used-ev-prices-surge-in-the-us-and-vary-widely-by-model-region.

[44] Zabritski, M. (n.d.) *Auto Finance Insights.* Experian. Retrieved March 21, 2022, from https://www.autofinancenews.net/wp-content/uploads/2021/09/2021-Q2-Industry-Pulse-Experian.pdf .

[45] Vincent, J., & Williams, S. (2020, July 16). *Coronavirus 0% car deals, payment deferrals and incentives.* US News. Retrieved November 30, 2021, from https://cars.usnews.com/cars-trucks/coronavirus-car-deals-payment-deferrals-and-incentives.

drove less in response to stay-at-home orders, insurance companies offered new incentives to retain customers. They extended grace periods for missed payments, offered refunds on premiums and offered increased protection for those providing services such as grocery and goods delivery.[46] By Q2 2021, auto demand had outstripped supply, and many of the automaker incentives had been rolled back. Cars were selling at or above MSRP by this time.[47] Many insurance companies also rolled back pandemic-related incentives. Premium refunds were not generally available for 2021.[48] Regulations mandating extended grace periods for missed auto insurance payments were not renewed by most states. As a result, these incentives were largely cancelled.[49, 50] With travel returning to pre-pandemic levels and car demand higher than ever, automakers and auto insurers no longer need to offer expanded incentives.

The percentage of CVRP applications applied to leased vehicles has decreased since the beginning of the pandemic. Looking at the program's entire history, 46% of CVRP rebates have been applied to leased vehicles, which is notably higher than the overall industry average. Despite growth through 2019, the percentage share of CVRP applications used for leasing experienced a significant decrease through 2020. This is related to the rise in applications for Teslas as they are overwhelmingly purchased rather than leased. Between 2019 and 2020, the percentage of CVRP applications for the lease or purchase of a Tesla rose 10% to nearly half of all applications. However, the percentage of Teslas that were leased remained low at about 8% before the pandemic and 11% during. The automaker with the next highest share of applications, around 20%, was Toyota. They were leased at a rate of about 23% before and during the pandemic.[51] The downward trend in percentage leasing was apparent for both LMI applicants and standard applicants. LMI applicants have historically leased at a greater percentage than standard applicants. While that remained true throughout 2020, the difference in leasing percentages between

[46] Vincent, J. (2020, December 4). *The coronavirus and car insurance*. U.S. News & World Report. Retrieved November 30, 2021, from https://www.usnews.com/insurance/auto/coronavirus-and-car-insurance.
[47] Ulitskaya, J. (2021, July 17). *Car shopping: How long will the inventory shortage last?: News*. Cars.com. Retrieved November 30, 2021, from https://www.cars.com/articles/car-shopping-how-long-will-the-inventory-shortage-last-437134/.
[48] Team Marble. (2021, January 22). *COVID-19 auto insurance refunds: What's happening?* Marble. Retrieved November 30, 2021, from https://www.marblepay.com/blog/covid-auto-insurance-refunds.
[49] *Covid-19-related insurance regulatory developments*. (2020, May 12). Eversheds Sutherland. Retrieved November 30, 2021, from https://us.eversheds-sutherland.com/NewsCommentary/Legal-Alerts/232138/COVID-19-related-insurance-regulatory-developments.
[50] Credit Karma Staff. (2020, July 16). *Coronavirus auto insurance payment relief: How many states and insurers are responding*. Credit Karma. Retrieved November 30, 2021, from https://www.creditkarma.com/advice/i/coronavirus-auto-insurance-relief#washington.
[51] See Section CVRP Lease Behavior During COVID-19.

the two groups narrowed. Among LMI applicants, the decrease in leasing percentages was common to all demographics besides Native Americans and 16–20 year-olds.[52]

2.9 Changes to CVRP Participant Makeup

The overall demographic makeup of CVRP applicants saw little change throughout the COVID-19 pandemic, suggesting that the pandemic did little to change who was buying EVs. While median applicant income dropped from $139,400 in 2018 to $129,600 in 2020, this is attributable to a vehicle MSRP cap at $60,000, introduced in 2019. The MSRP cap also likely explains why median vehicle MSRP fell from $47,00 in 2018 to $39,000 in 2020. There was no discernable difference in the median purchase price of EVs across income groups in 2020. Gender makeup was slightly affected. There was a 1.1% increase in female applications for non-Tesla's and a 4.3% increase in female applications for Tesla's during 2020. The racial makeup of applicants also experienced minor adjustments, with all changes being less than 3%. The percentage share of South Asian and East Asian applicants decreased. Conversely, the percentage share of White and Hispanic and Latino applicants increased. Looking at breakdowns by age, only two categories experienced percentage changes greater than 2%. The 21-29 age group increased its percentage share by 2.3% for Teslas. Meanwhile, the 40-49 age group decreased its percentage share of applications by 2.7% for Teslas. Only three counties experienced changes in their share of applications greater than 1%. Los Angeles County increased its share by 1.5%, and Santa Clara and Alameda County lost 2.1% and 1.2%, respectively. In total, the pandemic had no significant effect on the makeup of CVRP applicants.[53]

2.10 Car Purchasing Practices During the Pandemic and Going Forward

The pandemic forced dealerships to transition to a more streamlined and digitized car buying experience. An IHS Markit study of global car buyers found that 60% of surveyed purchasers bought their vehicles fully or partially online during H1 2020. Of these sales, 30% were conducted entirely online. The report found that consumers in the US had similar experiences. 43% of sales were fully online, 20% were partially online and 37% occurred entirely at the dealership.[54] Only 28% of vehicle purchasers walked into a dealership without notice in 2021, compared to 43% in 2019.[55] Group 1

[52] See Section CVRP Lease Behavior During COVID-19.
[53] See Section CVRP Composition Summary: Changes during COVID-19.
[54] *Automotive COVID-19 Recovery Series: Automotive Retail.* (2020). IHS Markit.
[55] *COVID-19 Sentiment Study.* (n.d.) Car Gurus. Retrieved March 21, 2022, from https://go.cargurus.com/rs/611-AVR-738/images/US-Covid19-Study.pdf.

Automotive, a Fortune 500 automotive retailer, saw online sales double during the early stages of the pandemic.[56]

Lessons learned from the pandemic will continue to change the car buying process in the future. Car buyers have enjoyed the convenience of online car buying and want to see those services continue. Among online buyers, 74% found car purchasing easier online than in person. Looking at all car buyers, 60% would prefer to do more of the purchasing process from home. Convenience was listed as the primary motivator for both those who bought a car online and in person. In one survey, respondents listed locating/configuring the vehicle, negotiating price and arranging a test drive as the top three things they would like to do online.[57] Another survey found that consumers were most interested in having dealership appointments, solo test drives, home test drives and home delivery. At the time this survey was conducted, Q3 2021, most shoppers were unconcerned about the safety of the retail activity.[58]

In response to customer interest in virtual sales, dealerships have been predicted to consolidate operations, and automakers have are anticipated to pursue more direct sales strategies. Online sales required fewer and shorter customer-employee interactions while remaining as profitable as in-person sales. In the future, we will likely see fewer dealership locations and employees.[59,60] We will also likely see more automakers at least partially adopting a direct-to-consumer (DTC) business model. This model is part of what allowed Tesla to withstand the pandemic so well. Some manufacturers, like VW and Ford, have followed Tesla's example and have begun implementing their own DTC practices.[61]

2.11 Conclusion

The COVID-19 pandemic revealed public policy as the main factor in the resilience of EV sales and changed consumer sentiment and behavior to the benefit of EVs. The resilience of the European and Chinese EV markets and the relatively poor performance of the US market emphasized the importance of strong policy support in times of crisis. In addition to policy, changes in travel patterns and consumer

[56] Wayland, M. (2020, May 21). *The coronavirus pandemic has upended auto sales and buying a car will never be the same.* CNBC. Retrieved November 30, 2021, from https://www.cnbc.com/2020/05/21/the-coronavirus-pandemic-has-upended-auto-sales-and-buying-a-car-will-never-be-the-same.html.
[57] *Automotive COVID-19 Recovery Series: Automotive Retail.* (2020). IHS Markit.
[58] *COVID-19 Sentiment Study.* (n.d.) Car Gurus. Retrieved March 21, 2022, from https://go.cargurus.com/rs/611-AVR-738/images/US-Covid19-Study.pdf.
[59] *Automotive COVID-19 Recovery Series: Automotive Retail.* (2020). IHS Markit.
[60] Wayland, M. (2020, May 21). *The coronavirus pandemic has upended auto sales and buying a car will never be the same.* CNBC. Retrieved November 30, 2021, from https://www.cnbc.com/2020/05/21/the-coronavirus-pandemic-has-upended-auto-sales-and-buying-a-car-will-never-be-the-same.html.
[61] Carrington, D. (2021, January 19). *Global sales of electric cars accelerate fast in 2020 despite pandemic.* The Guardian. Retrieved November 9, 2021, from https://www.theguardian.com/environment/2021/jan/19/global-sales-of-electric-cars-accelerate-fast-in-2020-despite-covid-pandemic.

sentiment, as well as continuing trends in technology, have all helped create fertile ground for EV sales. This is made apparent by the massive increases in EV sales across all markets in 2021, which occurred despite supply shortages and rising prices. The value of auto loans and the proportion of loans that are low-risk increased throughout the pandemic. While there was a decrease in CVRP applications for loans, this was likely caused by the increase in applications for Teslas. The pandemic did not have any significant effect on the makeup of CVRP applicants. Many consumers were exposed to the convenience of online purchasing during the pandemic. Car buyers were happy to do more of the purchasing process from their home and want to see these services continue.

3. CVRP Market Segmentation Before and During COVID-19

Anjelica Thang, Ben MacNeille, Janet Bowers

3.1 Summary

The California CVRP was launched on March 1, 2010. The goal of this report is to examine rebate patterns of applicants who applied as an individual before and during COVID-19. The analysis was conducted by disaggregating the rebate data in multiple ways including agreement type (purchase versus lease), pricing categories, rebate type and rebate applicants' income levels.

Assumptions used in this report include the following:

- The start date for the analysis is November 1, 2016. This was selected because the program changed two eligibility requirements. First, applicants who had gross annual incomes less than or equal to 300% of the Federal Poverty Level (FPL) were eligible to receive an additional $2,000. Second, applicants with gross annual incomes above certain thresholds (based on IRS filing status) were no longer eligible for the program.
- Before COVID-19 dates were defined as November 1, 2016 to February 29, 2020. During COVID-19, dates were defined as March 1, 2020 to June 15, 2021.
- Incomplete records were marked as missing data and removed from sections of analysis.
- All dates were based on rebate application received date because eligibility for the programs and various changes in the program all refer to this date rather than the date the vehicle was attained.

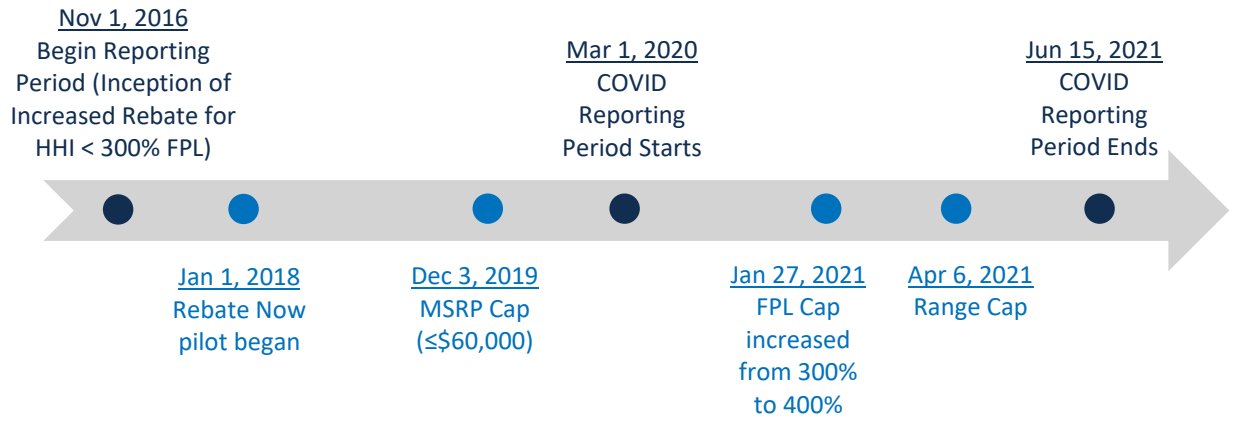
Significant changes in the program that were considered include:

- **Rebate Now:** San Diego County began a preapproval pilot on January 1, 2018. This program allows individuals to choose the point-of-sale option for the rebate. In April of 2021, the program was limited to income-qualified households and expanded to include San Joaquin Valley.
- **MSRP cap:** As of December 3, 2019, qualifying vehicles must have a base model MSRP (not necessarily purchase price) of $60,000 or less. Note this does not include fuel-cell electric vehicles eligible for both the CVRP and Clean Air Vehicle programs regardless of income level.
- **Income cap:** As of January 27, 2021, the program extended access to the Increased Rebate for those making between 300% and 400% of FPL.
- **Minimum range cap:** As of April 6, 2021, eligible PHEVs must have greater than or equal to 30 miles EPA range on electricity alone or an all-electric range of 45 miles in compliance with the

Urban Dynamometer Driving Schedule (UDDS) test standards. This eliminated some popular models, including the Prius Prime (2020–2022 models only post 25-mile max all-electric range).

These milestones are listed in Figure 1.

Figure 1. Program changes over time represented in a timeline. Text above is repeated in this graphic.*



*The timeline indicates the relative placement of the CVRP program adjustments that occurred between November 1, 2016 and June 15, 2021. Effects of these adjustments are examined in the report.

3.2 Findings

- **Lease v. Purchase Prices:** Before the pandemic, the ratio of purchased to leased vehicles was roughly 2:1. During the pandemic, the ratio increased to roughly 3:1. See Table 1.
- **MSRP cap:** The MSRP cap of $60,000 put into place in December 2019 appears to have affected higher-end vehicle buyers more than those who lease vehicles at this price point. The number of rebates for buyers of higher-priced EVs fell from 15.9% share of all purchased vehicles to 8.2% once the cap was in force (March 2020), while the number of rebates for lessees in this high market segment only decreased by 0.1 percentage points during the same time frame. It is difficult to establish causality regarding whether COVID-19 or the MSRP cap (or both) affected this shift in buyer applications. See Figure 2 and Figure 3.
- **Mileage range cap:** The increased minimum mileage cap was only in place during the last three months of this analysis; hence it is difficult to determine any specific effects. It is interesting to note that the Prius Prime, which only posts an electric range of 25 miles, did make the list of top models both before and during COVID, so the result of the mileage cap will most likely be felt in the future. See Table 6, Table 7, Table 8 and Table 9.
- **Increased FPL Eligibility:** Starting January 21, 2021, the CVRP program amended eligibility for the Increased Rebate to include applicants at the 300–400% FPL. Analyses revealed that after the increase went into effect, the percent of applications from people in this targeted income bracket increased four percentage points for buyers and three percentage points for lessees

between the first six months of 2020 compared with the first six months of 2021. See Table 12 and Table 13.

3.3 Total Records Analyzed

The total number of records, grouped by date of application received and vehicle agreement type, analyzed in this report is shown in Table 1. The number of records missing price or application received to date is indicated in each of the tables in this report for error checking purposes. Before the pandemic, 62% of the rebates were for purchased vehicles, and 38% were for leased vehicles. During the pandemic, the percentage of buyer rebates increased to 76% of all applications.

Table 1. Total number of records grouped by date of application received and vehicle agreement type.

Vehicle Agreement Type	Before COVID-19	During COVID-19	Grand Total
Lease	78,254	14,011	92,265
Purchase	127,207	44,324	171,531
To be determined*	0	250	250

*Vehicle agreement types for 250 applications received during COVID-19 have not yet been determined as these were submitted by applicants of the Rebate Now program who had not yet acquired their vehicle when the analysis was conducted.

3.4 Rebate Counts Grouped by Vehicle Price: Before versus During COVID-19

Data summarizing the total number of rebates in each price segment (grouped by vehicle agreement type) before and during COVID-19 are shown in Table 2 and Table 3. Percentages of these figures relative to payment agreement type are pictured in Figure 2 and Figure 3.

Table 2. Number of rebates before COVID-19 grouped by vehicle price and vehicle agreement type.

Price of Vehicle Acquired	Lease	Purchase	Grand Total
Less than $20,000	599	389	988
$20,000–30,000	15,700	16,830	32,530
$30,000–40,000	40,978	31,565	72,543
$40,000–50,000	9,606	24,052	33,658
$50,000–60,000	8,610	34,168	42,778
Above $60,000	2,761	20,203	22,964

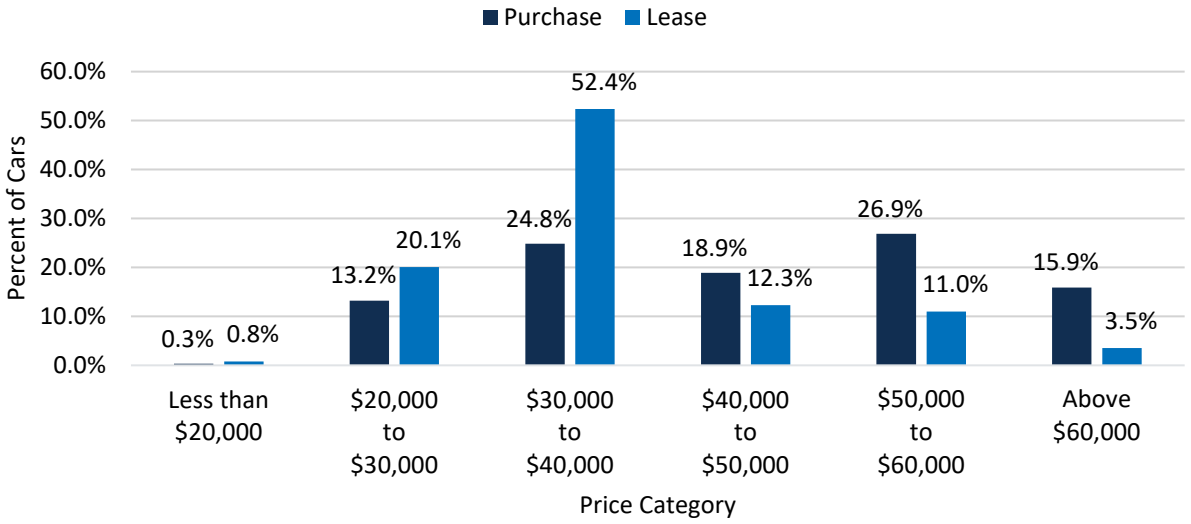
Table 3. Number of rebates during COVID-19 grouped by vehicle price and vehicle agreement type.

Price of Vehicle Acquired	Lease	Purchase	Lease or Purchase to be determined[a]	Grand Total
Less than $20,000	15	75	0	90
$20,000–30,000	1,098	3,559	0	4,657
$30,000–40,000	5,893	8,089	0	13,982
$40,000–50,000	3,584	12,509	0	16,093
$50,000–60,000	2,138	13,801	0	15,939
Above $60,000	442	3,396	0	3,838
Price unknown[b]	841	2,895	250	3,986

[a]Applicants to the *Rebate Now* program who had not yet obtained their vehicle.

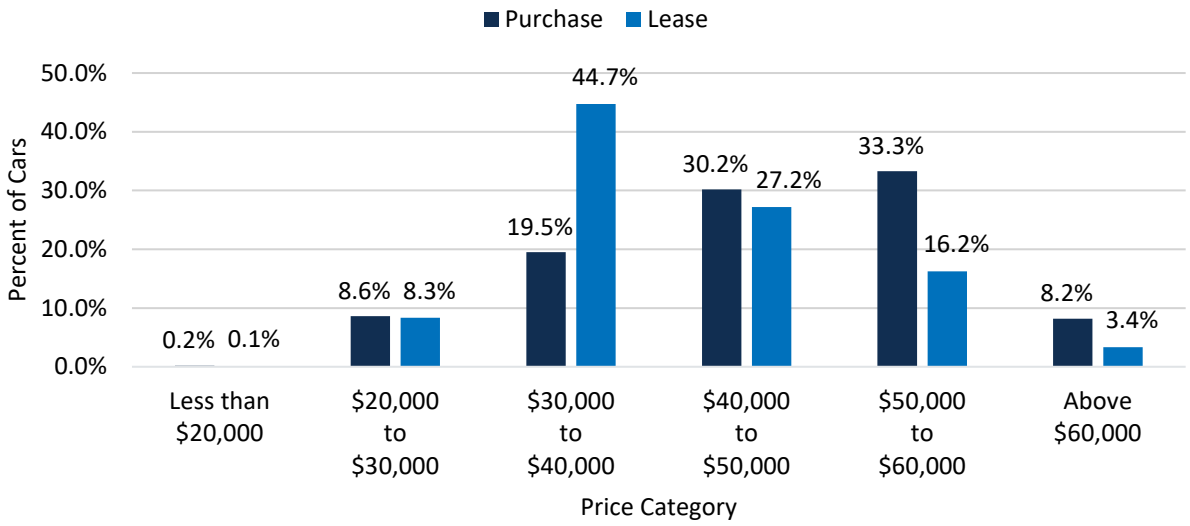
[b]Values reflect applications that were still being processed when analysis was conducted.

*Figure 2. Applications by vehicle price before COVID-19.**



*This figure illustrates the price points for vehicle rebate applications prior to COVID-19 disaggregated by purchase and lease categories.

*Figure 3. Applications by vehicle price during COVID-19.**



*This figure illustrates the price points for vehicle rebate applications during COVID-19 disaggregated by purchase and lease categories.

Prior to the pandemic, over half (52.4%) of all lease rebates were for vehicles priced between $30,000–$40,000. During the pandemic, leased vehicles in the $30,000–$40,000 range continued to be the most dominant segment, although this percentage fell from 52.4% to 44.7% of all lease rebates during COVID-19. A second noticeable decrease occurred in leased vehicle rebates at the lower price point of $20,000–$30,000 falling from 20.1% to only 8.3% during COVID-19. These decreases were accompanied by a 14.9 percentage point increase to those who leased vehicles in the $40,000–$50,000 range and a 5.2 percentage point increase in vehicles leased at the $50,000–$60,000 level. There were very few vehicles leased that were priced more than $60,000 either before or during COVID-19 which may indicate that the December 2019 MSRP cap did not affect lessees nearly to the extent that it did for buyers. See Figure 2 and Table 2.

The price segment garnering the highest share of purchase rebates both before and during the pandemic comprised vehicles costing between $50,000 and $60,000. The largest increases in percentage of purchase rebates during COVID-19 were seen in the $40,000–$50,000 range (gaining 11.3 percentage points during COVID) and in the $50,000–$60,000 range (gaining 6.4 percentage points in that higher-end market). These COVID-19 increases were accompanied by decreases in rebates for vehicles costing less than $40,000 (down 10 percentage points) and for vehicles costing more than $60,000 (down 7.7 percentage points). It is important to note that the drop in high-end vehicle rebates (from 15.9% to 8.2% of buyers during COVID) coincides with a change in the CVRP rebate guidelines that excluded vehicles with a base MSRP priced over $60,000 after December 3, 2019. Therefore, this analysis does not clarify whether the decline may have been due to COVID, or the cap, or both. See Figure 3, Table 2 and Table 3.

3.5 Rebate Counts Grouped by Vehicle Price: Year by Year

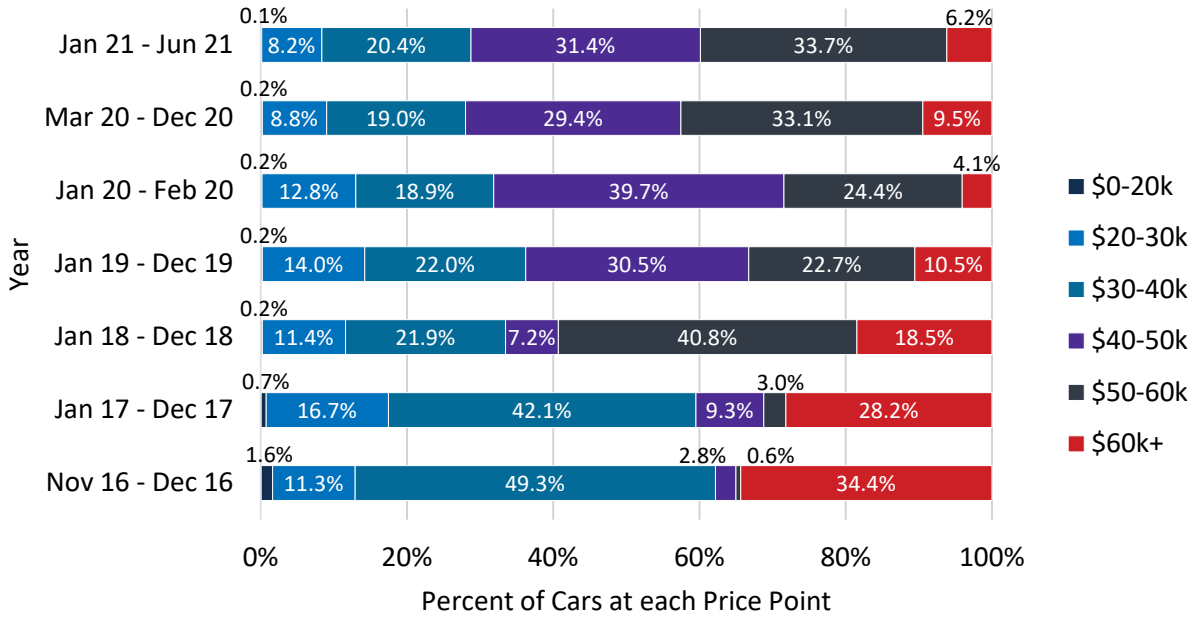
Figure 4 and Figure 5 also examine rebate trends for buyers and lessees (respectively) but drill down to a yearly scale. One trend that is evident in both figures is that there was a year-to-year decrease in rebates for vehicles either leased or purchased under $40,000. This decrease, which occurred between November of 2016 and December of 2020, was gradual for lessees but more dramatic for buyers beginning in 2018. See Figure 4 and Figure 5.

A second trend that can be seen in both figures is that from 2019 onward, $40,000 seems to be a critical price point: Over 50% of all lease rebates were associated with vehicles costing less than $40,000 while over 50% of all purchase rebates were associated with vehicles costing more than $40,000. See Figure 4 and Figure 5.

The decrease in lower-priced cars coupled with the increase in medium-priced cars was likely due to the popularity of the Tesla Model 3, which accounted for 31% of the rebates prior to COVID-19 and 34% of rebates during COVID-19, as well as the introduction of the Tesla Model Y (which coincided with the onset of COVID-19) that made up 26% of rebates. See also Table 6 and Table 7.

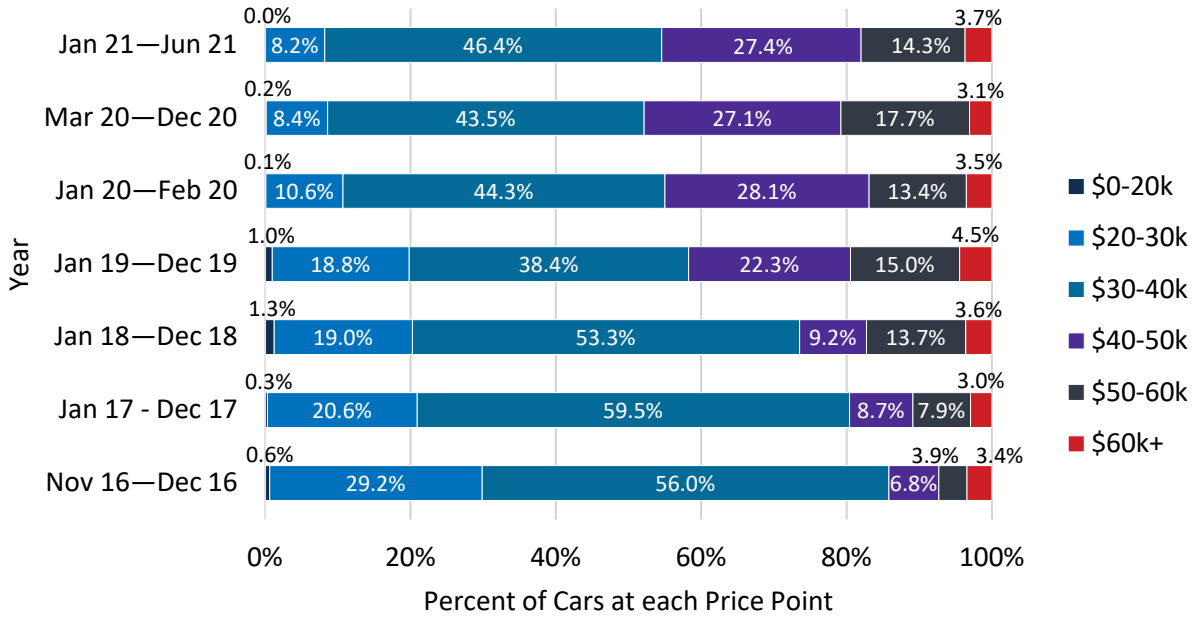
Figure 4 suggests a linear decrease in rebate applications from buyers purchasing cars priced over $60,000. In fact, from November of 2016 to January of 2020, rebates for purchases of higher-priced cars decreased from 34% to only 4% (an average decrease of 6 percentage points each year). This continual decrease suggests that the MSRP cap (enacted in December of 2019) may not have affected the decrease in purchases of higher-priced vehicles because evidence suggests that this trend had begun as early as January of 2017. A second trend within the purchase rebate sector is the increase in vehicles purchased between $50,000–$60,000 during the calendar year 2018. After 2018, vehicles costing between $40,000–$60,000 continuously accounted for well over 50% of all buyer rebates.

*Figure 4. Vehicle purchase price by year.**



*This figure illustrates the price points for purchased vehicle rebates by year.

Figure 5. Vehicle lease price by year.



*This figure illustrates the price points for leased vehicle rebates by year.

3.6 Rebate Counts Grouped by Rebate Types

One of the goals of the CVRP program is to ensure that LMI income families have access to incentive funding to help improve the air quality in all areas of California. When the program introduced the Increased Rebate in November of 2016, Californians earning at or below 300% FPL were qualified to receive an additional $2,000 rebate on top of the base amount if they purchased or leased a new vehicle. Two changes have since been made to increase the attractiveness and reach of the program. First, starting December 3, 2019, the bonus incentive was increased to $2,500. Second, on January 27, 2021, the eligibility requirements were extended to those earning between 300% and 400% FPL. Over the past five years, Increased Rebates have been roughly 10% of the number of Standard Rebates granted. Both before and during COVID-19, recipients of the Increased Rebate purchased or leased the largest percentage of vehicles falling in the price range of $30,000–$40,000. See Table 4 and Table 5. Prior to COVID, the second most frequent price category for Increased Rebates comprised vehicles priced between $20,000–$30,000 (23% of all Increased Rebates). However, during COVID-19 the second highest percentage shifted up to the $40,000–$50,000 range (27% of all rebates). See Table 4 and Table 5.

Table 4. Number and percentage of Standard Rebates grouped by price categories before and during COVID-19.

Price of Vehicle Acquired	Number of Standard Rebates Before COVID-19	Percentage of Standard Rebates Before COVID-19	Number of Standard Rebates During COVID-19	Percentage of Standard Rebates During COVID-19	Grand Total of Standard Rebates
Less than $20,000	827	0.4%	85	0.2%	912
$20,000 to $30,000	28,467	15.2%	3,484	7.2%	31,951
$30,000 to $40,000	64,529	34.4%	10,694	22.2%	75,223
$40,000 to $50,000	30,966	16.5%	13,868	28.8%	44,834
$50,000 to $60,000	40,734	21.7%	14,796	30.7%	55,530
Above $60,000	22,193	11.8%	3,646	7.6%	25,839
Price unknown*	0	0.0%	1,616	3.4%	1,616

*Values reflect applications that were still being processed when analysis was conducted.

Table 5. Number and percentage of Increased Rebates Grouped by Price Categories Before and During COVID-19.

Price of Vehicle Acquired	Number of Increased Rebates Before COVID-19	Percentage of Increased Rebates Before COVID-19	Number of Increased Rebates During COVID-19	Percentage of Increased Rebates During COVID-19	Grand Total of Increased Rebates
Less than $20,000	161	0.9%	5	0.0%	166
$20,000 to $30,000	4,063	22.9%	1,173	11.3%	5,236
$30,000 to $40,000	8,014	45.2%	3,288	31.6%	11,302
$40,000 to $50,000	2,692	15.2%	2,225	21.4%	4,917
$50,000 to $60,000	2,044	11.5%	1,143	11.0%	3,187
Above $60,000	771	4.3%	192	1.8%	963
Price unknown*	0	0.0%	2,370	22.8%	2,370

*Values reflect applications that were still being processed when analysis was conducted.

3.7 Rebate Counts Grouped by Make and Model

The top vehicle makes and models that received the most rebates (regardless of price category) before and during COVID-19 are listed in Tables 6 and 7. Four vehicles, Tesla Model 3, Chevrolet Bolt EV, Honda Clarity Plug-in Hybrid, and Toyota Prius Prime, made the top ten lists both before and during the pandemic. This is particularly noteworthy for the Prius Prime because it only registers an all-electric range of 25 miles and therefore was no longer eligible for a rebate as of April 6, 2021 when the minimum range for qualifying vehicles was increased from 20 UDDS electric miles to 35.

Table 6. Top 10 rebated vehicle models before COVID-19 listed in descending order.

Vehicle Models	Number of Rebates	Percent of Total Rebates
Tesla Model 3	64,542	31%
Other Models	47,510	23%
Toyota Prius Prime	18,808	9%
Chevrolet Bolt EV	18,013	9%
Chevrolet Volt	16,955	8%
Honda Clarity Plug-in Hybrid	9,523	5%
FIAT 500e	6,699	3%
Tesla Model S 70 and above	6,227	3%
Tesla Model X	6,110	3%
Ford Fusion Energi	5,637	3%
Volkswagen e-Golf	5,437	3%

Table 7. Top 10 rebated vehicle models during COVID-19 listed in descending order.

Vehicle Models	Number of Rebates*	Percent of Total Rebates
Tesla Model 3	18,659	34%
Tesla Model Y	14,115	26%
Chevrolet Bolt EV	5,760	11%
Other Models	4,898	9%
Toyota Prius Prime	4,156	8%
Honda Clarity Plug-in Hybrid	1,994	4%
Toyota RAV4 Prime	1,164	2%
Toyota Mirai Fuel Cell	1,139	2%
Hyundai Kona Electric	1,071	2%
Kia Niro Electric	922	2%
Chrysler Pacifica	721	1%

*Rebate applications that did not have a specified vehicle price were omitted.

3.7.1 Top Vehicle Makes and Models Before COVID-19

The makes and models listed in Table 8 each garnered more than 7,000 total rebates in the 40-month period before COVID-19. To reach this count, several of the vehicles are included in more than one price segment because some applicants may have chosen a base model whereas others chose higher-priced trim packages but still received a rebate because CVRP regulations use the base model price to determine model price eligibility. As noted in other sections, the largest number of rebates was given to those who purchased or leased a vehicle costing between $30,000 and $40,000. This analysis indicates that the two Chevrolet models (the Volt, which is a plug-in hybrid and the Bolt EV, which is fully electric), together accounted for approximately 20% of sales/leases in this highest volume price category during the Pre-COVID-19 period. At the higher end of the price ranges, the Tesla Model 3 was the most rebated vehicle, and it dominated three price segments spanning $40,000–$60,000+ and garnering 31% of all rebates prior to the pandemic. See Table 6 and Table 7.

Table 8. Number of rebates by price category for the top 5 vehicle makes and models prior to COVID-19.

Make & Model	Less than $20,000	$20,000 to $30,000	$30,000 to $40,000	$40,000 to $50,000	$50,000 to $60,000	Above $60,000
Tesla Model 3	0	4	2,732	19,577	33,823	7,638
Toyota Prius Prime	0	11,968	6,745	9	0	4
Chevrolet Volt	1	1,624	15,116	176	1	1
Chevrolet Bolt EV	0	10	14,343	0	3	0
FIAT 500e	1	234	6,454	0	0	0

3.7.2 Top Vehicle Makes and Models During COVID-19

During the 16-month COVID-19 period between March 1, 2020 and June 15, 2021, the five models shown in Table 9 all garnered more than 700 rebates each. Two of the top 10 selling makes were Teslas. The Model 3 accounted for 34% of all rebates and the Model Y accounted for an additional 26% of all rebated vehicle makes. See Table 7. Even though these are higher-priced vehicles, the average price of a rebated vehicle did not change. Before COVID-19, the average rebated vehicle price was $44,547 and remained almost unchanged at $44,793 during COVID-19.

*Table 9. Number of rebates by price category for the top 5 vehicle makes and models during COVID-19.**

Make & Model	Less than $20,000	$20,000 to $30,000	$30,000 to $40,000	$40,000 to $50,000	$50,000 to $60,000	Above $60,000
Tesla Model 3	0	2	3,937	10,142	4,143	435
Tesla Model Y	0	0	1	1,160	9,905	3,049
Chevrolet Bolt EV	0	15	4,643	1,101	1	0
Toyota Prius Prime	2	2,499	1,647	7	1	0
Honda Clarity Plug-In Hybrid	1	1,242	746	4	0	1

* Rebate applications that did not have a vehicle price specified were omitted.

3.8 Rebate Counts Grouped by FPL: Before and During COVID-19

3.8.1 Rebates for Vehicles Purchased by FPL

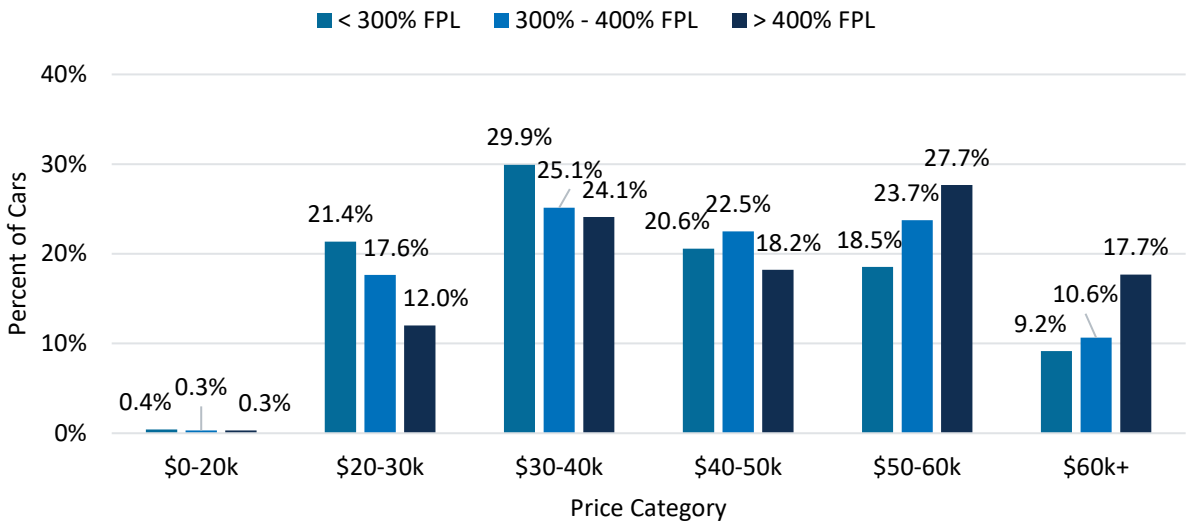
The total number of rebates for vehicles purchased before and during COVID-19 are aggregated by FPL in Table 10. Figure 6 and Figure 7show the percentage of vehicles purchased by price and applicants' FPL (less than 300% of FPL, between 300–400% of FPL and greater than 400% of FPL). Before COVID-19, a little over half of those under 300% FPL purchased a vehicle at a price point falling below $40,000, while only 36% of those above 400% FPL purchased lower-cost models. During COVID-19, this gap became even more noticeable, with 46% of those under 300% FPL continuing to purchase vehicles less than $40,000 while only 24% of those above 400% FPL purchased vehicles at that same price level.

*Table 10. Number of rebates for vehicles purchased before and during COVID-19 grouped by FPL.**

FPL Category	Before COVID-19	During COVID-19	Grand Total
At or Below 300% FPL	11,800	7,217	19,017
Between 300% FPL and 400% FPL	6,974	4,404	11,378
At or Above 400% FPL	108,433	32,703	141,136

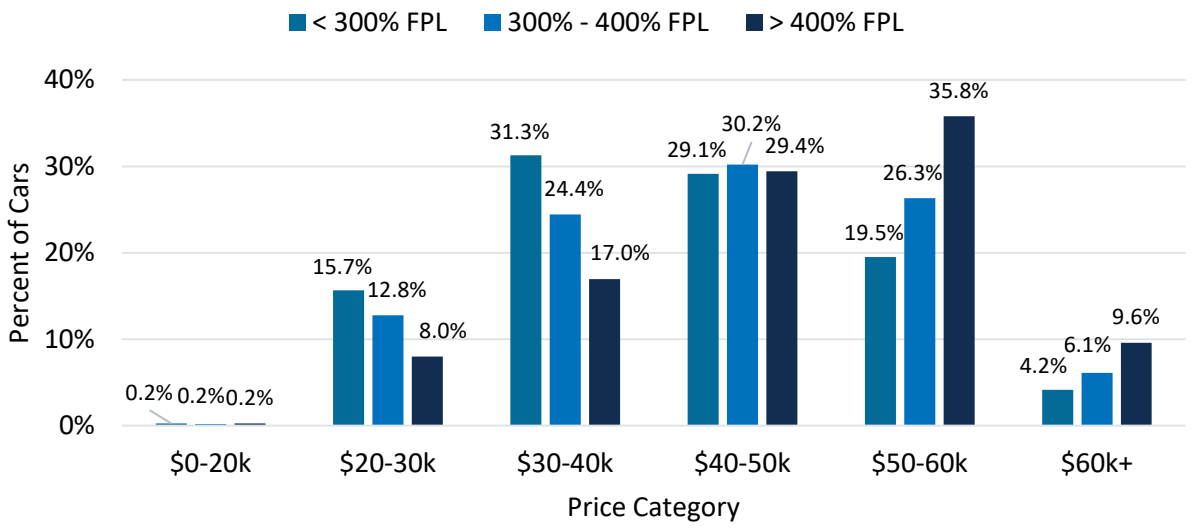
* Rebate applications that did not have a vehicle price specified were omitted.

*Figure 6. Percentage of rebates for vehicles purchased before COVID-19 grouped by price category and FPL.**



*This figure illustrates the percentage of purchase rebates from applicants at three income levels: at or below 300% FPL, between 300 and 400% of FPL and at or above 400% FPL before COVID-19.

*Figure 7. Percentage of rebates for vehicles purchased during COVID-19 grouped by price category and FPL.**



*This figure illustrates the percentage of purchase rebates from applicants at three income levels: at or below 300% FPL, between 300 and 400% of FPL and at or above 400% FPL during COVID-19.

3.8.2 Rebates for Leased Vehicles by FPL

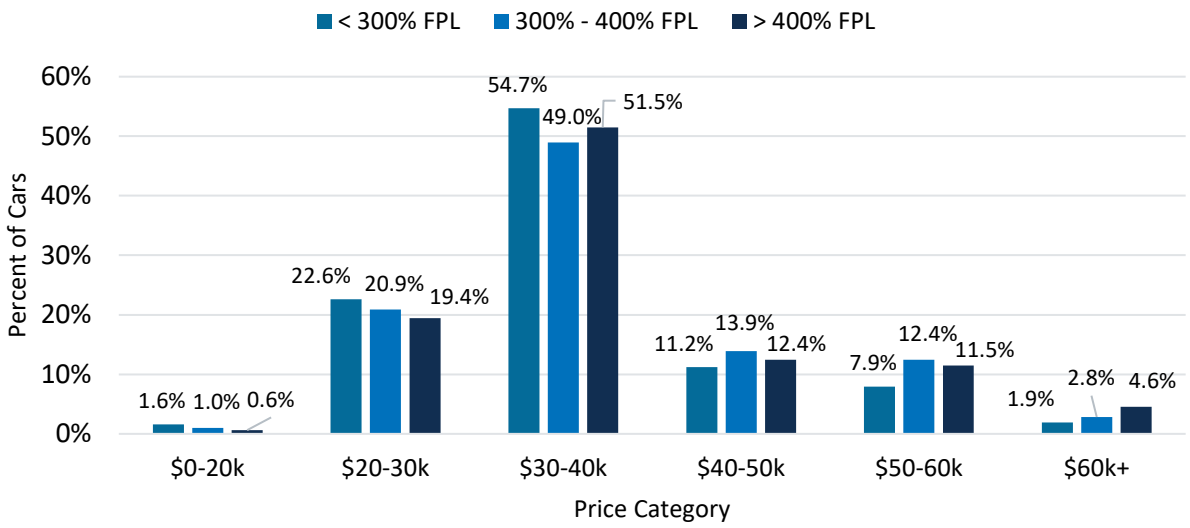
The rebate patterns for leased vehicles by FPL both before and during COVID-19 (shown in Figure 8 and Figure 9) look very different from the rebate patterns for purchased vehicles displayed in Figures 6 and 7. While no purchase price category garnered more than 30% of rebates, the lease market was dominated by vehicles at the $30,000–$40,000 range for lessees at all FPL levels. Earners in the mid income range (300%–400% FPL) leased a slightly higher percentage of vehicles costing more than $40,000 than those in the lower-income group both before and during the pandemic, so it is difficult to detect any direct effect of the increased FPL incentive (initiated in January 2021) from this analysis. The most striking pattern that emerged from this assessment it that the percentage of leased vehicles rebated at the $40,000–$50,000 range almost doubled from before COVID-19 to during COVID-19 for each of the three FPL levels respectively. See **Error! Reference source not found.**, Figure 8 and Figure 9.

*Table 11. Number of rebates for vehicles leased before and during COVID-19 grouped by FPL.**

FPL Category	Before COVID-19	During COVID-19	Grand Total
At or Below 300% FPL	11,085	2,998	14,083
Between 300% FPL and 400% FPL	3,639	1,387	5,026
At or Above 400% FPL	63,530	9,626	73,156

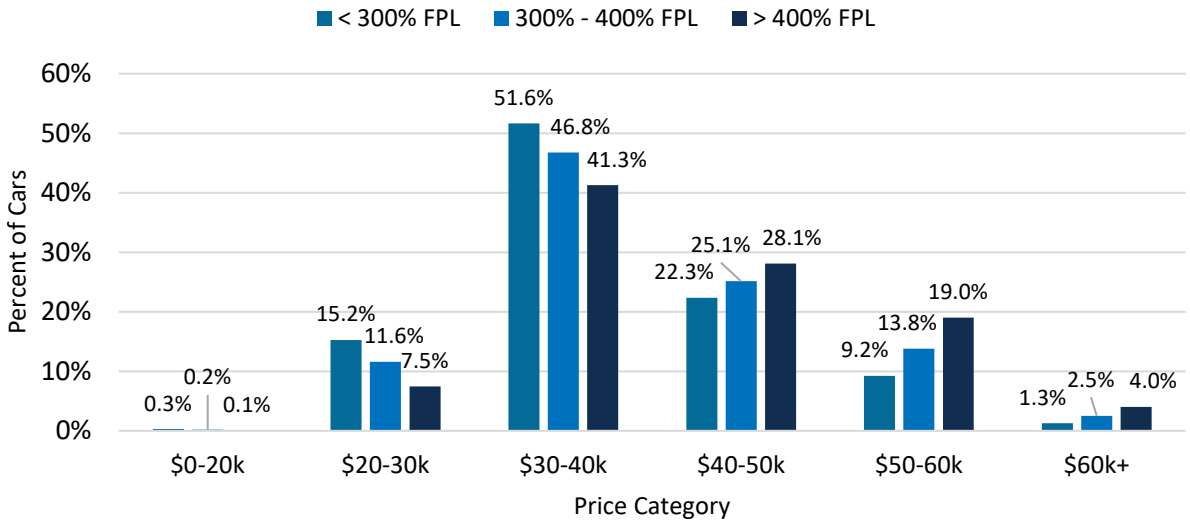
*Applications that did not have a vehicle price specified were omitted.

*Figure 8. Percentage of rebates for vehicles leased before COVID-19 grouped by price category and FPL.**



This figure illustrates the percentage of lease rebates from applicants at three income levels: at or below 300% FPL, between 300 and 400% of FPL, and at or above 400% FPL before COVID-19.

*Figure 9. Percentage of rebates for vehicles leased during COVID-19 grouped by price category and FPL.**



*This figure illustrates the percentage of lease rebates from applicants at three income levels: at or below 300% FPL, between 300 and 400% of FPL and at or above 400% FPL during COVID-19.

3.8.3 Increased Rebate

Starting January 21, 2021, the CVRP program amended eligibility for the Increased Rebate to include applicants at the 300–400% FPL. Analyses indicate that after the increase went into effect, the percentage of applications from people in this targeted income bracket increased four percentage points for buyers and three percentage points for lessees between the first six months of 2020 compared with the first six months of 2021. See Table 12 and Table 13.

Table 12. Market share for buyers by FPL for first six months of 2019, 2020, 2021.

FPL Category	January to June 2019	January to June 2020	January to June 2021
At or Below 300% FPL	10%	14%	19%
Between 300% and 400% FPL	7%	8%	12%
At or Above 400% FPL	84%	78%	70%

Table 13. Market share for lessees by FPL for first six months of 2019, 2020, 2021.

FPL Category	January to June 2019	January to June 2020	January to June 2021
At or Below 300% FPL	16%	16%	25%
Between 300% and 400% FPL	7%	8%	11%
At or Above 400% FPL	77%	76%	64%

4. ZEV versus Non-ZEV Primary Driver Population Differences

Meghna Eluganti

4.1 Purpose

The spread of COVID-19 resulted in subsequent government-mandated and voluntary lockdown restrictions. The lockdowns and health concerns changed driving patterns as many individuals started working remotely and spent less time in public. In this report, we examine shifts in behavior of ZEV drivers towards vehicle purchasing, public and personal transportation, EVs, EV incentives and environmental changes due to COVID-19 impact and compare it to non-ZEV drivers.

CSE designed two surveys for licensed drivers in California to understand how the swift expansion of remote work and health concerns about public transportation has influenced consumers' views towards transportation options and EV considerations. Consumers were asked about their interactions with transportation, electric vehicles, awareness of EV incentives, future vehicle purchasing, clean technology options and air quality awareness since the State of California's Executive Order declaring a statewide emergency in March 2020 that set forth travel and other restrictions.

4.2 Key Findings

- ZEV drivers prefer plug-in hybrids, battery-electric, fuel cell vehicles, whereas non-ZEV drivers prefer traditional gasoline and conventional hybrids.
- Tesla and BMW are the top two automaker choices for ZEV drivers. Toyota and Honda for non-ZEV drivers.
- Vehicle acceleration and body style are the most important vehicle characteristics for ZEV drivers, whereas maintenance costs and comfort are important for non-ZEV drivers.
- The majority of ZEV drivers considered purchasing a vehicle that is at most $50,000 purchase price, whereas non-ZEV drivers would purchase a vehicle up to $30,000.
- The majority of ZEV and non-ZEV drivers do not plan to lease a vehicle for their next purchase.
- There was a 22% increase in ZEV drivers considering purchasing or leasing an EV since lockdown.
- ZEV drivers are more likely to shop for vehicles online.
- Both ZEV and non-ZEV drivers showed an increase in the use of personal vehicles, bikes and walking more than before lockdown.
- Both ZEV and non-ZEV drivers showed a decrease in the use of public transportation since lockdown.
- The majority of ZEV drivers are aware of the California Clean Fuel Reward EV rebate program, whereas most non-ZEV drivers are not aware of any EV rebate programs.

- 84% of ZEV drivers are aware of one or more charging stations in their neighborhood compared to 53% of non-ZEV drivers.
- The majority of ZEV drivers have considered purchasing or already purchased a clean technology option.
- ZEV drivers are more aware of improvements to air quality since lockdown than non-ZEV drivers.

4.3 Introduction

CSE designed and developed two surveys, COVID-19 Impacts Survey-1 and COVID-19 Impacts Survey-2. The surveys targeted individuals who are over 18 years old and are licensed drivers in California. To reduce gender bias, the survey respondents were equally distributed between male and female respondents. COVID-19 Impacts Survey-1 was administered from June 24, 2020, through September 10, 2020. The survey asked respondents questions relating to COVID-19 impact on:

- Employment
- Mode of Work
- Personal and Public Transportation Choices
- Vehicle Purchase
- EV Consideration
- EV Awareness
- Air Quality

COVID-19 Impacts Survey-2 was administered from March 10, 2021, through April 12, 2021, and the survey asked respondents questions relating to COVID-19 impact on:

- Employment
- Mode of Work
- Personal and Public Transportation Choices,
- Travel Preferences
- Vehicle Purchase
- Awareness of EV Incentives
- Environmental Concerns

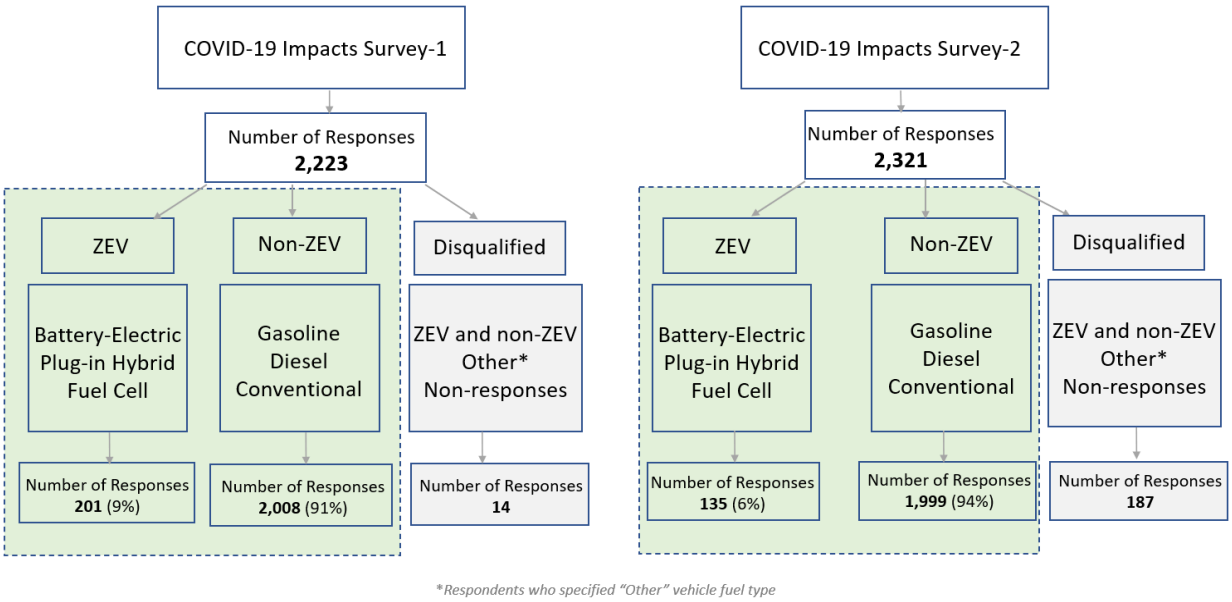
This study focuses on respondents who primarily drive Zero-Emission Vehicles and those who drive other conventional vehicles. We analyze these two groups' behavior towards personal and public transportation, long distance travel, vehicle purchasing preferences, EV incentives, rebates and charging stations awareness and environmental concerns. The study's goal is to understand if COVID-19 impacted ZEV and non-ZEV driver's transportation choices differently.

4.4 Data and Methods

4.4.1 Data Summary

Figure 10 details the breakdown of the total number of respondents in COVID-19 Impacts Survey-1 and COVID-19 Impacts Survey-2. The respondent counts are grouped by those who selected they were the primary driver for BEV or PHEV or FCEVs and those who selected they were the primary driver for Traditional Gasoline Vehicle or Diesel or Conventional Hybrid Vehicle. This was considered as a non-ZEV primary driver group, whereas those who selected BEV, PHEV or FCEV as ZEV group. See Figure 10. Respondents who did not specify "Other" type of vehicle or those who are a primary driver for both a ZEV type and non-ZEV type vehicle and those who did not answer the question were disqualified from the analysis.

Figure 10. Data segmentation and summary of the total number of respondents in COVID-19 Impacts Survey-1 and 2.



4.4.2 Methodology

To evaluate ZEV and non-ZEV drivers' transportation choices during COVID-19, we evaluate key question themes in the two surveys. Some of the key themes studied are:

1. Vehicle Purchasing Preferences
2. Commute and Travel Preferences
3. EV Incentives, Rebates and Charging Stations Awareness
4. Environmental Concerns and Clean Technology Options

We examine Vehicle Purchasing Preferences to understand the effect of lockdown on both ZEV and non-ZEV driver's vehicle buying choices. Section 1 and 2 in Appendix section lists the questions included in

the Vehicle Purchasing Preferences section of the two surveys. The questions are designed to ask respondents "Prior to shelter-in-place" and "Since the shelter-in-place" (pre/post lockdown) if they are interested in leasing or purchasing a vehicle, types of vehicle fuel type they would consider for their next purchase, type of body style they would prefer, type of automakers they would be interested in, important factors they would consider while purchasing a vehicle, how would they shop for a vehicle post lockdown, if they would consider EVs pre/post lockdown, what is the maximum vehicle price they are willing to pay if they plan to acquire a vehicle, how much are they willing to pay for a down payment and monthly payment for their purchased or leased vehicle. All the results for the questions were categorized by ZEV and non -ZEV primary driver respondents.

The next theme analyzed was Commute and Travel Preferences We evaluate ZEV vs. non-ZEV drivers changes in modes of transportation for commute and travel due to lockdown. Questions in this section are listed in sections 3 and 4 of the Appendix. In this section of the survey, we asked respondents their personal and public transportation preferences since the lockdown, pre and post-lockdown modes of long-distance travel via road, rail, air, sea etc., number of miles driven, and number of long-distance trips taken pre/post lockdown.

EV Incentives, Rebates and Charging Stations Awareness section of the survey was assessed to understand rebate and incentive awareness of ZEV and non-ZEV respondents, how the rebate amount has or will influence respondents in purchasing or leasing an EV and awareness of charging stations in their neighborhood. The questions in the survey included current inventive and rebate awareness, rebates and incentives needed to purchase or lease an EV (for non-EV drivers), rebates and incentives that influenced EV drivers to purchase or lease an EV (for EV drivers), minimum rebate amount needed to consider purchasing or leasing an EV and awareness of charging stations in their neighborhood. Sections 5 and 6 in the Appendix list all the questions evaluated in the two surveys.

The last theme in our analysis involves Environmental Concerns and Clean Technology Options. The questions analyzed in this theme in the survey are listed in section 7 and 8 of the Appendix section. We assess if changes in air quality and other health and environmental factors influenced respondents' transportation decisions during the lockdown. We evaluate the ZEV and non-ZEV drivers' consideration for purchasing clean technology options.

Lastly, in the analysis, we report the percentage of ZEV and non-ZEV driver responses to all the questions in the key themes. The Tables and Figures in the Results and Discussion section exclude responses that are "Prefer not to answer" option or blank responses.

4.5 Results and Discussion

4.5.1 Vehicle Purchasing Preferences

4.5.1.1 Purchase versus Lease and New versus Used

Table 14 shows the percentage of ZEV and non-ZEV primary drivers who planned to purchase or lease a vehicle prior to COVID-19 and since COVID-19. For simplicity in our analysis, we state this timeline as Before Lockdown for the period before then COVID-19 pandemic and since COVID-19 pandemic as Since Lockdown. Since Lockdown we saw a 14% decrease in ZEV driver's plans to purchase or lease a vehicle. Whereas only an 8% decrease in non-ZEV drivers' plans. Both ZEV and non-ZEV drivers plan to purchase or lease a new vehicle. Non-ZEV drivers are more inclined to purchase a used vehicle compared to ZEV drivers. See Table 14 and Table 15.

Table 14. ZEV and non-ZEV drivers' plans to purchase or lease a vehicle before and since lockdown.

Primary Driver	Before Lockdown	Since Lockdown
ZEV	66%	51%
Non-ZEV	46%	39%

Table 15. ZEV and non-ZEV drivers' plans to buy or lease a new or used vehicle since lockdown.

Primary Driver	New Vehicle	Used Vehicle
ZEV	74%	18%
Non-ZEV	61%	27%

4.5.1.2 Vehicle Fuel Type

Survey participants were asked about their vehicle fuel type preference for their next purchase. The results in both the surveys showed that Non-ZEV drivers are more likely to buy a non-ZEV fuel type vehicle such as traditional gasoline, conventional hybrid and diesel vehicles and ZEV drivers were more likely to purchase or lease Plug-in hybrids, all battery electric and hydrogen fuel cell vehicles. See Figure 11 and Figure 12.

Figure 11. ZEV and non-ZEV drivers' vehicle fuel type preferences since lockdown (COVID-19 Impacts Survey 1).

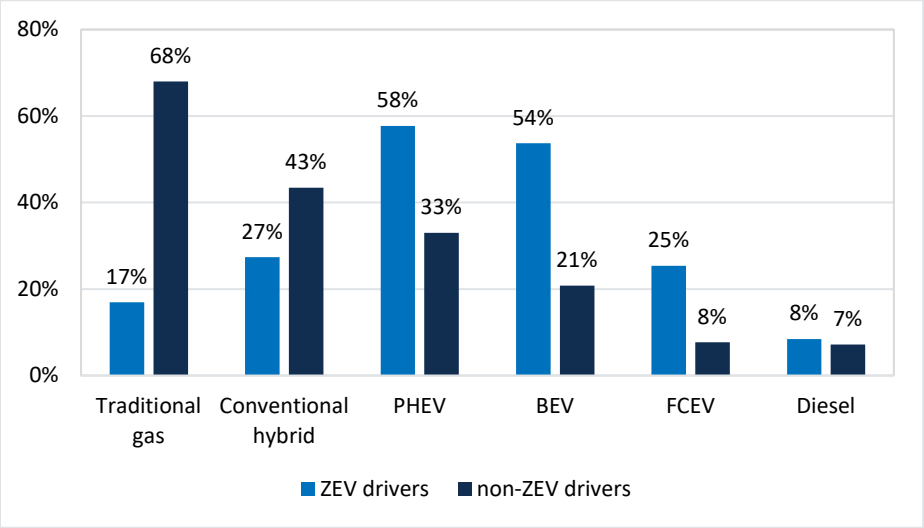
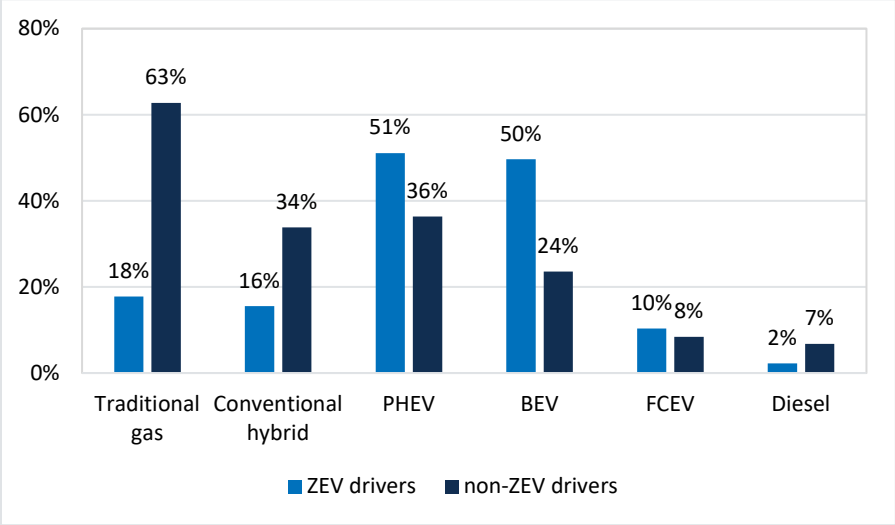


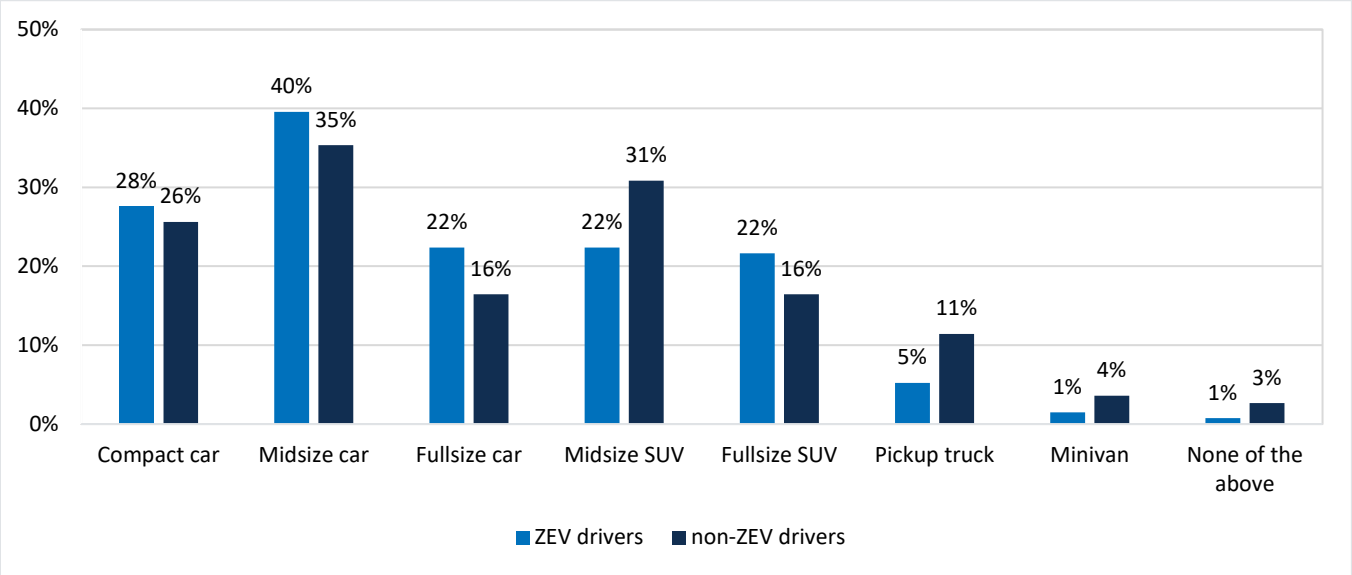
Figure 12. ZEV and non-ZEV drivers' vehicle fuel type preferences since lockdown (COVID-19 Impacts Survey 2).



4.5.1.3 Vehicle Body Style

The Survey participants were asked, "What vehicle body style(s) is your preference for your next purchase or lease?" and were asked to select all the options they would prefer. The results showed that midsize cars and compact cars were the top two choices for ZEV drivers, whereas midsize SUVs were the top options for non-ZEV drivers. See Figure 13.

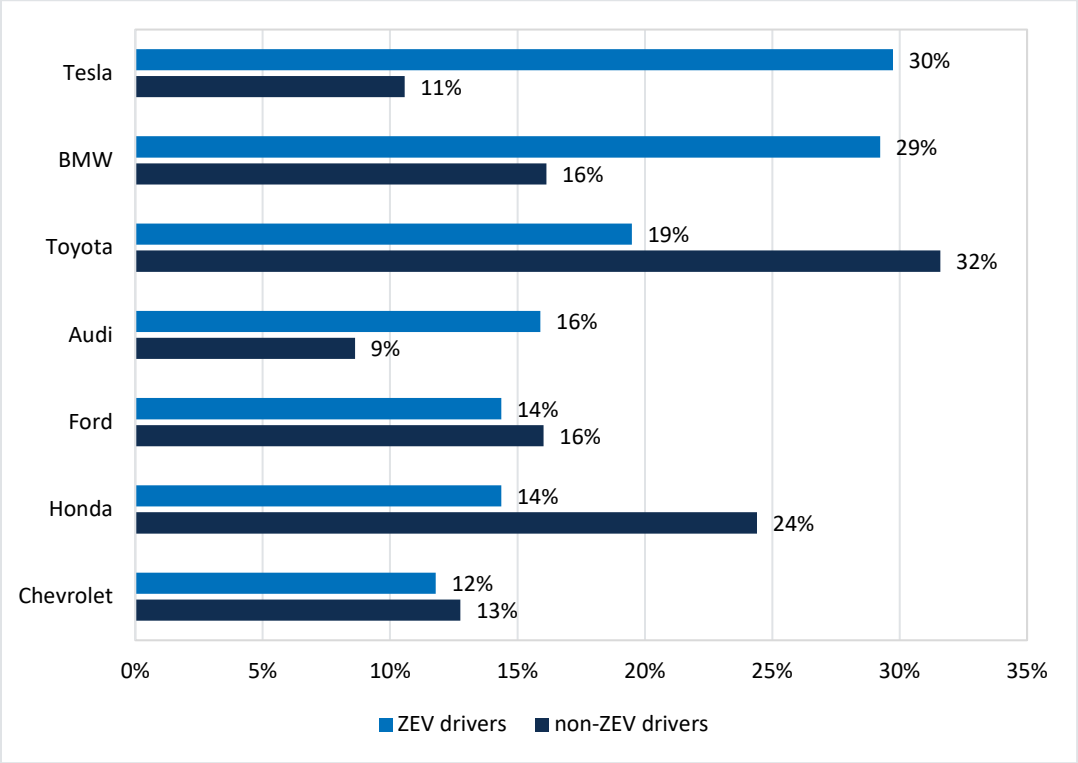
Figure 13. ZEV and non-ZEV drivers' preference towards vehicle body style for next purchase.



4.5.1.4 Automakers

To understand license drivers' preference towards a vehicle manufacturer, we asked survey respondents their preference towards an automaker(s) for their next purchase. Thirty (30) manufacturer options were provided to the respondents. The results in Figure 14 show the top 7 options for both ZEV and non-ZEV drivers. 30% of ZEV drivers selected Tesla and 29% selected BMW as their top manufactures compared to non-ZEV drivers, who choose Toyota and Honda as their top options. For more details on the breakdown of all 30 automakers, see Table 16 in the Appendix section.

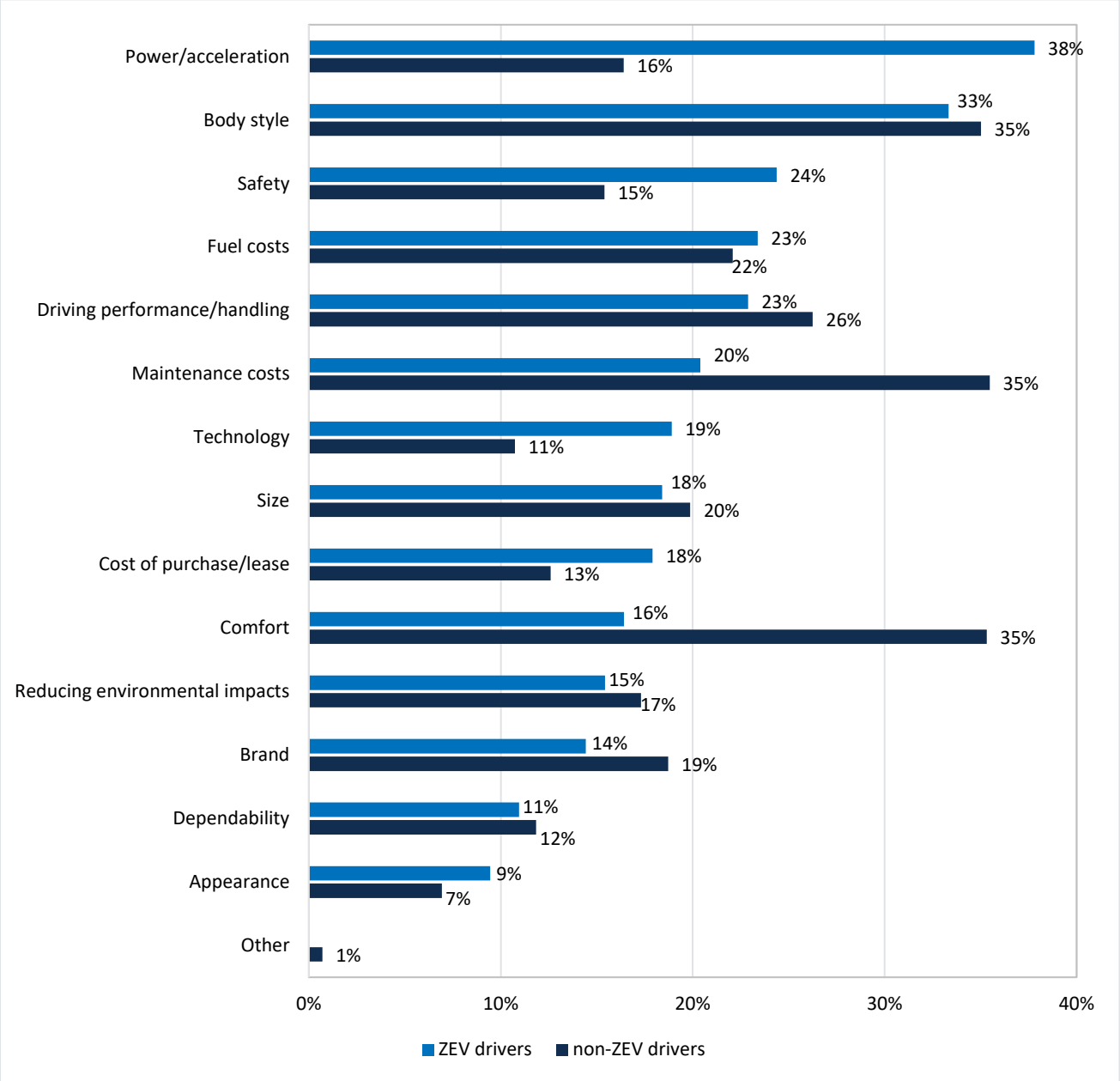
Figure 14. ZEV and non-ZEV drivers' preference towards vehicle manufacturers for next purchase.



4.5.1.5 Vehicle Characteristics

Vehicle characteristics play a key role in buyers' decisions to choose a vehicle. To understand the factors that most affect their purchase, we asked respondents important vehicle factors to consider when purchasing their next vehicle. We observed a contrasting trend between ZEV and non-ZEV buyers. While vehicle acceleration, body style, and safety were considered the most important factors ZEV drivers, comfort, maintenance costs, and body style were the top 3 factors that non-ZEV drivers would consider when purchasing or leasing their next vehicle. See Figure 15.

Figure 15. ZEV and non-ZEV drivers' preference towards important vehicle characteristics they would consider for next purchase.



4.5.1.6 Vehicle Expenses

To assess expenses associated with vehicle purchasing or leasing, we compare ZEV drivers and non-drivers' preferences towards vehicle down payment amount, vehicle purchase price, monthly vehicle

purchase or lease payments. Figure 16 shows ZEV and non-ZEV drivers' preferences towards maximum vehicle down payments. The survey participants were given options to select from "less than $5,000" to "over $60,000" to pay for down payments. More than 50% of ZEV drivers selected less than $35,000 as the maximum down payment they would be willing to pay, whereas, for non-ZEV drivers, over 50% of respondents said less than $15,000. Non-ZEV drivers are more likely to pay $20,000 less as maximum down payment compared to ZEV drivers. Also, approximately 20% of non-ZEV respondents were not interested in paying a down payment.

Figure 16. ZEV and non-ZEV drivers' preference towards a maximum down payment for next purchase.

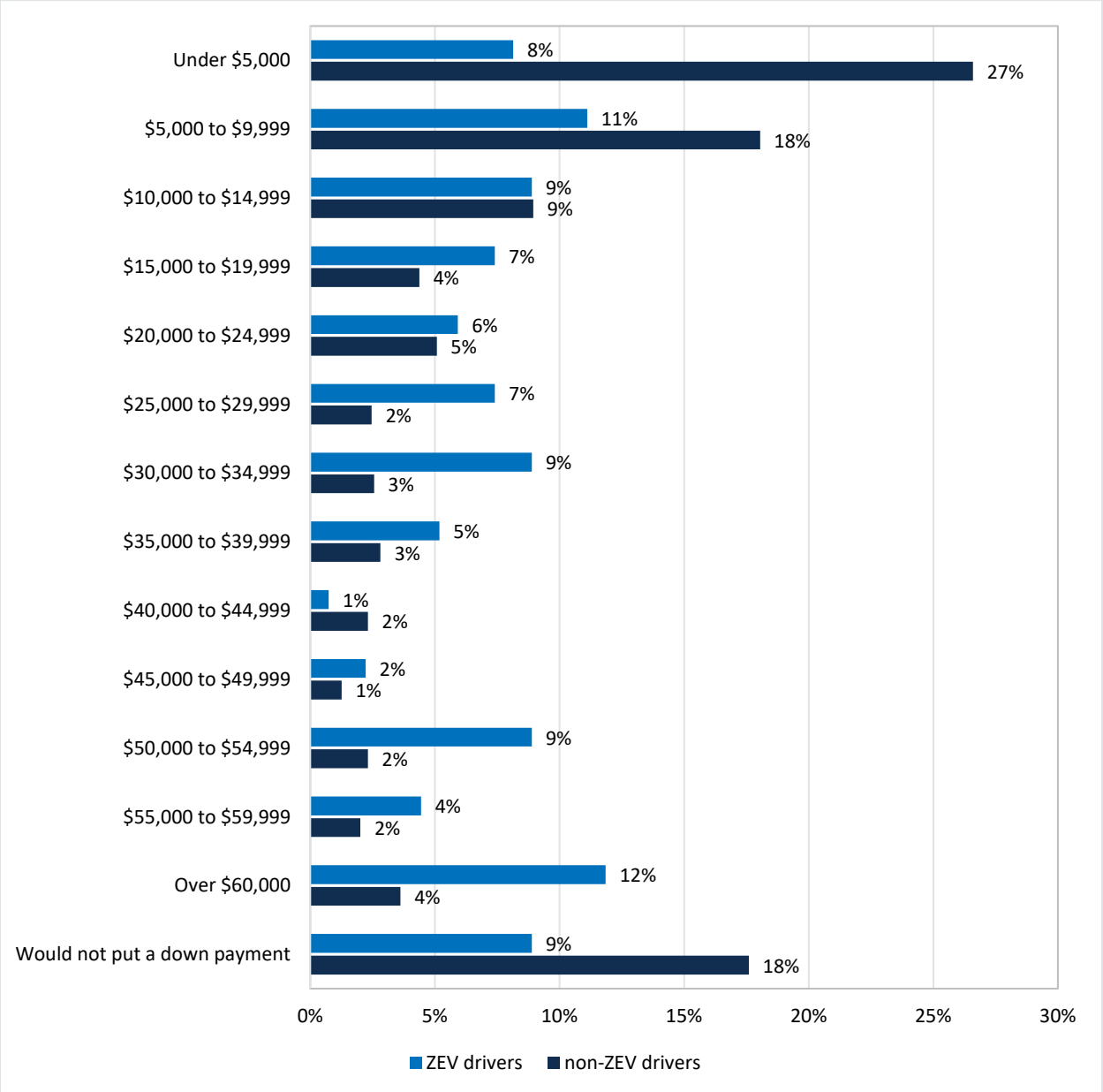


Figure 17 provides a breakdown of ZEV and non-ZEV drivers' preferences towards the highest price range they are willing to consider for purchasing or leasing their next vehicle. The average number of ZEV drivers were willing to pay a maximum of $50,000 for their next vehicle compared to $30,000 for non-ZEV drivers. 51% of all ZEV drivers were considering over $50,000 highest vehicle purchase price compared to only 20% of non-ZEV drivers revealing that ZEV drivers are more likely to pay over $60,000 for their vehicle purchase or lease compared to non-ZEV drivers.

Figure 17. ZEV and non-ZEV drivers' preference towards the highest purchase price for their next vehicle's purchase or lease.

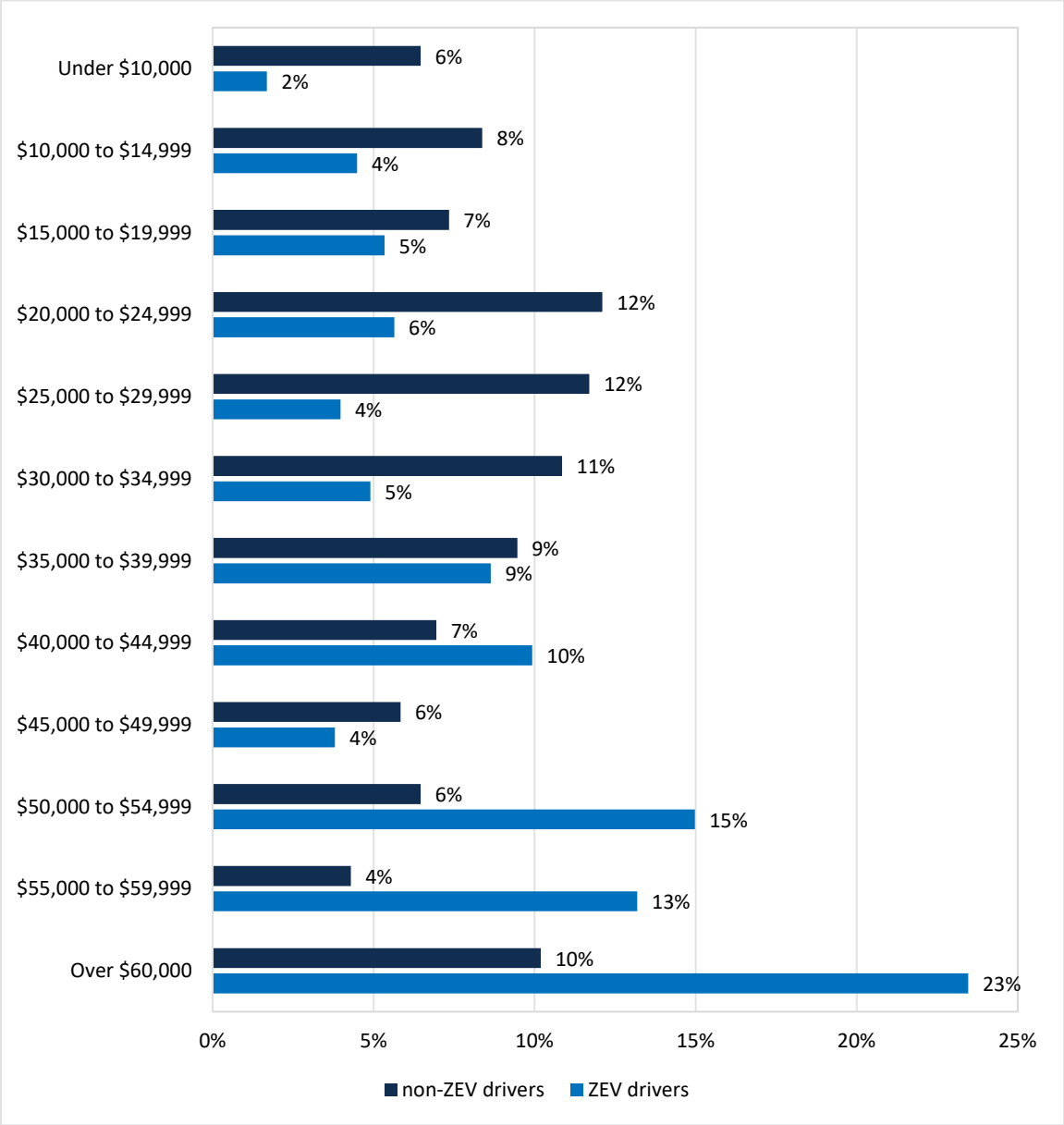


Figure 18 and Figure 19 provide the maximum monthly payments breakdown for vehicle purchase or lease. The highest number of ZEV drivers selected $300-$399 as the maximum vehicle purchase monthly amount whereas, the highest number of non-ZEV respondents selected $200-$299. Additionally, 27% of non-ZEV respondents would not consider financing a vehicle. This shows that ZEV drivers are more likely to pay higher monthly payments compared to non-ZEV drivers for their next vehicle purchase. 40% of ZEV drivers and 54% of non-ZEV drivers would not consider leasing their next vehicle, indicating an overall preference towards purchasing rather than leasing a vehicle.

Figure 18. ZEV and non-ZEV drivers' preference towards maximum monthly payments for their next vehicle purchase.

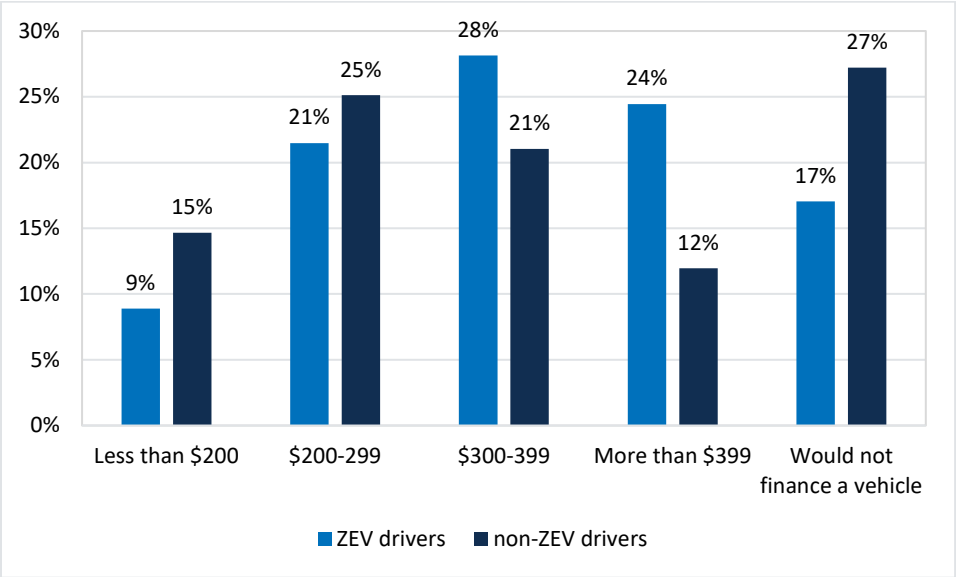
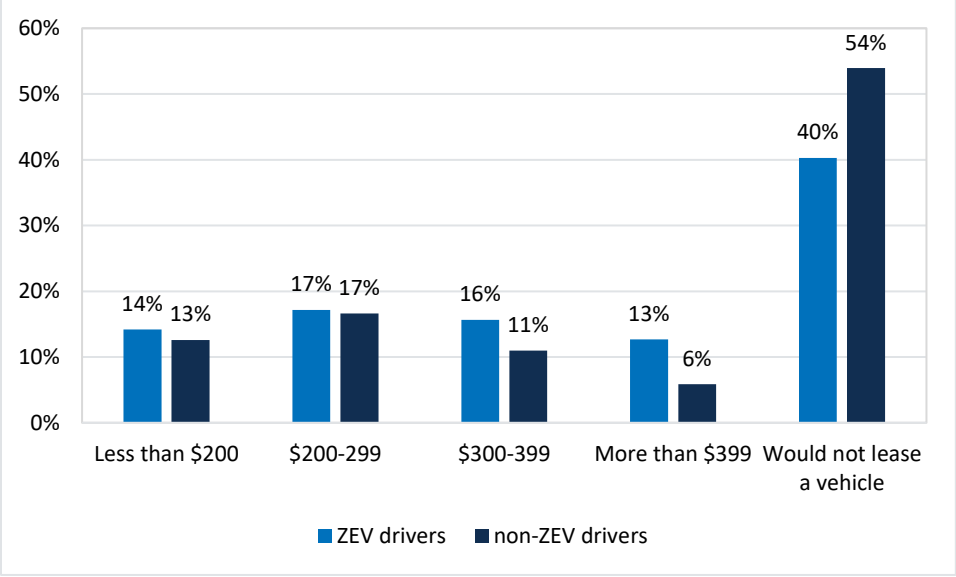


Figure 19. ZEV and non-ZEV drivers' preference towards maximum monthly payments for a vehicle lease.



4.5.1.7 EV Considerations

We also assess respondents' interest in purchasing or leasing an EV before and since lockdown. 84% of ZEV drivers and 45% of non-ZEV drivers were considering purchasing or leasing an EV before lockdown. See Figure 20. Since lockdown, the majority of both ZEV drivers and non-ZEV drivers are "Equally likely" or "More likely" to purchase or lease an EV. Figure 21 shows that 91% of ZEV respondents selected "Equally likely" or "More likely" compared to 67% of non-ZEV drivers. This indicates that since lockdown, there was an increase in 7% among ZEV drivers and a 22% increase among non-ZEV drivers' preference towards EVs.

Figure 20. ZEV and non-ZEV drivers' EV consideration before lockdown.

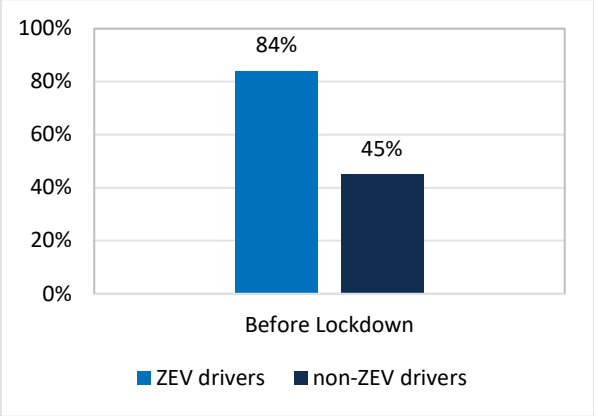
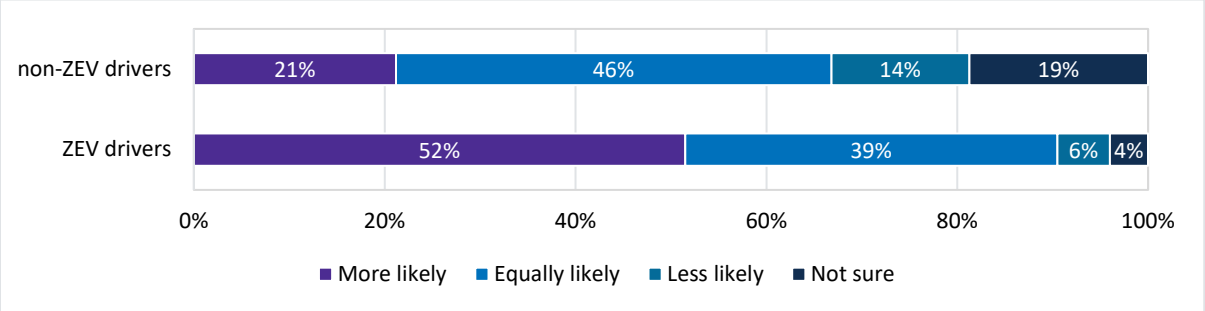


Figure 21. ZEV and non-ZEV drivers' EV consideration since lockdown.



4.5.2 EV Concerns

Figure 22 and Figure 23 break down common EV concerns for ZEV and non-ZEV drivers regardless of whether they have considered an EV. The figures show a Likert scale ranging between "Major concern" to "Not at all a concern" and "Not sure." Some common concerns such as charging costs, battery range, charging access, reliability and repair costs were provided to the respondents to assess if it is a concerning factor for the two driver groups. Some major concerns for non-ZEV drivers include repair costs, reliability, charging access at public, work, and home, charging time and battery range. ZEV drivers listed the majority of the concerns as a moderate concern compared to non-ZEV drivers who selected most options as major concerns. This shows that non-ZEV drivers lack knowledge of electric vehicles.

Figure 22. EV concerns for ZEV drivers.

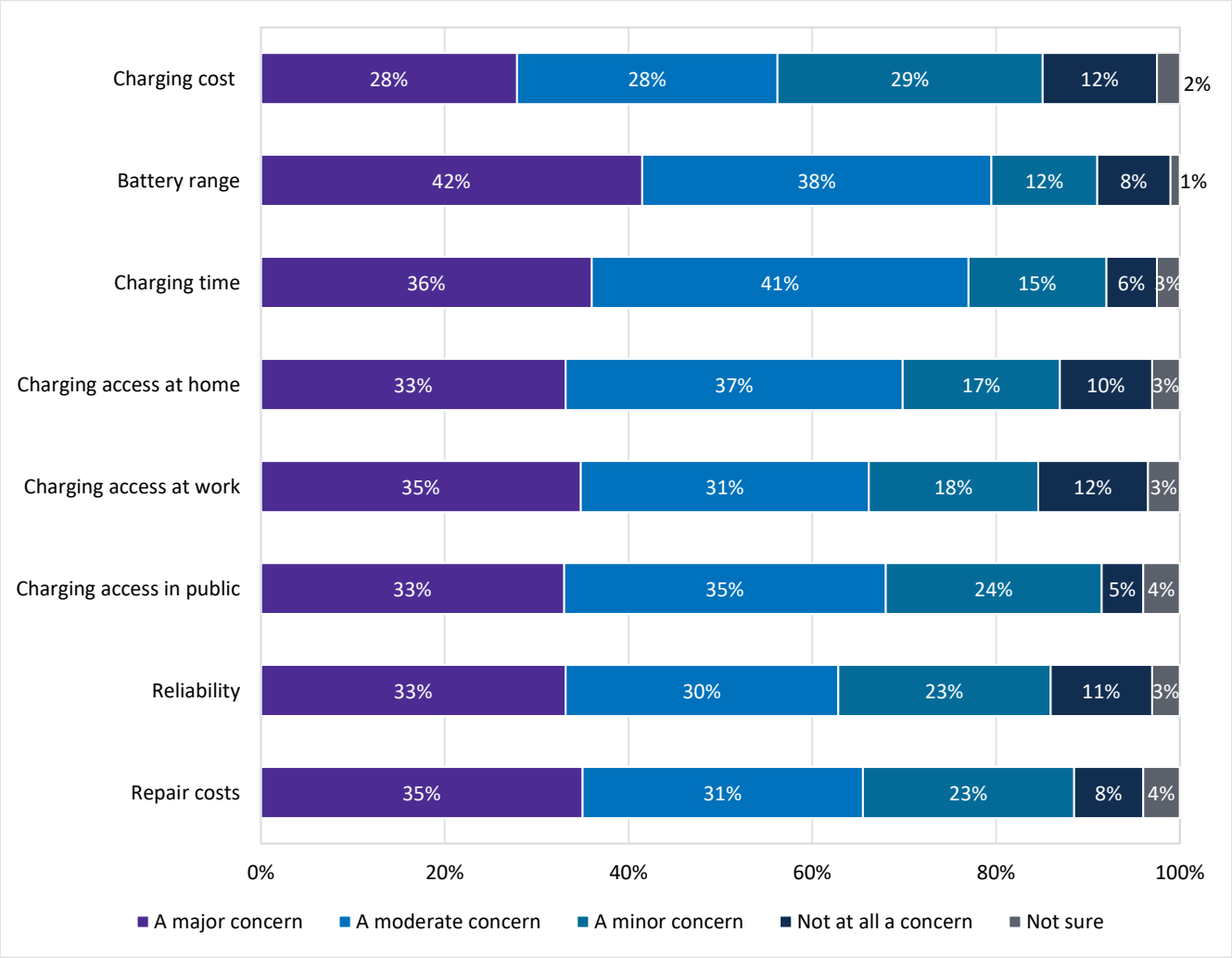
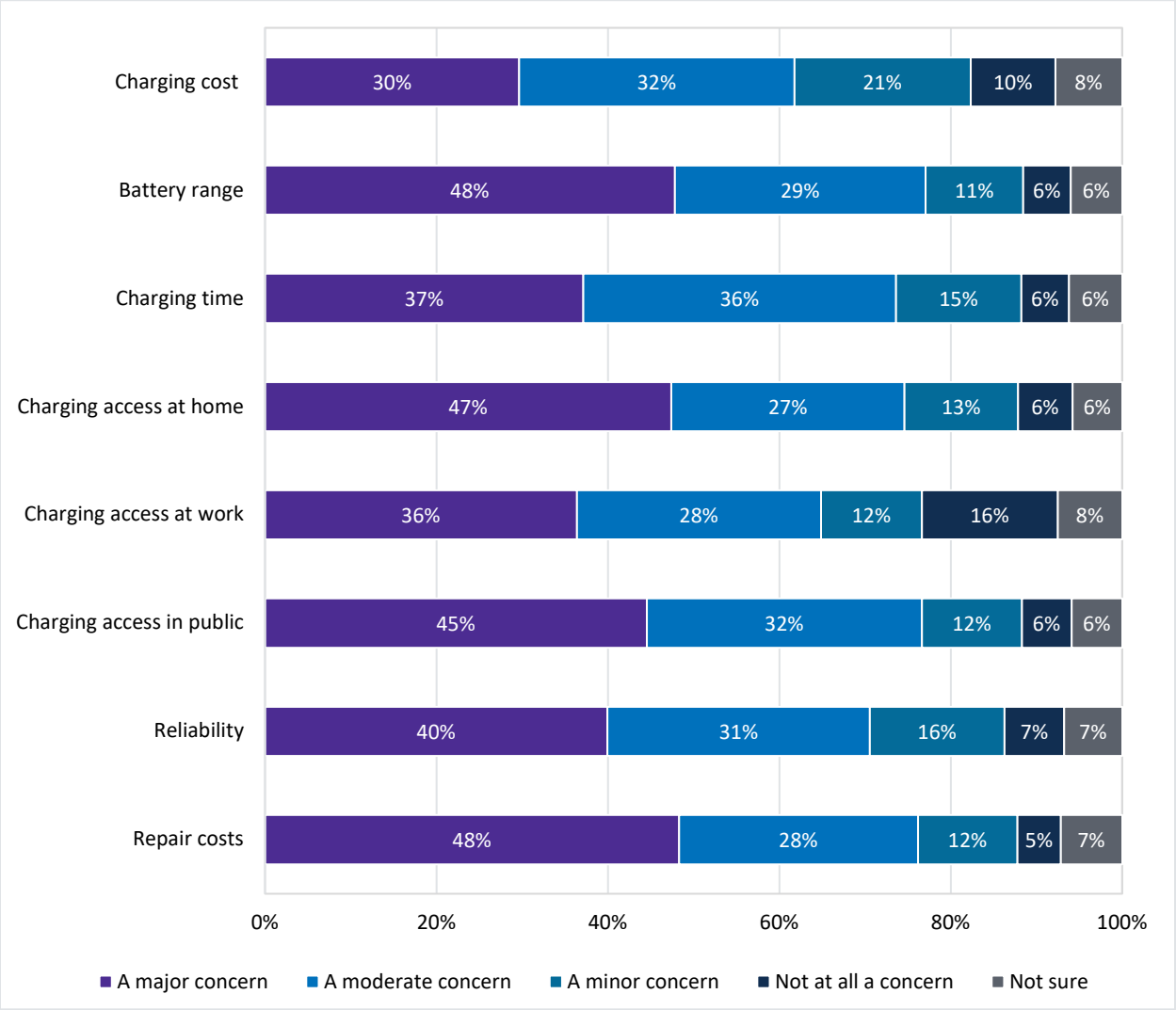


Figure 23. EV concerns for non-ZEV drivers.



4.5.3 Vehicle Shopping Concerns

Both ZEV and non-ZEV drivers' preference towards vehicle shopping since lockdown was studied further by evaluating their preference towards vehicle purchasing/leasing a new or used vehicle and if they were interested in going to a dealership or shop for a vehicle online. Figure 24 and Figure 25 show the breakdown of ZEV and non-ZEV preferences towards vehicle shopping. They were asked if they "More likely," "Equally likely" or "Less likely" to prefer the options. More ZEV drivers showed that since lockdown, they are more likely to shop for a vehicle online than non-ZEV drivers. Both ZEV and non-ZEV drivers are less likely to purchase a used vehicle and lease a new or used vehicle since lockdown.

Figure 24. ZEV drivers' vehicle shopping concerns since lockdown.

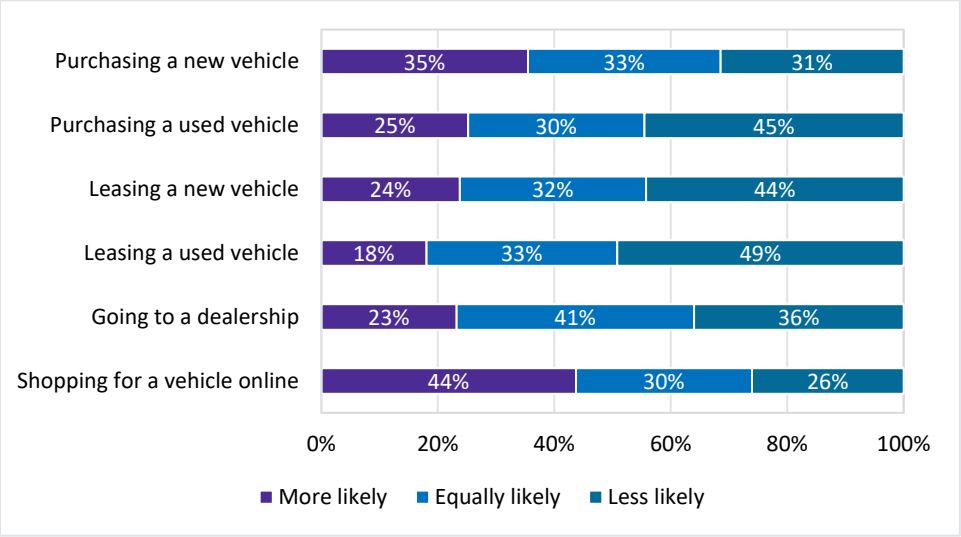
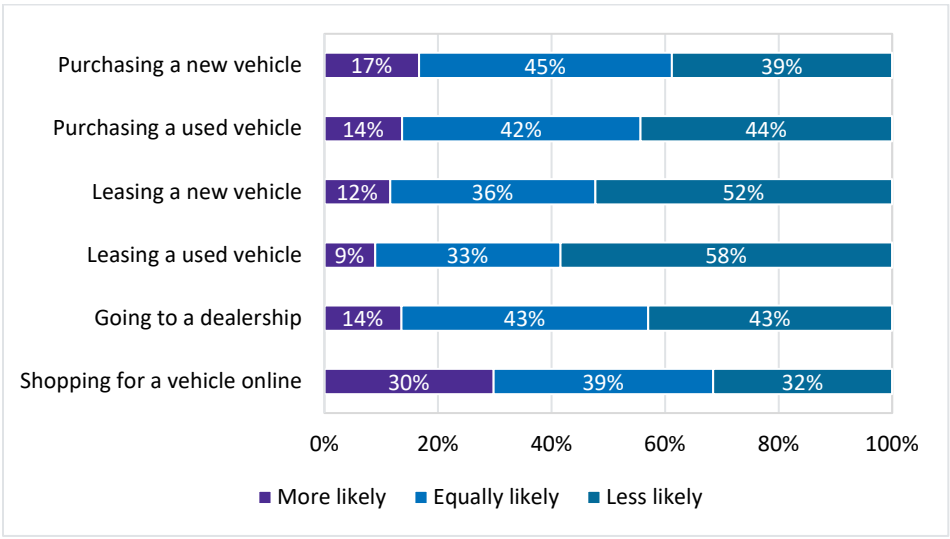


Figure 25. Non-ZEV drivers' vehicle shopping concerns since lockdown.



4.6 Commute and Travel Preferences

To assess the effect of lockdown on commute and travel, we asked respondents to compare their transportation choices before lockdown to see if they were using the transportation "More than before," "Less than before," "The same as before" and "No longer use this transportation choice." The transportation choices included are driving a personal vehicle, rental vehicle, RV, using rideshare, carpool, biking, public transportation, and personal mobility such as e-bikes or skateboards. Figure 26 and Figure 27 shows ZEV and non-ZEV drivers' preferences towards different transportation options

since the lockdown. The results show that although both ZEV and non-ZEV drivers are traveling and commuting less than they did before lockdown, the majority of ZEV and non-ZEV drivers prefer using their personal vehicle "The same as before" or "More than before" Both ZEV and non-ZEV drivers plan to use a rental vehicle, RV, rideshare services, carpool, and public transportation "Less than before" or "No longer use this transportation choice." Over 90% of ZEV and non-ZEV drivers are using a bike or walk as a transportation option "More than before" indicating that the lockdown reduced ZEV and non-ZEV preference towards public transportation and ZEV, and non-ZEV drivers relied on personal vehicles for commute and travel.

Figure 26. ZEV drivers' travel and commute decisions since lockdown.

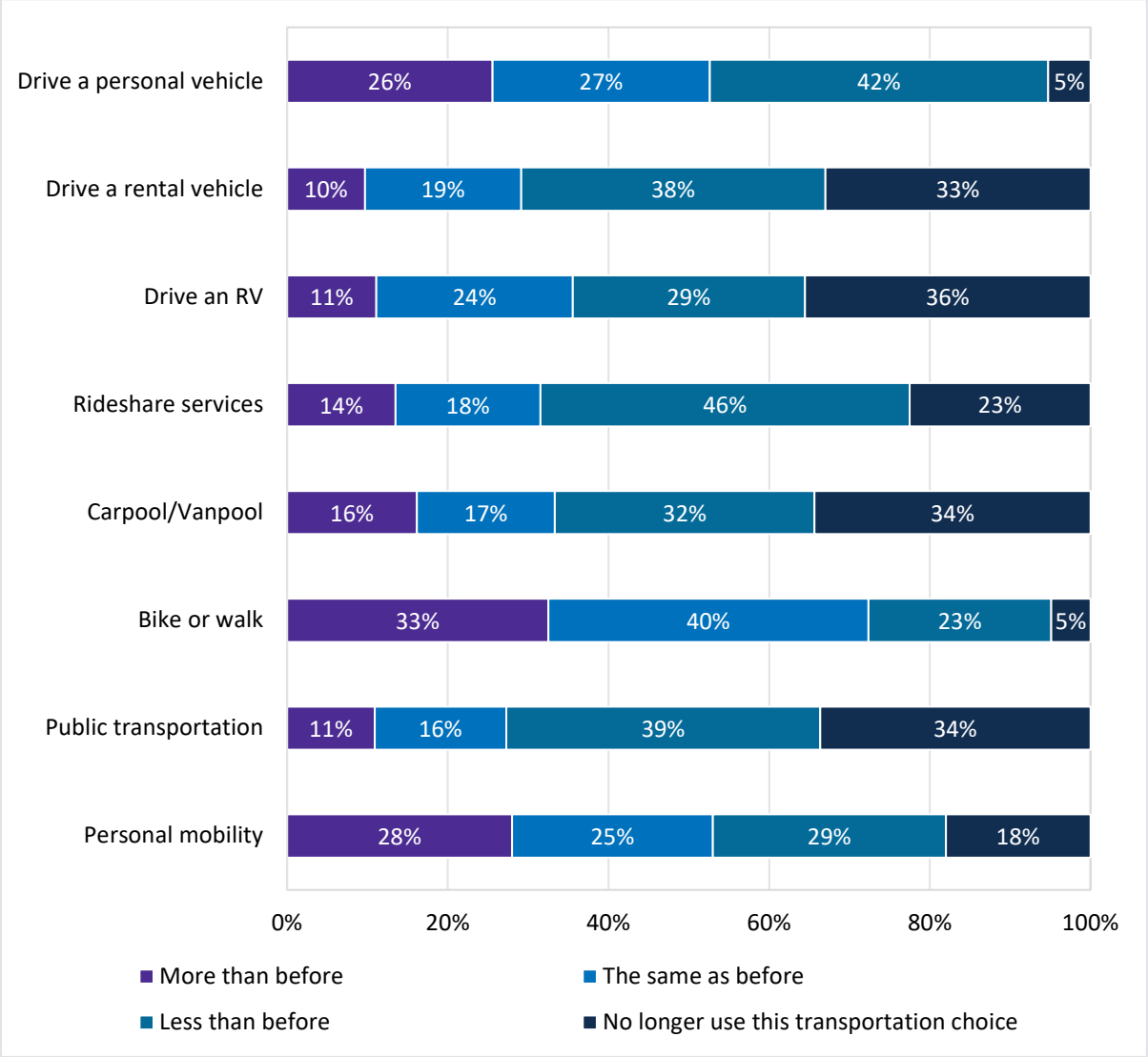
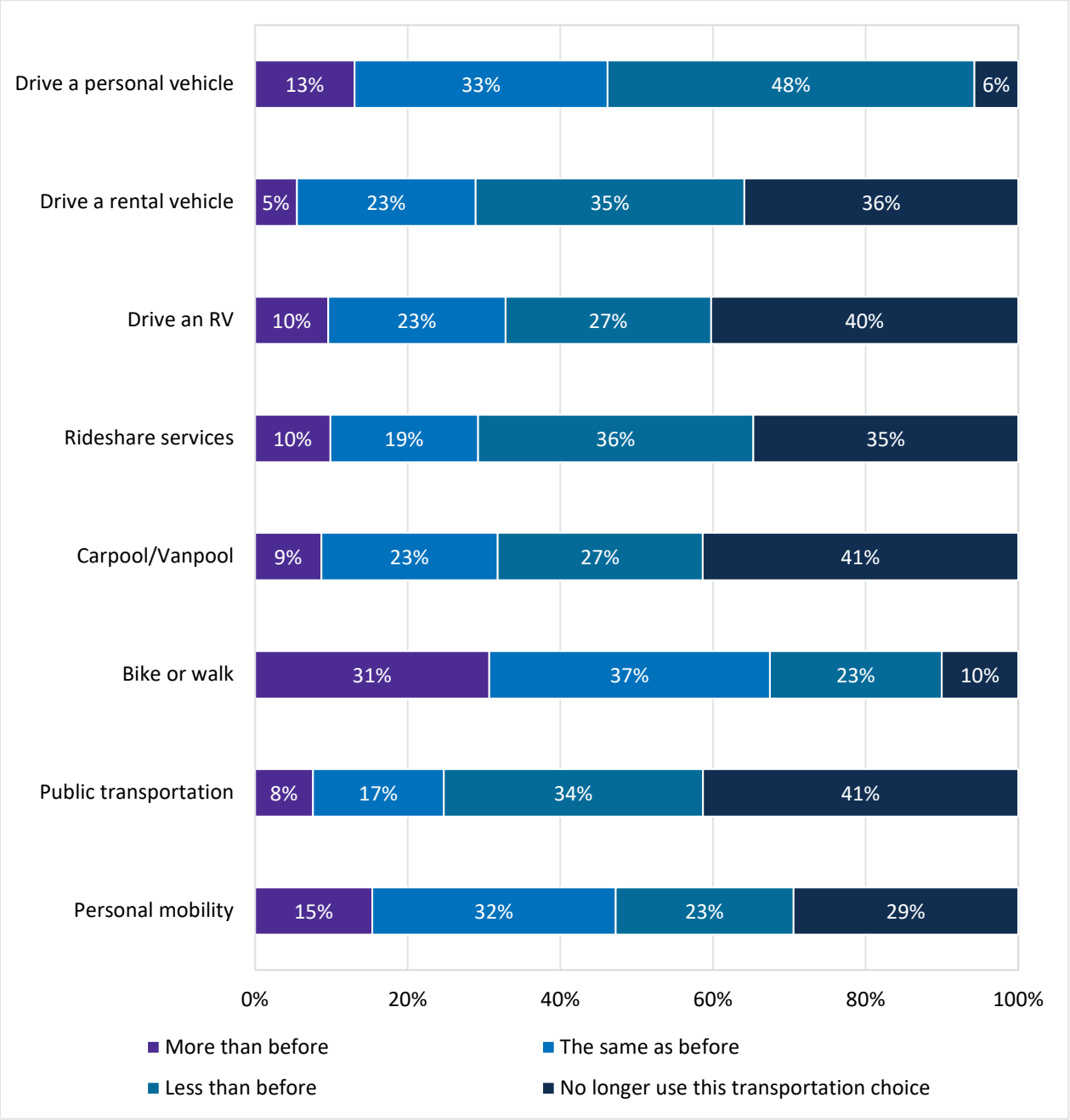


Figure 27. Non-ZEV drivers' travel and commute decisions since lockdown.



ZEV and non-ZEV drivers showed similar trends for preferred modes of long-distance travel. Figure 28 and Figure 29 showed the majority of both ZEV, and non-ZEV drivers preferred traveling by road and both the groups preference to travel by road before and since lockdown remained the same. Both ZEV and non-ZEV drivers' preference to travel by air reduced since lockdown. Both ZEV and non-ZEV drivers traveled less than five trips. Figure 30 and Figure 31 show a 19% increase in non-ZEV drivers and a 13% increase in ZEV drivers' preference to avoid long-distance trips since lockdown.

Figure 28. ZEV drivers' preferred modes of long-distance travel.

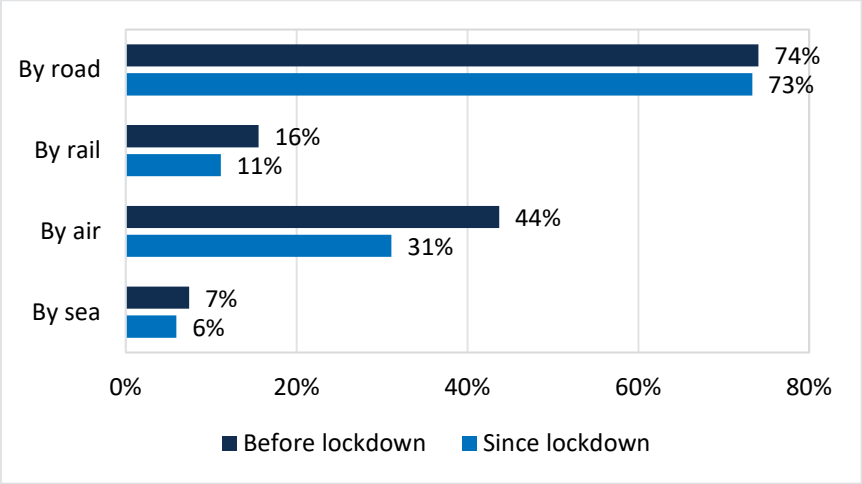


Figure 29. Non-ZEV drivers' preferred modes of long-distance travel.

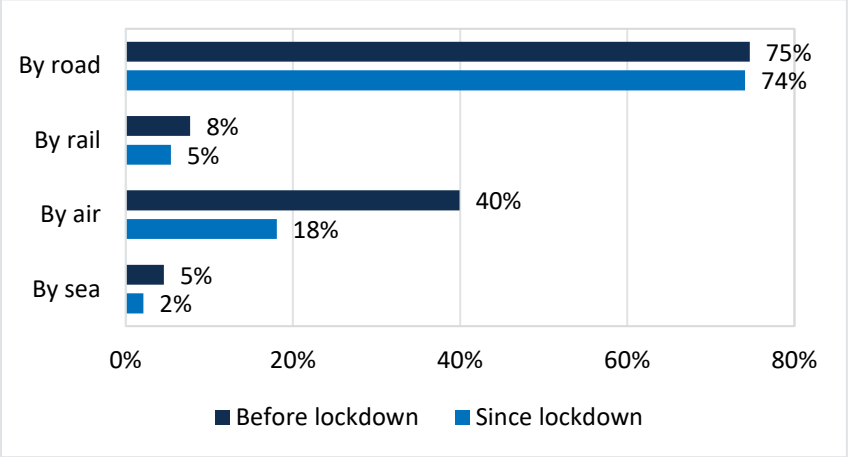


Figure 30. ZEV drivers' preference towards number of long-distance trips since lockdown.

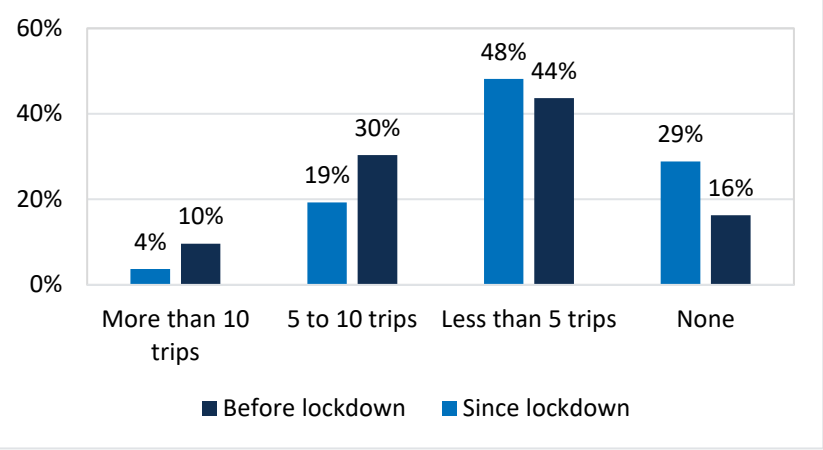
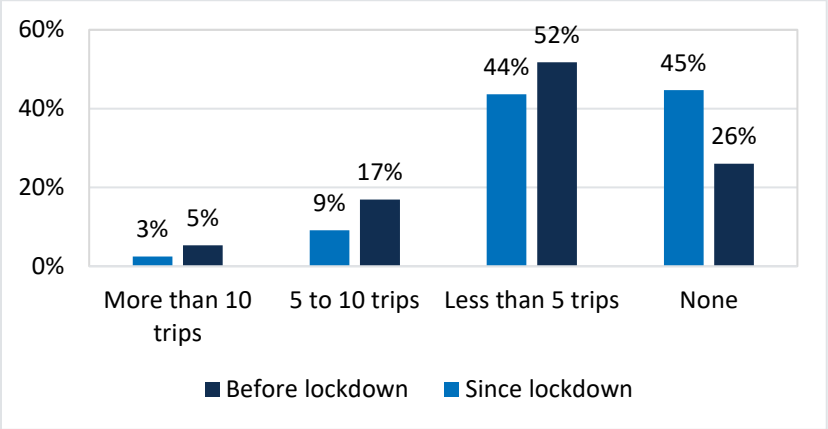


Figure 31. Non-ZEV drivers' preference towards number of long-distance trips since lockdown.



4.7 EV Incentives, Rebates and Charging Stations Awareness

72% of ZEV drivers, compared to 38% of non-ZEV drivers, were aware of any rebates available that will help reduce the purchase price for EVs. See Figure 32. Fewer non-ZEV drivers were aware of the availability of stacked incentives while purchasing or leasing an EV. See Figure 33. Both ZEV and non-ZEV drivers showed similar trends in the amount needed in rebates to consider purchasing or leasing an EV. See Figure 34. The majority of ZEV and non-ZEV drivers chose "$5,000 to $5,999" and "$10,000 or more" as top options for the minimum dollar amount for EV rebates.

Figure 32. ZEV and non-ZEV drivers' awareness of EV rebates.

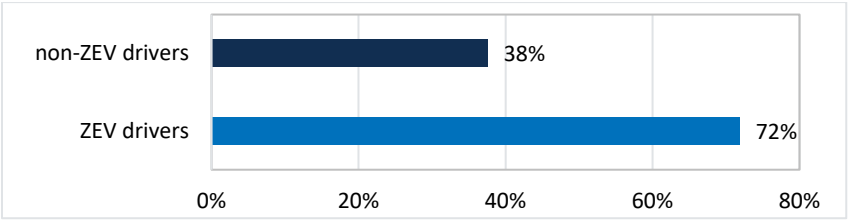


Figure 33. ZEV and non-ZEV drivers' awareness of stacked EV incentives.

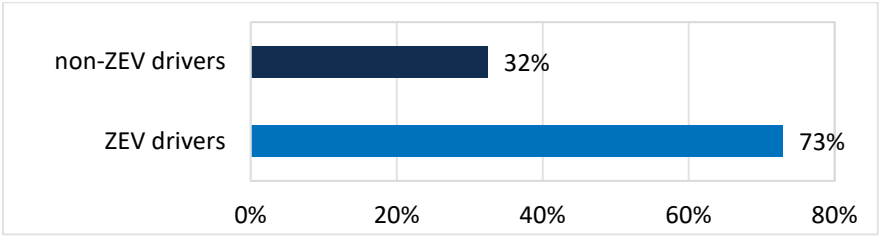
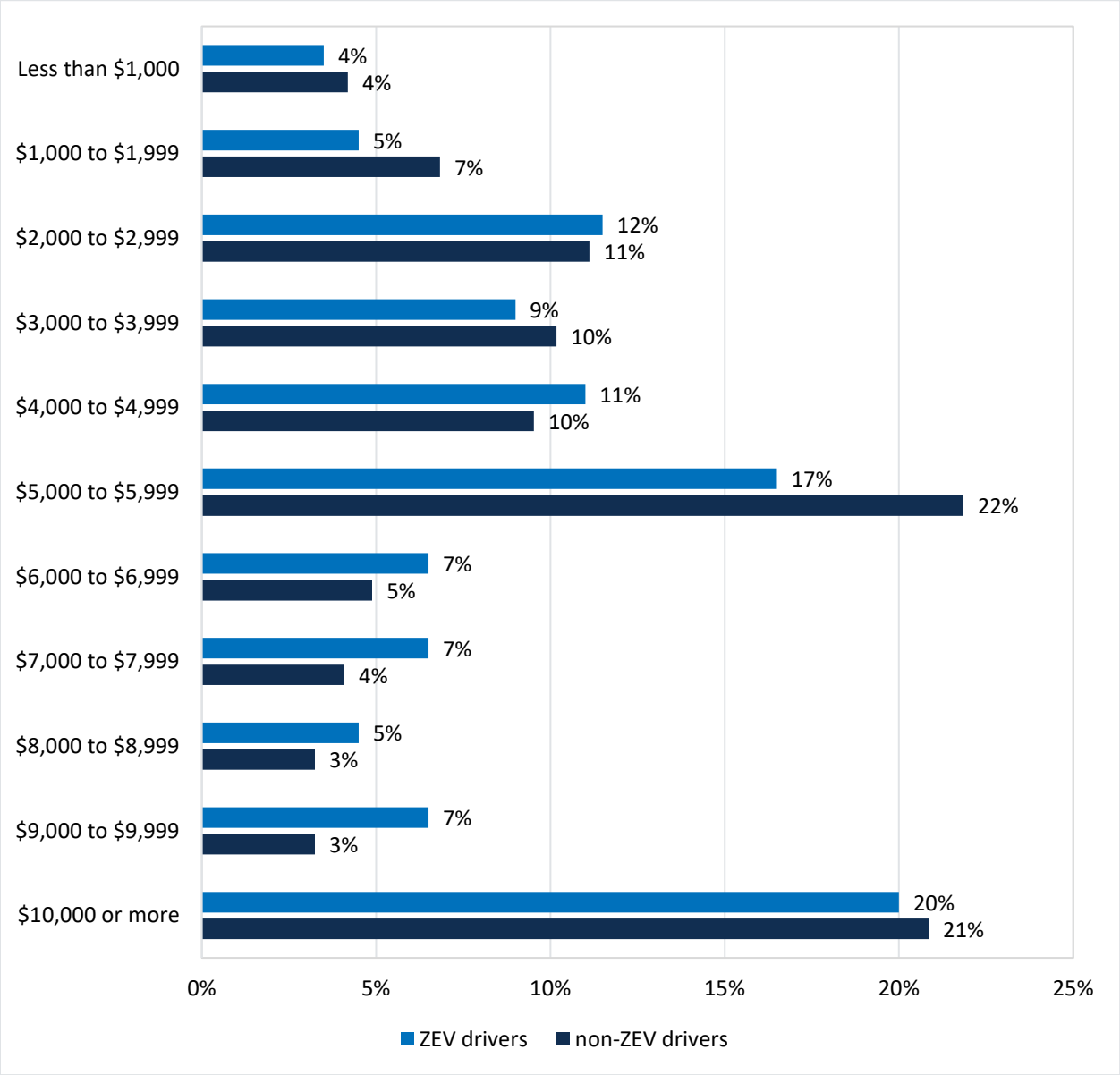
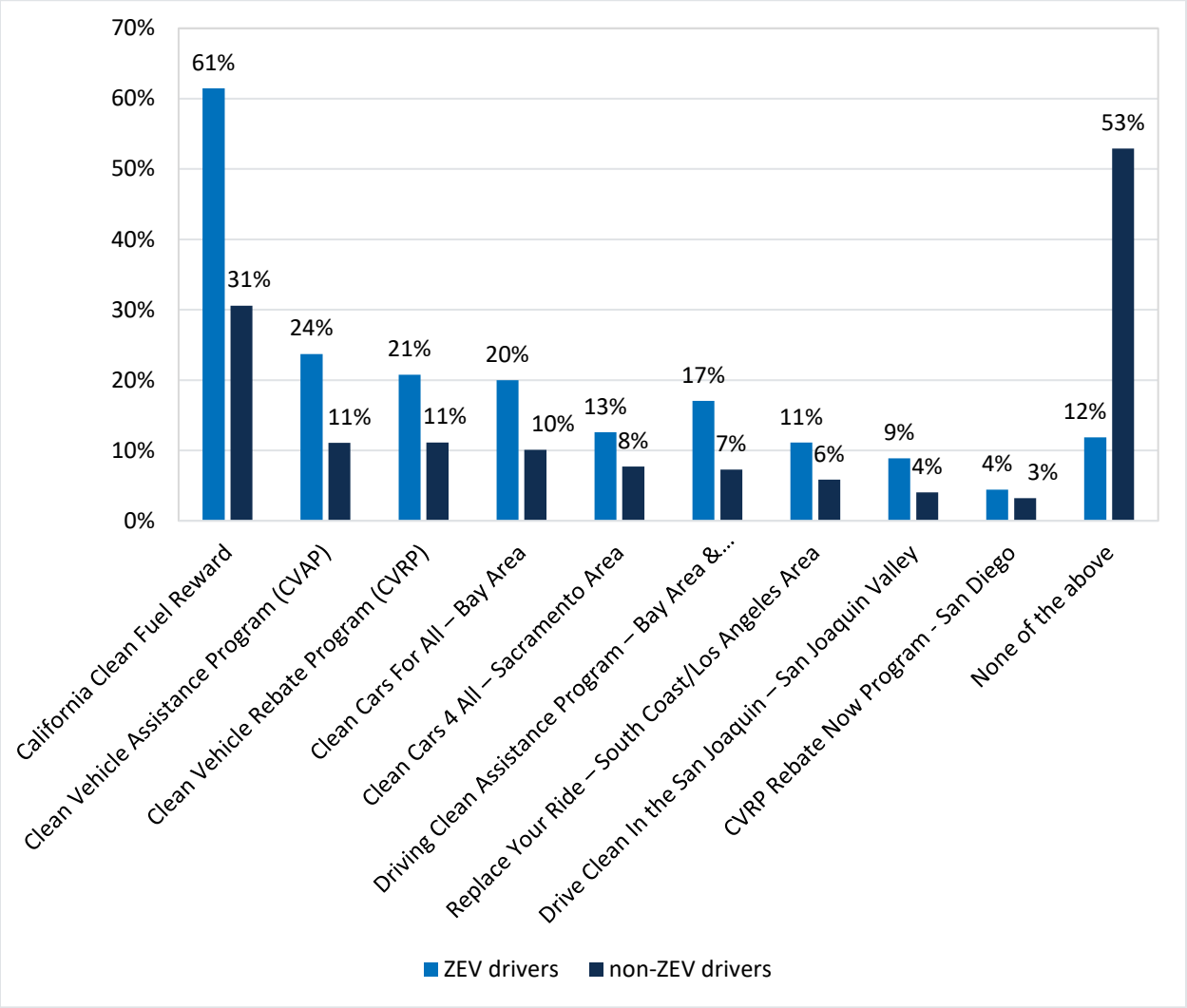


Figure 34. ZEV and non-ZEV drivers' preference towards minimum rebate dollar amount needed to acquire an EV.



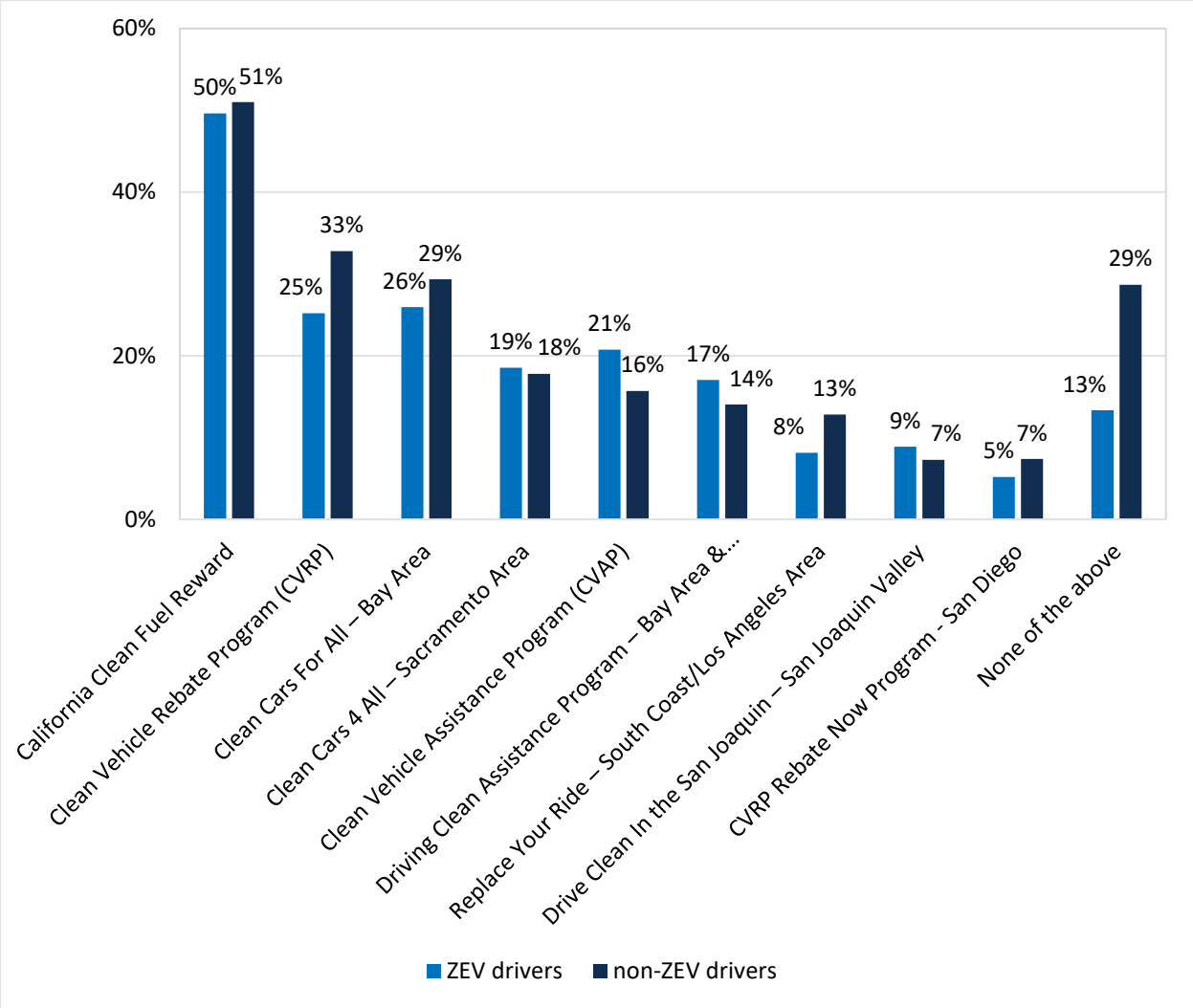
Respondents were asked about their awareness of current electric vehicle rebate and grant programs in California. They are provided with rebate and grant programs names such as California Clean Fuel Reward Program, Clean Vehicle Assistance Program (CVAP) Clean Cars For All etc., and were asked if they were aware of these programs. We assessed if ZEV and non-ZEV drivers were aware of these programs. The results showed that 61% of ZEV drivers compared to 31% of non-ZEV drivers are aware of the California Clean Fuel Reward program. The majority of non-ZEV drivers were not aware of any of the rebate or grant programs available for adopting an EV. See Figure 35. Among non-ZEV drivers who selected the program, 31% were aware of the California Clean Fuel Reward program.

Figure 35. Awareness of rebate and grant programs for ZEV and non-ZEV drivers.



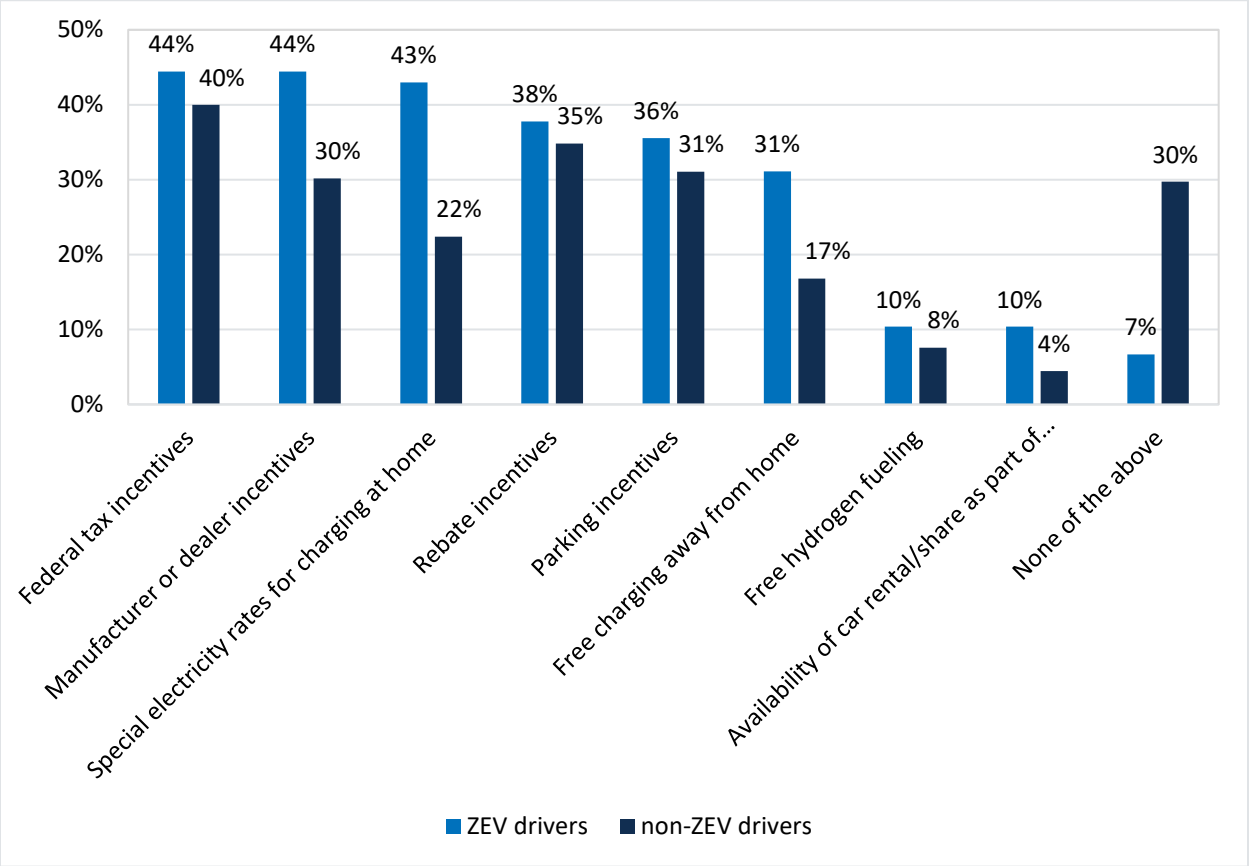
We also asked respondents if any of the EV rebate or grant programs influenced them to acquire an EV. Figure 36 shows the majority of both ZEV and non-ZEV drivers were interested in the California Clean Fuel Reward program to purchase or lease an EV. California Clean Fuel Reward, Clean Vehicle Rebate Program and Clean Cars For All – Bay Area were the top three programs that both ZEV and non-ZEV drivers were interested in purchasing or leasing an EV.

Figure 36. ZEV and non-ZEV drivers Rebate and Grant programs influence in acquiring an EV.



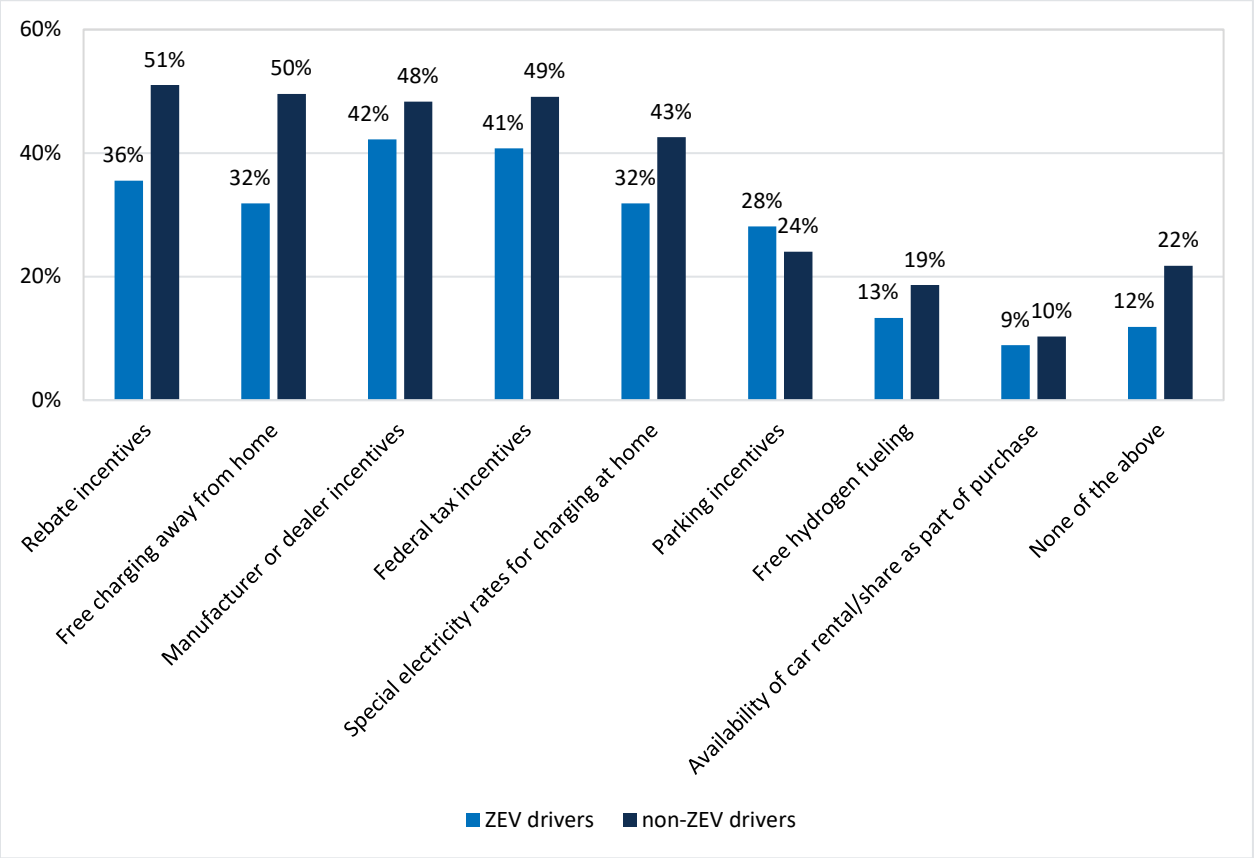
Awareness of EV incentives such as federal tax incentives, manufacturer and dealer incentives, special electricity rates etc., were assessed for both ZEV and non-ZEV drivers. The results showed that ZEV drivers were more aware of incentives compared to non-ZEV drivers. See Figure 37. The top three incentives that ZEV drivers were aware of are federal tax incentives, manufacturer or dealers incentives, and special electricity rates for charging at home. The top three incentive options that non-ZEV drivers are aware of include the federal tax incentives, state rebate incentives and parking incentives. 30% of non-ZEV drivers are not aware of any incentive options available to acquire an EV.

Figure 37. Awareness of Incentive options for ZEV and non-ZEV drivers.



We asked respondents if the current incentives available for EVs influenced them in purchasing or leasing an EV. Figure 38 shows that non-ZEV drivers were more interested in EV incentives in purchasing or leasing an EV compared to ZEV drivers. Approximately half of the non-ZEV drivers were interested in State rebate incentives, free charging away from home, manufacturer or dealer incentives and federal tax incentives. ZEV drivers were more interested in manufacturer or dealer incentives and federal tax incentives than other options.

Figure 38. ZEV and non-ZEV drivers' incentive options influence in acquiring an EV.



We evaluated ZEV drivers and non-ZEV drivers' awareness of charging stations available in their neighborhoods. Figure 39 shows that 47% of non-ZEV drivers compared to 17% of ZEV drivers are aware of no charging stations in their neighborhood. 84% of ZEV drivers are aware of one or more charging stations in their neighborhood compared to 53% of non-ZEV drivers.

Figure 39. ZEV and non-ZEV drivers' awareness of charging stations in their neighborhood.

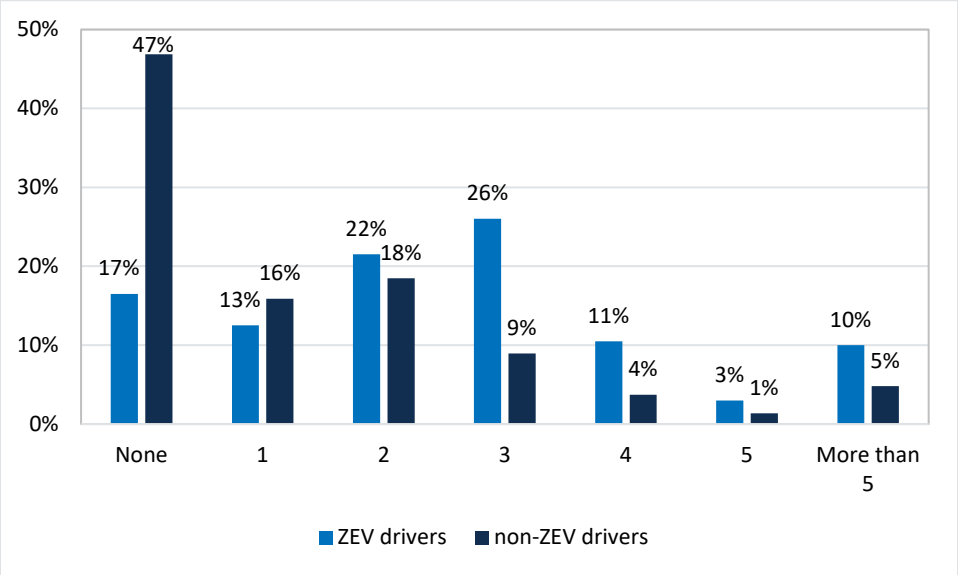
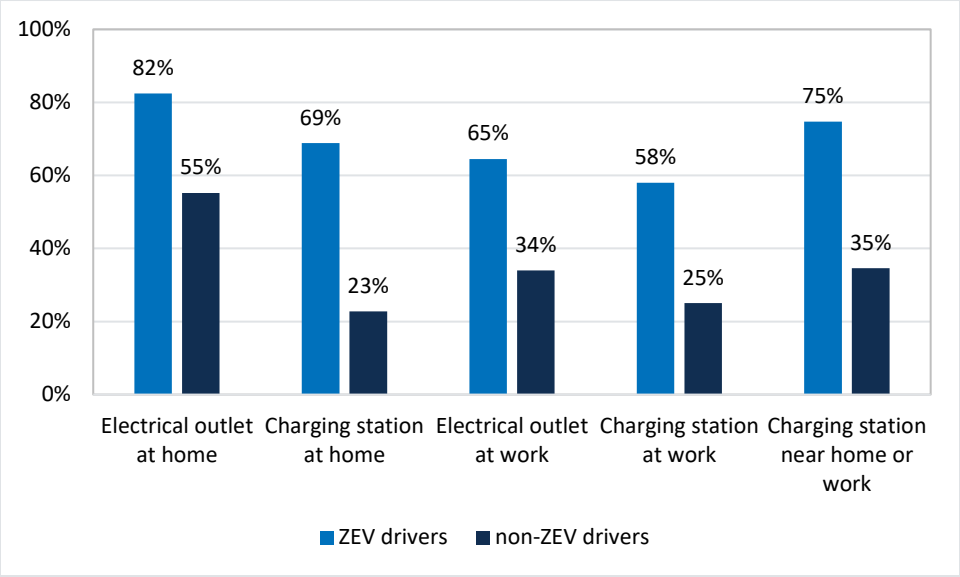


Figure 40 shows ZEV and non-ZEV drivers' access to EV charging options regardless of whether they own an EV or not. The results showed that the majority of ZEV drivers have access to an electrical outlet at home and work, a charging station at home and work, or a charging station near work or home. Less than 35% of non-ZEV drivers had access to an electrical outlet at work and a charging station at home or work.

Figure 40. ZEV and non-ZEV drivers access to EV charging options.



4.8 Environmental Concerns and Clean Technology Options

We studied environmental concerns such as air quality and the use of clean technology options such as stationary battery storage, efficient lighting etc., since lockdown. Figure 41 and Figure 42 show ZEV and non-ZEV drivers' preference to purchasing clean technology options. The majority of ZEV drivers either have considered purchasing a clean technology option or already own one compared to non-ZEV drivers who have not considered purchasing many clean technology options.

Figure 41. ZEV drivers considering purchasing clean technology options.

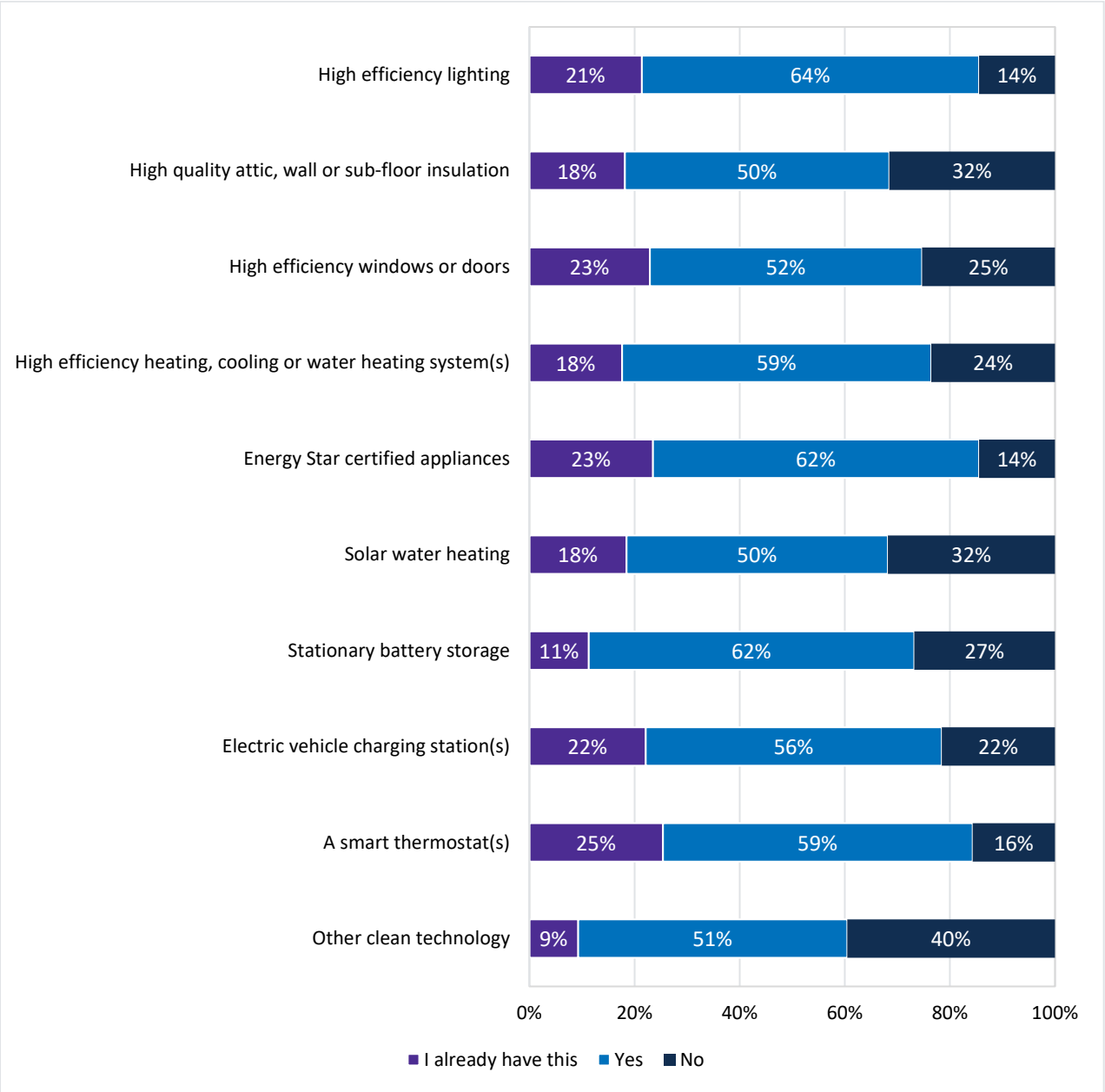
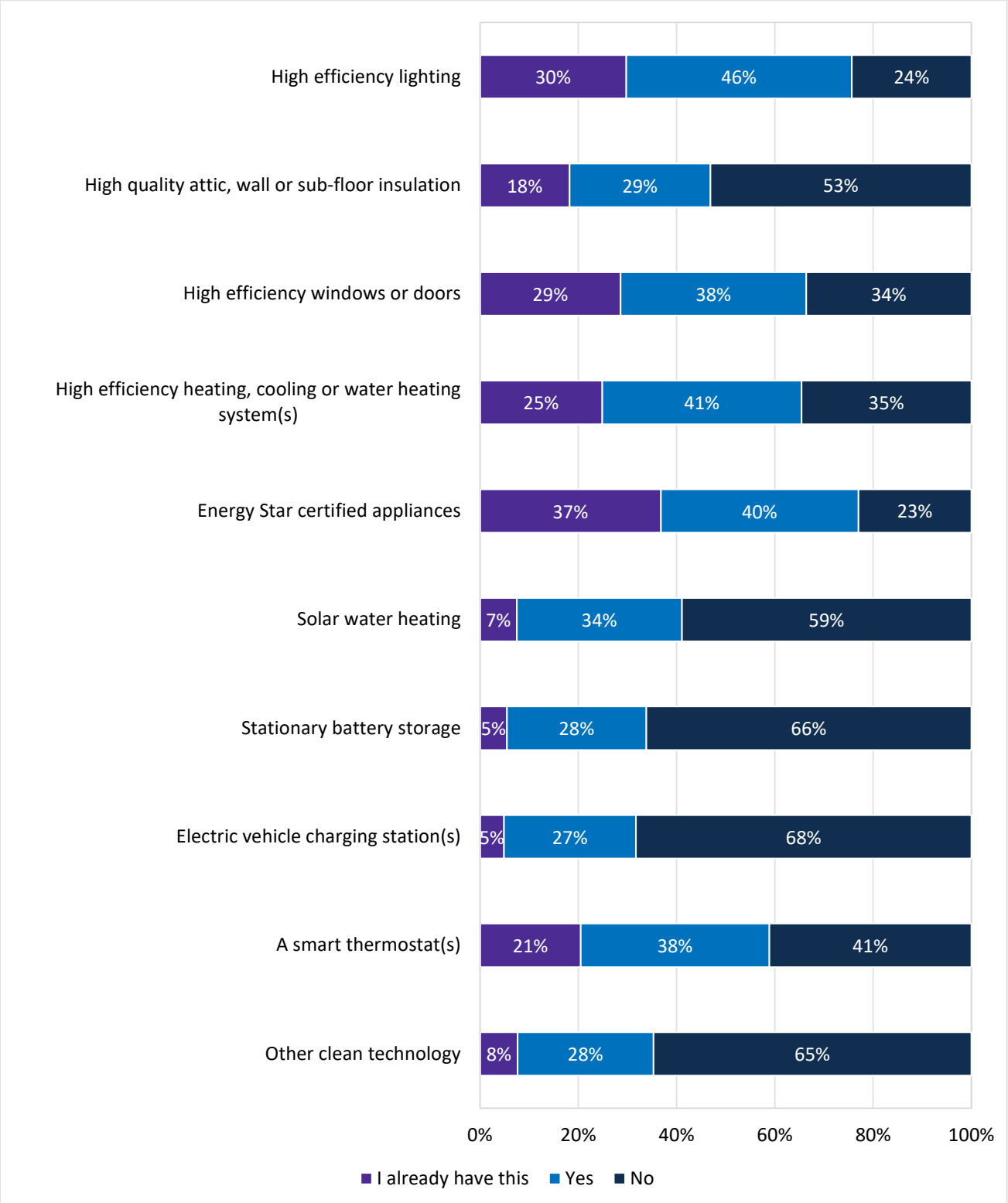
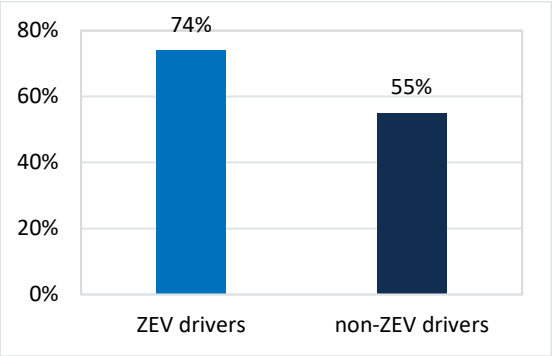


Figure 42. Non-ZEV drivers considering purchasing clean technology options.



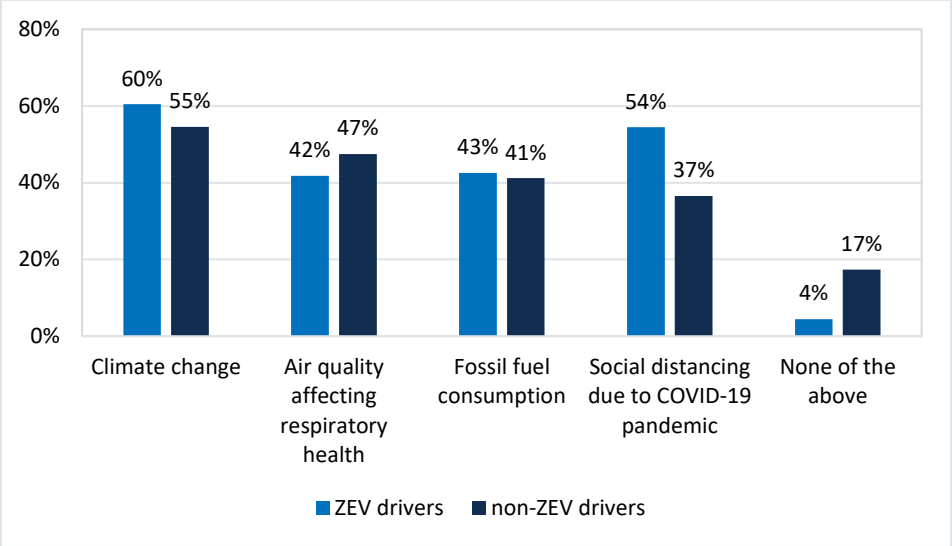
Since lockdown, due to reduced commute, and travel, we assessed ZEV and non-ZEV drivers' awareness of improvements in air quality. 74% of ZEV drivers compared to 55% of non-ZEV drivers had noticed improvements to air quality. See Figure 43.

Figure 43. Air quality improvements since lockdown.



The majority of ZEV drivers listed "Climate change" and "social distancing due to COVID-19 pandemic" as the most important health and environmental factors compared to non-ZEV drivers who listed "Climate change" and "Air quality affecting respiratory health" as top health and environmental factors they would consider when choosing a transportation option. See Figure 44.

Figure 44. Health and environmental factors importance when considering a transportation choice.



4.9 Conclusions

The analysis revealed that although COVID-19 reduced both ZEV and non-ZEV drivers' preference to acquire a vehicle, reduced long-distance travel and commute to work, it also showed that non-ZEV

drivers are more likely to consider an EV since lockdown. ZEV drivers are more likely to pay a higher price for a vehicle than non-EV drivers. ZEV drivers are more aware of EV incentives, rebates, and grant programs than non-ZEV drivers. Non-ZEV drivers are more concerned with charging costs, charging accessibility, battery range and repair costs of EVs compared to ZEV drivers. Lack of awareness and knowledge of EVs is the result of the difference between the two groups. Non-ZEV drivers also showed more inclination towards incentives that could potentially influence them in purchasing or leasing an EV. Lastly, the majority of both ZEV and non-ZEV drivers are considering the effect of climate change, air quality and social distancing during lockdown when considering a transportation choice showing that although ZEV drivers and non-ZEV drivers have different preferences in terms of automakers, body style, purchase price, non-ZEV drivers are reconsidering their transportation choices since lockdown.

4.10 Appendix

1. Survey questions under Vehicle Purchasing Preferences section in COVID-19 Impacts Survey-1
    - Prior to the shelter-in-place order, were you planning on buying or leasing a car in the next 2 years?
    - Since the shelter-in-place order, are you planning on buying or leasing a car in the next 2 years?
    - The next time you consider buying or leasing a car, what type of vehicle would you prefer?
    - The next time you consider buying or leasing a car, what fuel type(s) would you consider? [Select all that apply]
    - The next time you consider buying or leasing a car, what is the highest purchase price that you would consider in your price range?
    - The next time you consider buying or leasing a car, what automakers would you be most likely to consider?
    - The next time you consider buying or leasing a car, which three things will be the most important factors you consider when you are making a decision?
    - Prior to the shelter-in-place order, had you ever considered buying or leasing an electric vehicle (EV)?
    - Since the shelter-in-place order, how likely are you to consider an EV?
    - Regardless of whether you have ever considered an EV, to what extent would the following factors be a concern for you?
2. Survey questions under Vehicle Purchasing Preferences section in COVID-19 Impacts Survey -2
    - How has the COVID-19 pandemic changed your vehicle shopping preferences?
    - What vehicle body style(s) is your preference for your next purchase or lease? [Select all that apply]
    - The next time you consider acquiring a vehicle, what fuel type(s) would you consider? [Select all that apply]
    - What is the maximum down payment you are willing to put towards your next vehicle?
    - The next time you are considering purchasing a vehicle, what is the maximum total price you are willing to pay?
    - The next time you are considering purchasing and financing a vehicle, what is your preferred maximum monthly payment?
    - The next time you are considering leasing a vehicle, what is your preferred maximum monthly payment?
3. Survey questions under Commute and Travel Preferences section in COVID-19 Impacts Survey-1
    - As the state re-opens, how do you anticipate your transportation decisions will change?
4. Survey questions under Commute and Travel Preferences section in COVID-19 Impacts Survey-2

- Since the COVID-19 pandemic (March 2020 onwards), how often do you use the following transportation choices when compared to pre-pandemic for commuting and/or travel?
- Prior to the COVID-19 pandemic (March 2019-February 2020), what were your preferred modes of long-distance travel? [Select all that apply]
- Since the COVID-19 pandemic (March 2020 onwards), what are your preferred modes of long-distance travel? [Select all that apply]
- In the 12 months prior to COVID-19 pandemic (March 2019-February 2020), how many long-distance trips by road did you take?
- Since the COVID-19 pandemic (March 2020 onwards), how many long-distance trips by road have you taken?
- Which of the following best describes the change in miles you have driven per week since the start of the COVID-19 pandemic (March 2020 onwards)?
- Which of the following best describes the change in miles you drive for a long-distance road trip since the start of the COVID-19 pandemic?

5. Survey questions under EV Incentives, Rebates and Charging Stations Awareness section in COVID-19 Impacts Survey-1
    - Are you aware of rebates available to lower the purchase price of an EV?
    - What minimum dollar amount would a rebate need to be to make you more likely to consider buying or leasing an EV?
    - Approximately how many EV charging stations have you noticed in your neighborhood?
    - Regardless of whether or not you have an EV, do you have easy access to any of the following EV charging options?
6. Survey questions under EV Incentives, Rebates and Charging Stations Awareness section in COVID-19 Impacts Survey-2
    - Are you aware that many of these incentives can be combined (stacked) to lower the vehicle cost?
    - Which of the following incentives available for adopting electric vehicles are you currently aware of? [Select all that apply]
    - Which of the following rebate or grant programs available for adopting electric vehicles are you aware of? [Select all that apply]
    - Which incentive(s) would make you more interested in acquiring an electric vehicle? (non-EV owners) [Select all that apply]
    - Which rebate or grant program(s) would make you more interested in acquiring an electric vehicle? (non-EV owners) [Select all that apply]
    - Which incentive(s) influenced you to acquire an electric vehicle? (EV Owners) [Select all that apply]
    - Which rebate or grant program(s) influenced you to acquire an electric vehicle? (EV Owners) [Select all that apply]

7. Survey questions under Environmental Concerns and Clean Technology Options" section in COVID-19 Impacts Survey-1
    - Have you noticed improvements in the air quality since the shelter-in-place order went into effect?
    - Have you considered purchasing these clean technology options for your home?
8. Survey questions under Environmental Concerns and Clean Technology Options section in COVID-19 Impacts Survey-2
    - Which of the following health and environmental factors are important to you when considering your transportation choices? [Select all that apply]

Table 16. ZEV and non-ZEV driver preference towards vehicle automakers.

Automakers	ZEV drivers	non-ZEV drivers
Tesla	30%	11%
BMW	29%	16%
Toyota	19%	32%
Audi	16%	9%
Ford	14%	16%
Honda	14%	24%
Chevrolet	12%	13%
Lexus	12%	8%
Mercedes-Benz	10%	6%
Hyundai	9%	9%
Nissan	8%	10%
Volkswagen	8%	4%
Acura	6%	5%
Subaru	5%	10%
Jeep	4%	6%
Volvo	4%	2%
Buick	4%	2%
Mitsubishi	4%	2%
Cadillac	3%	3%
Dodge/RAM	3%	5%
Mazda	3%	6%
Infiniti	3%	3%
Jaguar	3%	1%
Kia	3%	7%
Chrysler	2%	2%
Fiat	2%	2%

GMC	2%	4%
MINI	2%	2%
Lincoln	1%	2%
Other	1%	2%

5. CVRP Lease Behavior During COVID-19

Madelyn Stafford and Ben MacNeille

5.1 Purpose

California's CVRP provides consumer rebates for the purchase or lease of new clean vehicles. More than 419,000 CVRP rebates have been distributed since the first application in 2010.[62] In total, 45% of CVRP rebates have been used for leased vehicles, while the remainder has been for purchased vehicles. This high lease rate is partly due to higher rates seen towards the initial inception of CVRP in 2010, and lease rates have been dropping throughout the years. Overall, it is higher than the industry average for new vehicle acquisition, which was 31% for Q4 in 2019. This industry average rate dropped to 27% in Q2 of 2020 when the COVID-19 pandemic began and was 26% at the end of Q2 in 2021.[63] Similarly, lease rates among CVRP applicants have been substantially lower in recent years, falling to 23% in 2020 and to 25% for the first half of 2021.

To understand current CVRP lease and purchase trends, it is important to discuss the general reasoning behind why consumers may prefer to lease instead of purchase an EV. Key factors include unfamiliarity with EV technology, the rapid advancement of EVs, the declining costs of EVs and the lower down and monthly payments for leasing compared to financing a new vehicle. As EVs have advanced in the past decade, so has familiarity with these vehicles and their technology. With more EV options, reduced battery costs, longer range, improved perceptions of reliability, and better overall operating experience, EV consumers may prefer to purchase vehicles rather than lease, especially for certain vehicle makes.

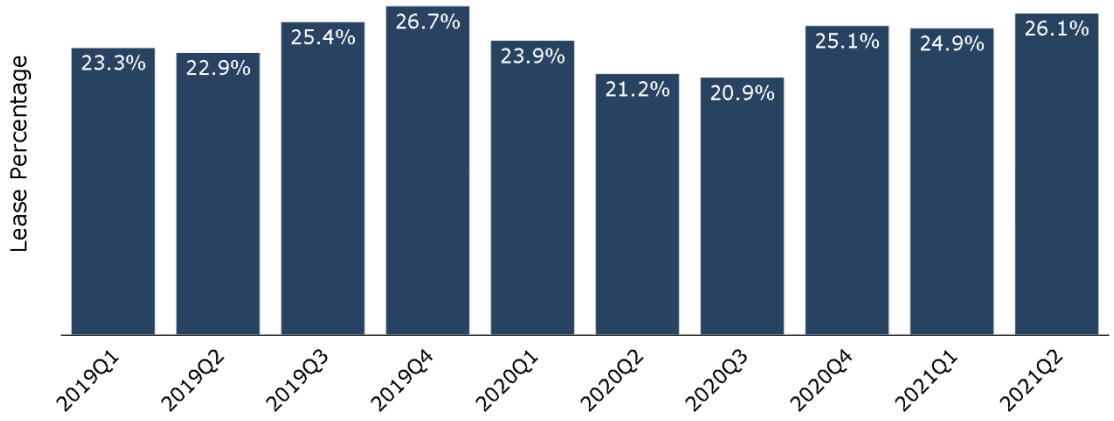
The purpose of this report is to understand the demographics and behaviors of CVRP rebate recipients that leased vehicles leading up to and during the COVID-19 pandemic and the resulting economic conditions. In this report, the period through January 2019 and February of 2020 is considered Pre-COVID-19, and the period between March of 2020 and the end of June of 2021 is considered COVID-19. This report also focuses on LMI income applicants, whose leasing choices are more likely to be indicative of the monetary and reliability perceptions previously described. To be considered LMI, participants must have a household income at or below 300% FPL.

[62] Center for Sustainable Energy. (2020). *CVRP Rebate Statistics.* Data last updated September 28, 2021. Retrieved October 15, 2021, from https://cleanvehiclerebate.org/rebate-statistics.
[63] Norrestad, F. (2021, September 3). *Percentage of Newly-Bought Vehicles on Lease in the United States from 1st Quarter of 2017 to 2nd Quarter of 2021.* Statista. Retrieved October 10, 2021, from https://www.statista.com/statistics/453122/share-of-new-vehicles-on-lease-usa/.

5.2 Recent CVRP Leasing Trends

CVRP applications allocated to leased vehicles by quarter fluctuated between 20%-27% throughout 2019, 2020 and Q2 of 2021, as shown in Figure 45. The lowest fiscal quarters in this period were observed in Q2 and Q3 of 2020, at 21.2% and 20.9%. In Q4 of 2020, the percentage of CVRP applications allocated to leased vehicles increased after a prior decrease during the beginning of the COVID-19 pandemic. In 2021, an increase in rates is observed for both quarters when comparing them to 2019 and 2020.

Figure 45. The percentage of CVRP applications used for leases by fiscal quarter.



During COVID-19, many car companies and financial institutions began to offer low lease and financing interest rates on new cars to incentivize customers and help combat the drop in sales experienced during the pandemic. Average year-over-year loan interest rates decreased in Q2, Q3 and Q4 of 2020. The biggest decrease in rates was observed in Q2 of 2020, hovering around -1.0% depending on the candidate's credit scores compared to the same quarter in 2019. By Q2 of 2021, rates started to increase slightly compared to those observed in 2020. In Q2 of 2021 rates increased 0.16% for candidates with prime credit scores. However, these lower loan interest rates observed during COVID-19 did not appear to strongly affect lending sentiment for CVRP applicants during the COVID-19 pandemic.[64]

[64] Experian Information Solutions Inc. (2021). *State of the Automotive Finance Market.* Experian. Retrieved November 16, 2021, from https://www.experian.com/automotive/automotive-credit-webinar.

Another factor to consider, besides COVID-19, for the increase in lease percentage through 2019 and subsequent decrease through Q3 of 2020, is the variation in Tesla's share of total CVRP applications; Tesla vehicles comprise between 45%-70% of CVRP applications in each quarter. Tesla vehicles are overwhelmingly purchased rather than leased, and the high percentage of Tesla vehicles impacts the overall split between leased and purchased vehicles. This high purchase rate observed for Tesla vehicles since the inception of CVRP in 2010 can be partially attributed to the fact that Tesla delayed offering leasing options for most of their models. For example, Tesla released the Model 3 in Q3 2017, but it was not available for lease until Q3 of 2019. The Model 3 had the largest share of CVRP applications for a single vehicle during the Pre-COVID-19 and COVID-19 period examined in this report.

Tesla's delayed offers for lease options could have served as a barrier for some customers and may help explain the tendency to purchase instead of lease these vehicles. To provide greater insights, we also analyze smaller market players who experienced interesting trends throughout the analysis period. These trends will be explored in greater detail in the following sections.

5.3 CVRP Leasing Populations

CVRP rebate applicants belong to either Increased Rebate or Standard Rebate eligibility groups. The Increased Rebate group is comprised only of LMI applicants, who are defined as having household income less than or equal to 300% FPL.[65] The Standard Rebate group is above the 300% FPL income threshold and below CVRP income caps. The household income criteria for LMI individuals receiving an Increased Rebate changed from being less than or equal to 300% FPL to less than or equal to 400% FPL on January 27th of 2021. For this report, only participants less than or equal to 300% FPL were included in our analysis for LMI participants. This was done to maintain congruency in data and the groups while analyzing LMI participants from 2019 until the end of Q2 in 2021.

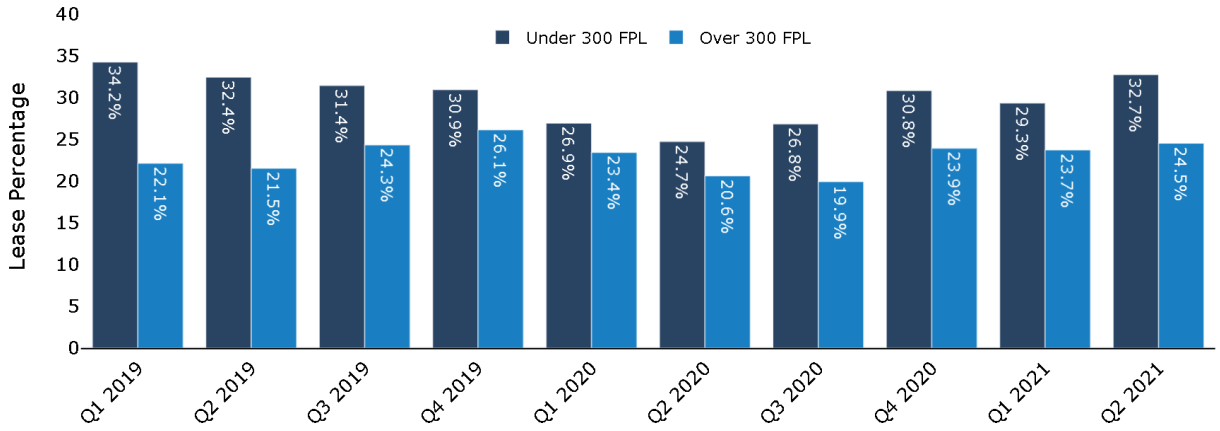
Increased Rebate recipients were more likely to lease vehicles, which have lower monthly payments than the Standard Rebate group across all quarters analyzed, as shown in Figure 46. The Increased Rebate group also had a general trend of decreasing towards lower lease percentages in consecutive quarters up until Q2 of 2020. Starting in Q3 of 2020, the general trend for Increased Rebate recipients shifts and begins to increase. There was a slight decrease between Q4 in 2020 and Q1 in 2021 of -1.5%. For the Standard Rebate group, their lease percentages fluctuated throughout this period. This group saw a general increase in 2019 towards higher leasing rates. From Q4 in 2019 until Q3 of 2020, the Standard Rebate group's lease rate decreased.

It is interesting to note that the onset of the COVID-19 pandemic coincides with the positive shift towards higher leasing rates for the Increased Rebate group. The COVID-19 pandemic created financial

[65] Center for Sustainable Energy. (2020). *CVRP Eligibility Guidelines: Income Eligibility.* Retrieved March 21, 2022, from https://cleanvehiclerebate.org/eng/eligibility-guidelines.

hardships for many, and it could be possible that this factor may have influenced participants when they considered leasing instead of purchasing since leasing a vehicle typically requires lower monthly payments.

Figure 46. The percentage of CVRP applications used for leases by rebate type and fiscal quarter.



5.4 Defining COVID-19 Economic Conditions

COVID-19 economic conditions are defined here by year-over-year comparisons of monthly CVRP application totals between 2019, 2020 and the first half of 2021. These comparisons are in the context of stringent health regulations and subsequent economic fallout, including greater unemployment and reduced purchasing. Total CVRP applications increased slightly in February 2020 compared to February 2019. However, year-over-year comparisons between March 2020 and February 2021 decreased. While the volume of total applications began increasing in June 2020, the year-over-year decline in leases continued until March 2021.

The drop in CVRP applications in March and April of 2020 aligned with several COVID-19 responses locally and nationally throughout that time. California's COVID-19 response occurred on March 4 when Governor Newsom declared a State of Emergency, followed by the national declaration of emergency on March 13. On March 12, the DOW Jones Industrial Average experienced the largest drop since 1987, and on March 16, the DOW experienced its largest-ever drop on record. On March 19, statewide shelter-in-place took effect in California. California did not fully reopen until July 15 of 2021, when restrictions such as physical distancing, capacity limits and other executive orders were lifted.

Based on CVRP data and contextual evidence, we consider March 2020 as the critical timepoint marking the onset of COVID-19 economic conditions. While the months from June through December 2020 experienced an increase in total applications, they are still markedly lower than in 2019. See Table 17. COVID-19 economic conditions negatively impacted application volumes. In March of 2021, we began to see a positive percentage change in CVRP applications when comparing year-over-year growth.

Table 17. Change in monthly CVRP applications, 2020 to June 2021.

Month	CVRP Applications	Percent Change (Year/Year)
Jan-2020	5208	-23.4%
Feb-2020	4796	0.8%
Mar-2020	4203	-35.3%
Apr-2020	2036	-72.1%
May-2020	1760	-71.8%
Jun-2020	2602	-57.3%
Jul-2020	3128	-36.6%
Aug-2020	2503	-44.2%
Sep-2020	3399	-33.3%
Oct-2020	3894	-32.8%
Nov-2020	3728	-35.6%
Dec-2020	5514	-2.0%
Jan-2021	4671	-10.3%
Feb-2021	3439	-28.3%
Mar-2021	7255	72.6%
Apr-2021	6186	203.8%
May-2021	2952	67.7%
June-2021	3555	36.6%

Throughout this report, we compare the period of COVID-19 economic conditions (EC) from March 2020 to June 2021 to the preceding Pre-COVID-19 EC analysis period of January 2019 to February 2020.

5.5 LMI Lessee Demographics during COVID-19 Economic Conditions

There was a 2.5% decrease in lease percentages among LMI CVRP applicants from the Pre-COVID-19 period compared to the COVID-19 EC period, as shown in Figure 47.

Figure 47. Heatmap of lease percentage among LMI applicants below 300% FPL Pre-COVID-19 EC vs. COVID-19 EC. See table below for information without color background.

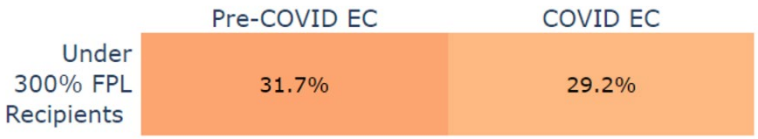


Table 18. Lease percentage among LMI applicants below 300% FPL Pre-COVID-19 EC vs. COVID-19 EC.

	Pre-COVID-19 EC	COVID-19 EC
Under 300% FPL Recipients	31.7%	29.2%

To understand which groups were more affected by the COVID-19 EC period, Figure 48 shows the breakdown of LMI CVRP applicants by gender, ethnicity, race and age. While both female and male applicants leased less during COVID-19 EC, the decrease was greater among females, who leased -4.3% less than the Pre-COVID-19 EC. In comparison, there was a -1.4% decrease among males. Hispanic or Latino applicants leased less during COVID-19 EC, but with a smaller decrease at -4.1% compared to the LMI group.

When comparing Pre-COVID-19 EC to COVID-19 EC within age groups, only three age groups of LMI participants saw an increase. The 16-20 age group saw the largest increase at 9.5% between the two periods, making this group the highest lease percentage out of all ages for COVID-19 EC. The 60-69 and 70-79 age groups also saw slight increases. The largest decrease was in the 80+ group, which exhibited a large drop of -16.2%. The 80+ age group had the highest leasing rate Pre-COVID-19 EC but fell to the second-highest during the COVID-19 EC period.

Reductions in lease percentages after the onset of COVID-19 varied by race. Only two groups, Middle Eastern or North African and White or Caucasian, saw a slight increase for the COVID-19 EC period. The other eight race groups decreased. The most notable decreases were among the Native Hawaiian or Pacific Islander group with a drop of -9.0%, the East Asian group with -7.5% and the two or more races group with -5.5%. The highest lease rates by race group for the COVID-19 EC period were Middle Eastern or North African at 46.8%, White or Caucasian at 37.1% and American Indian or Alaskan Native at 32.8%. These groups also had the top three highest lease rates Pre-COVID-19 EC, in the same order.

Groups 2% or more below the average LMI lease rate of 29.2% during the COVID-19 EC period were the Native Hawaii or Pacific Islander group at 14.4%, the Southeast Asian group at 16.6%, the Hispanic or Latino group at 24.1%, the South Asian group at 25.3%, the East Asian Group at 25.4%, and the 21-29 group at 26.4%.

Groups 2% or more above the average LMI lease rate of 29.2% during the COVID-19 EC period were the Middle Eastern or North African group at 46.8%, the 16-20 age group at 40.3%, the 80+ group at 37.1%, the White or Caucasian group at 37.1%, the 70-79 group at 36.1%, the Native American or Alaskan Native group at 32.8% and the 60-69 group at 32.7%.

Figure 48. LMI Demographics Lease Percentage Pre- and Post-COVID-19 EC. See table below for information without color background.

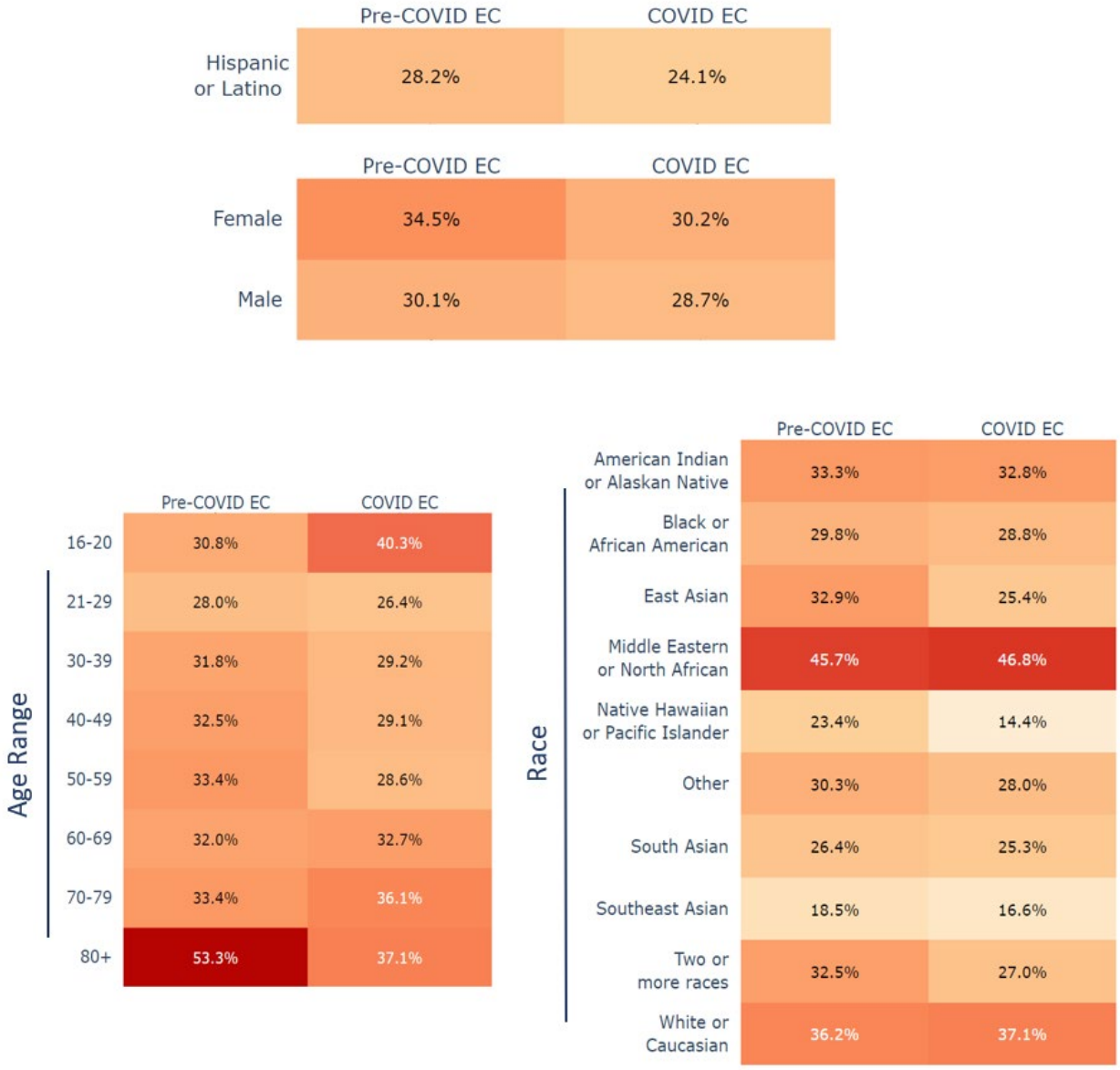


Table 19. LMI Demographics Lease Percentage Pre-COVID-19 EC and Post-COVID-19 EC.

	Pre-COVID-19 EC	**COVID-19 EC**
Hispanic or Latino	28.2%	24.1%

	Pre-COVID-19 EC	**COVID-19 EC**
Female	T34.5%	30.2%
Male	30.1%	28.7%

	Pre-COVID-19 EC	COVID-19 EC
Ages 16-20	30.8%	40.3%
21-29	28.0%	26.4%
30-39	31.8%	29.2%
40-49	32.5%	29.1%
50-59	33.4%	28.6%
60-69	32.0%	32.7%
70-79	33.4%	36.1%
80+	53.3%	37.1%

	Pre-COVID-19 EC	COVID-19 EC
American Indian or Alaskan Native	33.3%	32.8%
Black or African American	29.8%	28.8%
East Asian	32.9%	25.4%
Middle Eastern or North African	45.7%	46.8%
Native Hawaiian or Pacific Islander	23.4%	14.4%
Other	30.3%	28.0%
South Asian	26.4%	25.3%
Southeast Asian	18.5%	16.6%
Two or more races	32.5%	27.0%
White or Caucasian	36.2%	37.1%

5.6 LMI Vehicle Make and Model Tendencies

We analyzed LMI CVRP applications for each vehicle make and model and whether these applications were for leased or purchased vehicles. The percentage of Tesla vehicle applications grew from 8.1% Pre-COVID-19 EC to 13.1% for leased vehicles during the COVID-19 EC period and 41.4% to 54.3% for total applications. Teslas are leased at much lower rates than other models and comprise a substantial portion of all CVRP vehicles. Because of this, the amount of Tesla vehicles in the CVRP application pool can have a strong effect on lease and purchase trends.

Vehicle manufacturers Honda, BMW and Ford also contributed to the lower lease percentage during COVID-19 EC, as both their market share and lease percentage decreased substantially compared to Pre-COVID-19 EC. See Table 20. Contrary to this trend Chevrolet, Hyundai and Kia saw increases in lease percentage, while maintaining market share post-COVID. Toyota and Nissan saw an increase during COVID-19 EC for lease percentage, but also saw a decrease in market share.

Table 20. CVRP application share and lease percentage before and during COVID-19 EC by vehicle make.

Vehicle Make	CVRP Applications Pre-COVID	Percentage of Total CVRP Applications during COVID	Percentage of Total CVRP Applications Delta	Percentage of Total CVRP Applications during COVID	Percentage of Vehicles Leased during COVID	Percentage of Vehicles Leased Delta
Tesla	41.4%	54.3%	12.9%	8.1%	13.1%	5.0%
Toyota	18.9%	14.9%	-4.0%	24.9%	25.4%	0.5%
Honda	10.2%	5.7%	-4.5%	45.1%	23.5%	-21.6%
Chevrolet	8.3%	12.4%	4.1%	57.0%	73.8%	16.8%
BMW	4.4%	0.9%	-3.5%	97.3%	91.9%	-5.4%
Hyundai	3.5%	3.9%	0.4%	54.3%	71.5%	17.2%
Nissan	2.9%	1.5%	-1.4%	64.6%	66.7%	2.1%
Ford	2.5%	1.2%	-1.3%	79.9%	40.8%	-39.1%
Kia	2.4%	2.8%	0.4%	56.0%	69.6%	13.6%

Looking at specific vehicle models in the Tesla Model 3 was the most popular vehicle among LMI applicants during the COVID-19 EC period, comprising 33.1% of all CVRP applications. The Tesla Model 3 had a low lease rate of 12.3%, which was an increase from the 7.3% lease percentage observed Pre-COVID-19 EC. The Tesla Model Y was the second most popular vehicle at 21.2% of total CVRP applications for the COVID-19 EC period and had a low lease rate of 14.2%. The Tesla Model Y was a new market entrant in the COVID-19 EC period. The Chevrolet Bolt EV was the third most popular vehicle, with a 12.3% COVID-19 EC share, and went from a 56.8% lease rate Pre-COVID-19 to 74.1% COVID-19 EC. The Toyota Prius Prime rounded out the top four CVRP-rebated vehicles with an 11.4% market share during the COVID-19 EC period, 21.5% of which were leases.

Table 21. CVRP application share and lease percentage before and during COVID-19 EC by vehicle model.

Vehicle Model	Percentage of Total CVRP Applications Pre-COVID	Percentage of Total CVRP Applications during COVID	Percentage of Total CVRP Applications Delta	Percentage of Total CVRP Applications during COVID	Percentage of Vehicles Leased during COVID	Percentage of Vehicles Leased Delta
Tesla Model 3	39.3%	33.1%	-6.2%	7.3%	12.3%	5.0%
Tesla Model Y	N/A	21.2%	N/A	N/A	14.2%	N/A
Chevrolet Bolt EV	6.7%	12.3%	5.6%	56.8%	74.1%	17.3%
Toyota Prius Prime	16.0%	11.4%	-4.6%	11.4%	21.5%	10.1%
Honda Clarity PHEV	9.1%	5.3%	-3.8%	38.7%	17.8%	-20.9%
Toyota Mirai Fuel Cell	2.9%	2.5%	-0.4%	98.7%	48.9%	-49.8%
Kia Niro Electric	0.6%	1.6%	1.0%	54.0%	80.1%	26.1%
Hyundai Kona Electric	1.0%	1.5%	0.5%	34.7%	80%	45.3%
Hyundai Ioniq PHEV	1.1%	1.2%	0.1%	37.8%	37.8%	0.0%
Kia Niro Plug-in Hybrid	1.6%	1.1%	-0.5%	53.8%	55.8%	2.0%

Chrysler Pacifica Hybrid	1.0%	1.0%	0.0%	17.0%	9.2%	-7.8%
Toyota RAV4 Prime	N/A	1.0%	N/A	N/A	11.9%	N/A
Hyundai Ioniq Electric	0.9%	0.9%	0.0%	86.8%	92.9%	6.3%

5.7 Conclusions

Nearly half (45%) of CVRP rebates have been applied to leased vehicles during the history of CVRP, a higher figure than the overall industry average. However, in recent years the CVRP lease rates have been decreasing. Understanding the motivations behind lease preferences of EVs could be a focus of future research. The findings in this analysis also reveal how vehicle acquisition preferences relate to make and model choice. Led by increases in CVRP applications for Tesla vehicles and COVID-19 impacts, the percentage of CVRP applications for leased vehicles was lowest for both LMI and Standard Rebate participants in Q2 and Q3 of 2020. The lowest lease percentage observed since the beginning of COVID-19 EC was for Standard Rebate participants in Q3 2020 at 19.9%. The low lease rates observed in both the standard and LMI groups may be due to a variety of consumer and supply-side factors throughout various stages of the pandemic.

Higher lease rates for the LMI population versus the Standard Rebate pool were noted in all quarters of the analysis period. The LMI population leased vehicles at 24.7% and 26.8% during Q2 2020 and Q3 2020, which were the lowest rates observed for the LMI group. During this time, LMI participants had been 6.3% more likely to lease their vehicles than other program participants. This aligns with the previous trend of LMI individuals' greater affinity for leasing.

The decrease in leasing percentages with LMI participants during COVID-19 EC has been common to most ethnicities, races, genders, and age groups, apart from those who identify as Middle Eastern or North African, White or Caucasian, are 16-20 years old, 60-69 years-old and 70-79 years old.

Leasing tendencies clearly vary by make and model, with applicants preferring to purchase Tesla vehicles at a much higher rate (nearly 87%) than other vehicles. The changes in vehicle lease rates during COVID-19 EC varied widely, with some makes' lease rates increasing. Hyundai saw a lease increase for COVID-19 EC of 17.2%. At the other end of the spectrum, Ford, Honda and Nissan lease rates decreased by 39.1%, 21.6% and 5.4%.

CVRP application volume decreased tremendously during the COVID-19 EC period from March 2020 to the end of February 2021, as did popular CVRP makes and models. These outcomes are due to a combination of economic uncertainty, greater levels of unemployment, concerns about contracting COVID-19 from others, and a variety of other factors throughout the COVID-19 EC period. How lease behavior is related to CVRP participation changes during COVID-19 EC is an area of active research that the findings here will help inform.

6. CVRP Priority Population Participation During COVID-19

Madelyn Stafford and Ben MacNeille

6.1 Purpose

This report identifies trends observed in priority California CVRP applicants and LMI applicants leading up to and during the COVID-19 pandemic. We consider the period of January 2019 through February 2020 the Pre-COVID-19 economic period, and March 2020 through the end of June 2021 the COVID-19 economic period. During the COVID-19 economic period, 38.2% of CVRP's rebates were used by those in a priority population, as opposed to 31.8% in the Pre-COVID-19 period.

CVRP provides consumer rebates for the purchase or lease of new clean vehicles. More than 419,000 CVRP rebates have been distributed since the first application in 2010.[66] During the lifetime of CVRP, programmatic policies have been enacted to better reach populations of interest. Priority populations are defined by California Climate Investments (CCI) as those that are economically disadvantaged, exposed to multiple sources of pollution, or are especially vulnerable to the effects of pollution and a changing climate. CVRP provides funds to priority applicants that reside in designated communities and income brackets who may face increased barriers to EV adoption. In 2019, 31.7% of CVRP applicants were in a priority population. In 2020, the share of priority population applicants increased to 35.1%, and for the first half of 2021, the share increased to 41%. Applicants in priority populations have experienced an overall increase in participation rates through the COVID-19 economic period.

Additionally, this report focuses on two sets of priority applicants considered LMI based on household income who are eligible to receive an Increased Rebate through CVRP. To be considered LMI in the past, participants needed a household income at or below 300% FPL. However, this was increased to 400% FPL in January of 2021.

6.2 Key Findings

- **Priority Applicant Participation in CVRP**
  Priority Applicants (i.e., applicants belonging to any of the priority populations) experienced a drop in participation rates after a peak of 36.5% in April 2020 before recovering to 38.5% in December 2020. Year-over-year (YOY) comparisons showed relatively lower increases in

[66] Center for Sustainable Energy. (2020). *CVRP Rebate Statistics.* Data last updated September 28, 2021. Retrieved December 6, 2021, from https://cleanvehiclerebate.org/rebate-statistics.

participation rates in June, August and September of 2020. July 2020 yielded the only negative relative YOY comparison at -0.4 percentage points. This group made up 38.2% of total CVRP applications during COVID-19.

- **CVRP Applicants with Household Income at or Below 300% FPL**
  This group experienced a drop in participation rates between June and November of 2020. Compared to 2019, the relative YOY comparisons were lowest between June and November 2020. Negative YOY comparisons were observed in June, July and August 2020. This group made up 17.5% of total CVRP applications during COVID-19.

- **CVRP Applicants with Household Income between 300% and 400% FPL**
  This group did not experience any significant drops in participation rates for CVRP or relative YOY comparisons during COVID-19. This group made up 9.9% of total CVRP applications during COVID-19.

- **CVRP Applicants Located within a Low-Income Community (LIC)**
  This group comprised of applicants residing in census tracts having median income at or below 80% of the statewide median income in California. Applicants in this group did not experience any significant CVRP participation rate drops during COVID-19. Relative YOY comparison increases decreased slightly from May to December 2020, but no negative YOY rates were observed. This group made up 24.0% of total CVRP applications during COVID-19.

- **CVRP Applicants Located within a Disadvantaged Community (DAC)**
  This group saw a drop in participation rates between May and December 2020. This group also experienced a drop in relative YOY comparison rates between May and November of 2020, with May being the only month a negative YOY rate was observed. This group made up 11.6% of total CVRP applications during COVID-19.

- **CVRP Applicants that are Low-Income or Located in a LIC and are Located within ½ Mile of a Disadvantaged Community**
  This group experienced a drop in CVRP participation rates during August to November of 2020. No change in YOY participation rates was observed in 2020 for the months of September and November, and June 2021. Note that this group made up the smallest portion of CVRP applicants, accounting for 5.0% during COVID-19, and fluctuations may be due to low sample size rather than a trend.

6.3 CVRP Priority Population Participation

CVRP is one of the many programs receiving funding from CCI via proceeds from the cap-and-trade auction in California.[67] California Climate Investments requires that at least 35% of all cap-and-trade auction proceeds go towards funding projects in priority communities and households. The California Air Resources Board (CARB), the administering agency for CVRP, and CCI have identified priority populations to whom 35% of CCI funding should be allocated.[68] Priority populations are described in Table 22.

Table 22. California Clean Investments Priority Populations and funding ratios.

Community/Income Status	Description	Intended Allocation of Funds
Disadvantaged Communities (DAC)	The top 25% of communities experiencing disproportionate amounts of pollution, environmental degradation, and socioeconomic and public health conditions, according to OEHHA's CalEnviroScreen tool (Figure 5).	25%
Low-Income Communities (LIC) and Households*	Census tracts with median incomes at or below 80% of the statewide median or households with income below a threshold designated as low-income by the Department of Housing and Community Development (Figure 4).	5%
Low-Income Households/Low-Income Communities within ½ mile of a Disadvantaged Community	Households and communities with incomes that meet the standard to be considered low-income as set forth by CARB that are also within ½ mile of a Disadvantaged Community (Figure 6).	5%

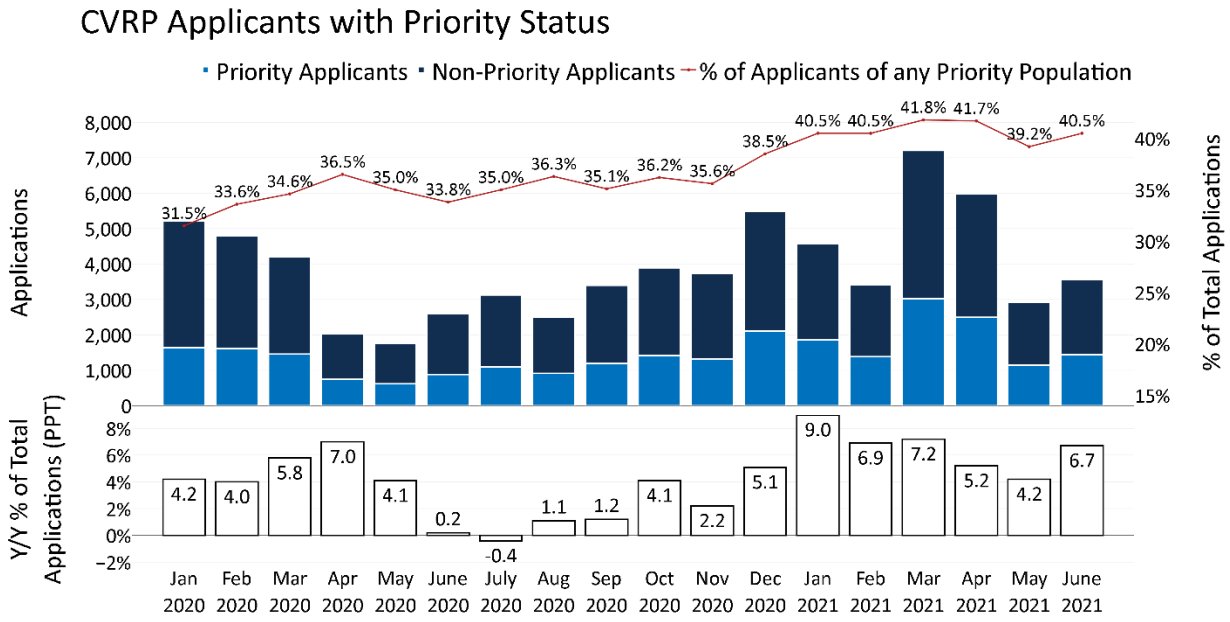
*CVRP considers households at or below 300% FPL for CVRP low-income households from 2016-2021 and under 400% FPL low-income households after January 27, 2021.

With these funding guidelines in mind, we focus on comparing the participation rates for individuals belonging to one or several priority groups. It is important to note that for this report, 300% or below the FPL is used to determine low-income households, and LIC are determined by census tract. The CVRP household income criteria for LMI individuals eligible to receive an Increased Rebate changed from

[67] *About California Climate Investments.* California Climate Investments. Retrieved December 6, 2021, from http://www.caclimateinvestments.ca.gov/about-cci.
[68] *Priority Populations*. (n.d.). California Climate Investments. Retrieved December 6, 2021, from https://www.caclimateinvestments.ca.gov/priority-populations.

being less than or equal to 300% FPL to less than or equal to 400% FPL on January 27th of 2021. Only participants less than or equal to 300% FPL were included in the priority applicant umbrella to maintain congruency since the criteria changed more than halfway through COVID-19.

Figure 49. CVRP applicant total, percentage of priority CVRP applications and priority application rate year-over-year comparisons by month.



The percentage of CVRP applicants belonging to at least one priority population, denoted in Figure 49 as Priority Applicants, increased in relative year-over-year comparisons and overall monthly applications for January, February, March and April 2020. It is interesting to note a positive increase for both YOY and total applications observed in April and March of 2020, even though COVID-19 began in March. This group made up 38.2% of total CVRP applications during COVID-19.

YOY comparisons for priority applicants began to decrease in May 2020, and we see the lowest YOY comparisons observed for this period from June-November 2020. Only one month yielded a negative YOY comparison to 2019, and this was in July with a rate of -0.4 percentage points (PPT). There is a notable increase from 5.1 PPT in December 2020 to 9.0 PPT in January 2021. Between January 2021 and May 2021, we see a general decrease for YOY comparisons, but the rates are still higher overall than those observed for the same months in 2020. June 2021 ends with a YOY rate of 6.7 PPT for priority applicants.

The lowest CVRP participation rates observed for priority applicants in 2020 are observed in January and February, at 31.5% and 33.6%. This rate increased to 36.5% in April 2020, then hovered between 34% and 36% for May through November 2020. In December 2020, a jump of 2.9% brought the total monthly

participation of priority applicants in CVRP up to 38.5%. The observed rate continued to increase to the highest observed in March 2021, at 41.8%. By June 2021, the priority application rate was 40.5%. The largest drop observed was -2.5% from April to May of 2021. The largest increase observed was 2.9% from November to December of 2020.

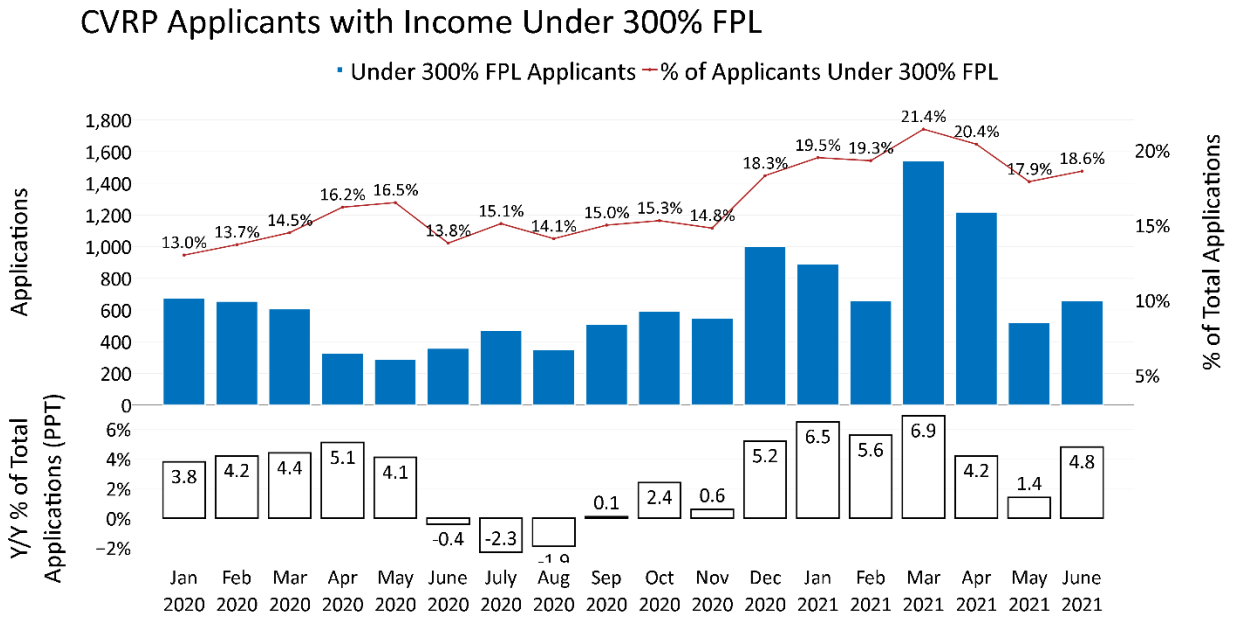
6.3.1 CVRP Applicants at or Below 300% FPL

CVRP rebate applicants belong to either Increased Rebate or Standard Rebate eligibility groups. The Increased Rebate group was limited to applicants with a household income less than or equal to 300% FPL, prior to the program policy change in January of 2021. This group made up 17.5% of total CVRP applications during COVID-19.

Figure 50 shows that participation rates for applicants at or below 300% FPL increased until May 2020. The sharpest drop in the total percentage of applicants was -2.7% in June 2020, bringing the rate down to 13.8% for the month and yielding the lowest rate observed for this group during the analysis period. In December 2020, there was a jump of 3.5%, bringing the rate up to 18.3% for December 2020. The highest participation rate was observed in March 2021, with 21.4% of CVRP applicants at or below 300% FPL.

Pre-COVID-19 and up until May 2020, participation rates of applicants below 300% FPL increased slightly and had no sharp decreases for both relative YOY comparisons and overall participation rates. YOY comparisons show a significant drop in June of 2020. Negative YOY comparisons are observed in June (-0.4 PPT), July (-2.3 PPT) and August (-1.9 PPT). Lower rates are observed during COVID-19 from June until November, but rates increased by the end of the year in 2020. The YOY comparison increased up to 5.2 PPT in December 2020 and reached a high point of 6.9 PPT in March of 2021.

Figure 50. Below 300% FPL total applications, percentage of CVRP applications and year-over-year comparisons by month.



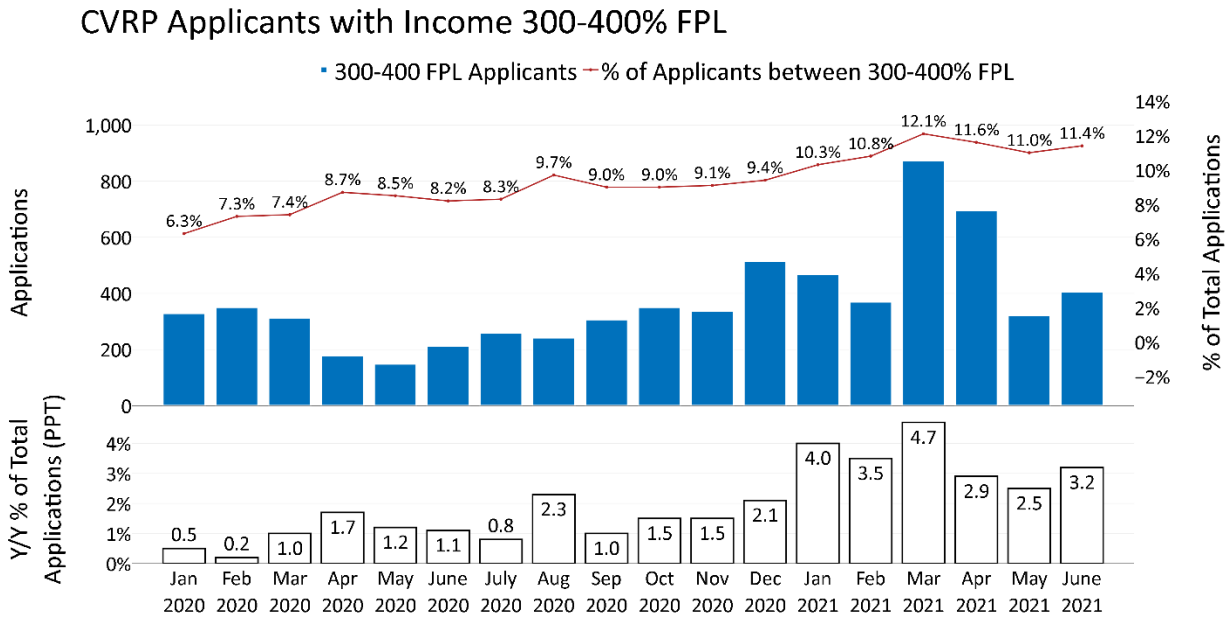
6.3.2 CVRP Applicants Between 300% and 400% FPL

The 300-400% FPL group was analyzed separately due to CVRP chnges in rebate income requirements. The income requirement went from at or below 300% FPL to or below 400% on January 27 of 2021. This group includes applicants considered LMI by current CVRP standards but would not have been included in the LMI group in the past. This group made up 9.9% of total CVRP applications during COVID-19.

In Figure 51, priority applicants that fall within 300-400% FPL saw an overall participation increase in CVRP applications leading up to and during COVID-19. This group did not experience a significant drop in participation rates for CVRP applications throughout 2020 and 2021. The lowest participation rate was observed Pre-COVID-19 in January 2020, with only 6.3% of that month's applicants being in the 300-400% FPL group.

Looking at applicants within the 300-400% FPL group YOY comparisons, there were no significant decreases and no negative YOY comparisons during the analysis period. The lowest YOY rate observed occurred in February 2020, before COVID-19 began. Starting in January 2021, we begin to see higher YOY comparison rates, with the highest during this period coming in at 4.7% in March 2021. While this group experienced some fluctuations Pre-COVID-19 and during COVID-19, participation consistently increased throughout the analysis period and was punctuated by the extension of an Increased Rebate in January 2021.

Figure 51. 300-400% FPL total applications, percentage of CVRP applications and year-over-year comparisons by month.

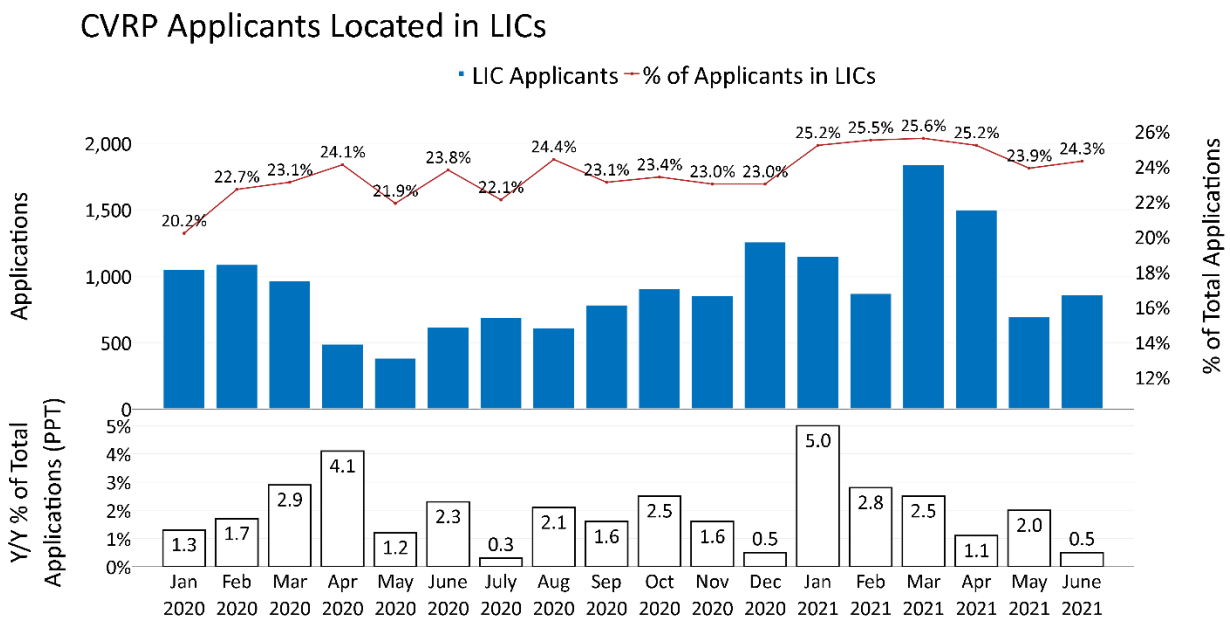


6.3.3 CVRP Applicants Located in Low-Income Communities and Households

Applicants located in Low-Income Communities, meaning a LIC census tract determined by the median income of all its residents, comprise the following population. Note that low-income participants discussed earlier are determined by household income. This group made up 24.0% of total CVRP applications during COVID-19.

Figure 52 shows that this group's overall priority application participation rates did not exhibit significant decreases Pre-COVID-19 or during COVID-19. The participation rates fluctuated without a steady increase or decrease until January 2021. In January of 2021, the percentage of priority applications increased by 2.2% to a total of 25.2%. The highest overall percentage for CVRP priority applicants was 25.6% in March 2021, and the rate ended at 24.3% in June 2021. This group did not exhibit any negative relative YOY comparisons during or Pre-COVID. April 2020 experienced the second-highest YOY rate at 4.1 PPT, the highest being 5.0 PPT in January 2021. During COVID-19, lower YOY increases are seen between May 2020 and December 2020. YOY increases were higher in early 2021 but dropped in April, May and June of 2021.

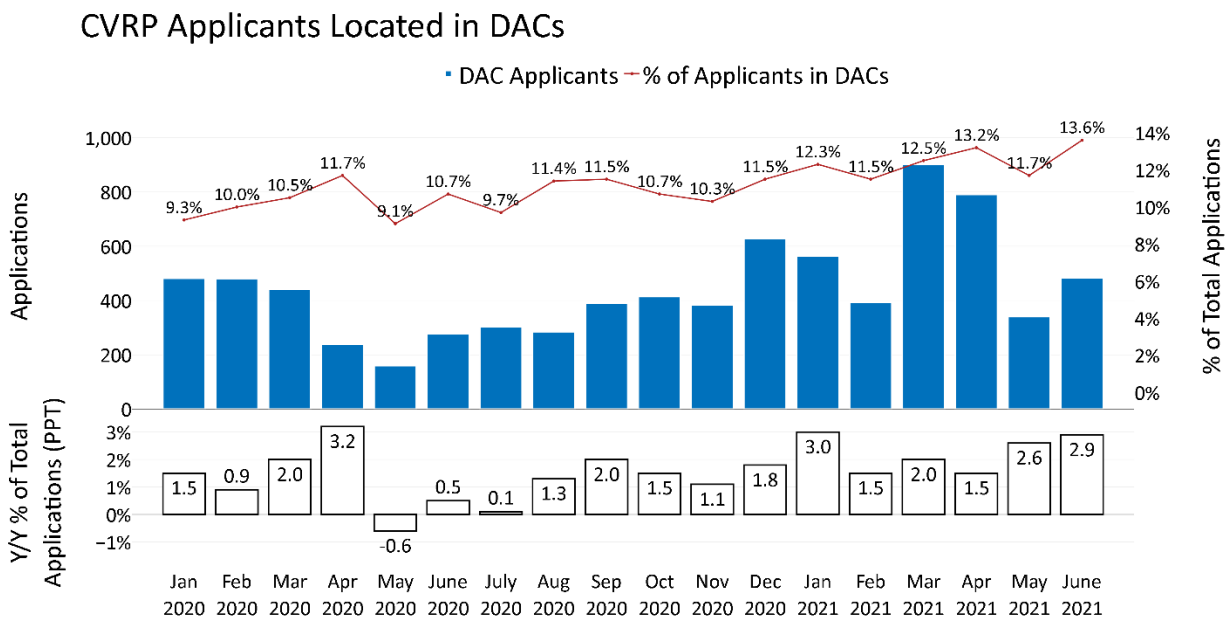
Figure 52. LIC total applications, percentage of CVRP applications and year-over-year comparisons by month.



6.3.4 CVRP Applicants Located in Disadvantaged Communities

Figure 53 displays participation in CVRP for priority applicants residing in census tracts designated as disadvantaged communities (DACs). This group made up 11.6% of total CVRP applications during COVID. Keeping on trend with previous groups, drops in overall application participation and YOY comparisons are not observed in Pre-COVID-19 months or in April 2020. A steep drop in total priority CVRP application participation occurred between April and May 2020, with the rate falling -2.6% down to 9.1%. May 2020 is the lowest rate observed during this period for total CVRP priority application participation. Overall priority CVRP rates began to increase in January 2021. The YOY comparisons by month during COVID-19were positive aside from May 2020, which experienced a drop of -2.6 PPT. Increases were notably low in June and July 2020 as well.

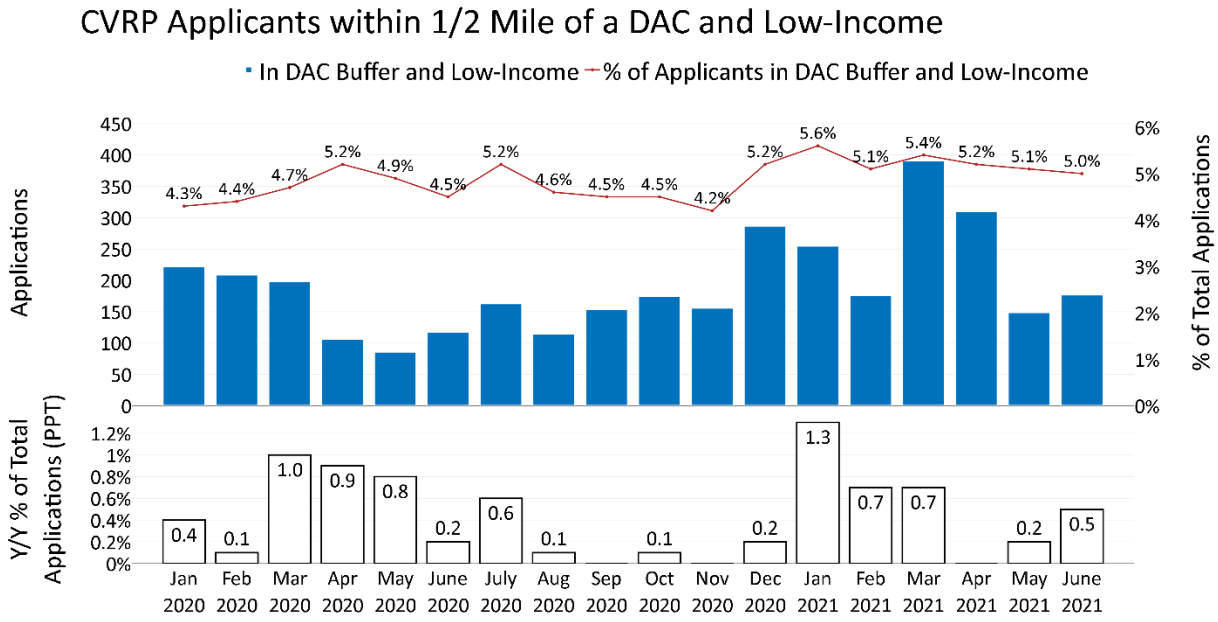
Figure 53. DAC total applications, percentage of CVRP applications and year-over-year comparisons by month.



6.3.5 CVRP Applicants with Income at or Below 300% FPL or Located in a LIC and within ½ Mile of a Disadvantaged Community

CVRP participation among applicants located in a LIC or with incomes at or below 300% FPL and situated within ½ mile of a DAC are displayed in Figure 54. This group made up the smallest population of CVRP applicants analyzed here, accounting for 5.0% during COVID. Participation for this group did not experience any significant drop until May 2020 during COVID, which continued until November 2020, when the lowest participation rate of 4.2% was observed. Participation rates increased in January 2021 to 5.6%, the highest rate observed in this period. The YOY comparisons for this group were positive or zero throughout the analysis period. YOY comparisons increased to a high mark of 1.3 PPT in January 2021.

Figure 54. Applicants from Low Income Households or located in LICs within 1/2 mile of a DAC total applications, percentage of CVRP applications and year-over-year comparisons by month.



6.4 Conclusions

Despite changing economic conditions and fluctuations in CVRP application volumes leading up to and during COVID-19, priority applicants have seen an increase in participation rates since 2019. During COVID-19, 38.2% of CVRP applicants have been from a priority population. In 2019, 31.7% of CVRP applicants were priority applicants. In 2020, this rate was 35.1%, and for the first half of 2021, it was 41%. Priority application rates were highest during COVID-19 for those within a low-income community or household, averaging 24.0% priority participation. Priority applicants at or below 300% of FPL were observed at an average participation rate of 17.5% during COVID, and those between 300-400% had a participation rate of 9.9%. Applicants within a disadvantaged community made up 11.6% of CVRP applications during COVID. Applicants situated within ½ mile of a DAC in a LIC or with incomes at or below 300% FPL made up the smallest portion of CVRP applicants, accounting for 5.0% during COVID.

Though COVID-19 began in March of 2020, priority applicant participation rates did not experience a significant drop until June of 2020. The trend among groups examined was to experience drops in participation rates in May or June 2020 and an increase in December 2020 or January 2021. The exception to this trend were applicants located within ½ mile of a DAC; however, this population has a small sample size and is more prone to fluctuations.

While COVID-19 dramatically reduced overall participation in CVRP, priority applicant participation increased in general during the COVID-19 period. For priority applicants, COVID-19 economic conditions

negatively impacted participation rates two to three months after COVID-19 began. Rates then showed steady increases after December 2020 or January 2021, half a year before the recognized COVID-19 economic period ended. With overall participation rates increasing for priority applicants within CVRP since 2019, these are promising trends. The negative economic impacts to the groups examined in this report may be offset by programmatic policies focused on increasing their participation. These policies include income caps, lower Standard Rebates and vehicle MSRP caps. These, along with outreach focused on these populations, likely lessened the impact of COVID-19 on behavior from this group.

6.5 Further Research

Additional LMI-focused research questions emerged while conducting analysis based on CVRP and California Climate Investments interpretations of low-income households. CVRP de-facto interprets households under 300% FPL as low-income (300% FPL was the Increased Rebate income threshold starting in 2016), and under 400% FPL starting in 2021, as those eligible for the Increased Rebate. The CCI definition of low-income households is:

Those with incomes either at or below 80 percent of the statewide median or below a threshold designated as low-income by the Department of Housing and Community Development.

Because of the heterogeneity in cost of living in California, individuals residing in high-cost counties are considered low-income by CCI via HUD standards but do not qualify for the Increased Rebate in CVRP. See Table 23 and Table 24. Inversely, participants in low-cost counties may not be eligible by HUD standards but are still under 400% FPL. Further research would help identify regions of interest that exclude low-income participants from the Increased Rebate and regions that are disproportionately inclusive to Increased Rebates given low cost of living. These findings would help guide CARB dollars to the drivers and regions that most need rebates.

Table 23. Income thresholds by county, state and federal standards.

County	**HUD Low-Income Threshold[69] (Household of 4)**
San Francisco	$146,350
San Mateo	$146,350
Sacramento	$75,000
San Joaquin	$72,500

[69] *State Income Limits for 2021*. (n.d.). Department of Housing and Community Development. Retrieved December 14, 2021, from https://www.hcd.ca.gov/grants-funding/income-limits/state-and-federal-income-limits/docs/income-limits-2021.pdf.

Table 24. Income thresholds by state and federal standards.

80% of Statewide Median Income[70]	**300% FPL (Household of 4)**	**400% FPL (Household of 4)**
$81,052 (80% of $101,315)	$79,500	$106,000

[70] *Census Bureau Median Family Income by Family Size.* (n.d.). California Census Bureau. Retrieved December 14, 2021, from https://www.justice.gov/ust/eo/bapcpa/20200401/bci_data/median_income_table.htm.

7. CVRP Composition Summary: Changes during COVID-19

The findings in the following slide deck demonstrate the trends and compositional changes of CVRP applications during COVID-19. Applications are reported on a monthly basis and include demographic data and information about each rebated vehicle. For the purposes of this study, COVID-19 is defined as March-December 2020. While March-December 2019 is considered Pre-COVID-19. This report compares these two periods to examine differences and similarities and assesses the overall resilience of the EV market.

There was a 43% decrease in total CVRP applications during COVID-19. However, most demographics saw little or no change in their share of applications, suggesting that while the total volume of applications decreased, there was no significant change in who was buying EVs. Applicants with a household income of less than $150,000 who rebated non-Tesla vehicles had a 5.6% increase in applications during Covid, which was the greatest percentage change of any demographic. Women increased their share of applications for Tesla vehicles by 4.2%. There was no percentage change in applications among racial and ethnic identities greater than 3%. In general, Asian applicants saw their percent share of applications decrease, except for Southeast Asian applicants, whose percentage share for non-Tesla vehicles slightly increased. Hispanic applications for Tesla vehicles saw the largest increase in percentage shares by racial/ethnic identity. All age groups between 30-59 years old saw a decrease in percentage share of applications and all other age groups saw an increase, the largest change being a 2.7% decrease for the 40-49 age group who purchased Tesla vehicles.

The share of CVRP applications for Tesla vehicles increased from 51% pre Covid to 63% during Covid. This growth can be attributed to the addition of Model Y sales in 2020, which garnered 24.4% of applications. While the percent share of applications for a Tesla Model 3 did drop from 47.1% to 38.9%, the Model 3 remained the most popular vehicle. The share of applications dropped by 2.9% for all other battery electric vehicles and 9% for plug-in hybrid electric vehicles. During COVID-19, the most popular non-Tesla model was the Chevy Volt EV, which accounted for 9.4% of applications.

CVRP Composition Summary: Changes During COVID-19

Comparing Applications from March to December, 2019 versus 2020

Anjelica Thang, Meghna Eluganti

Center for Sustainable Energy®

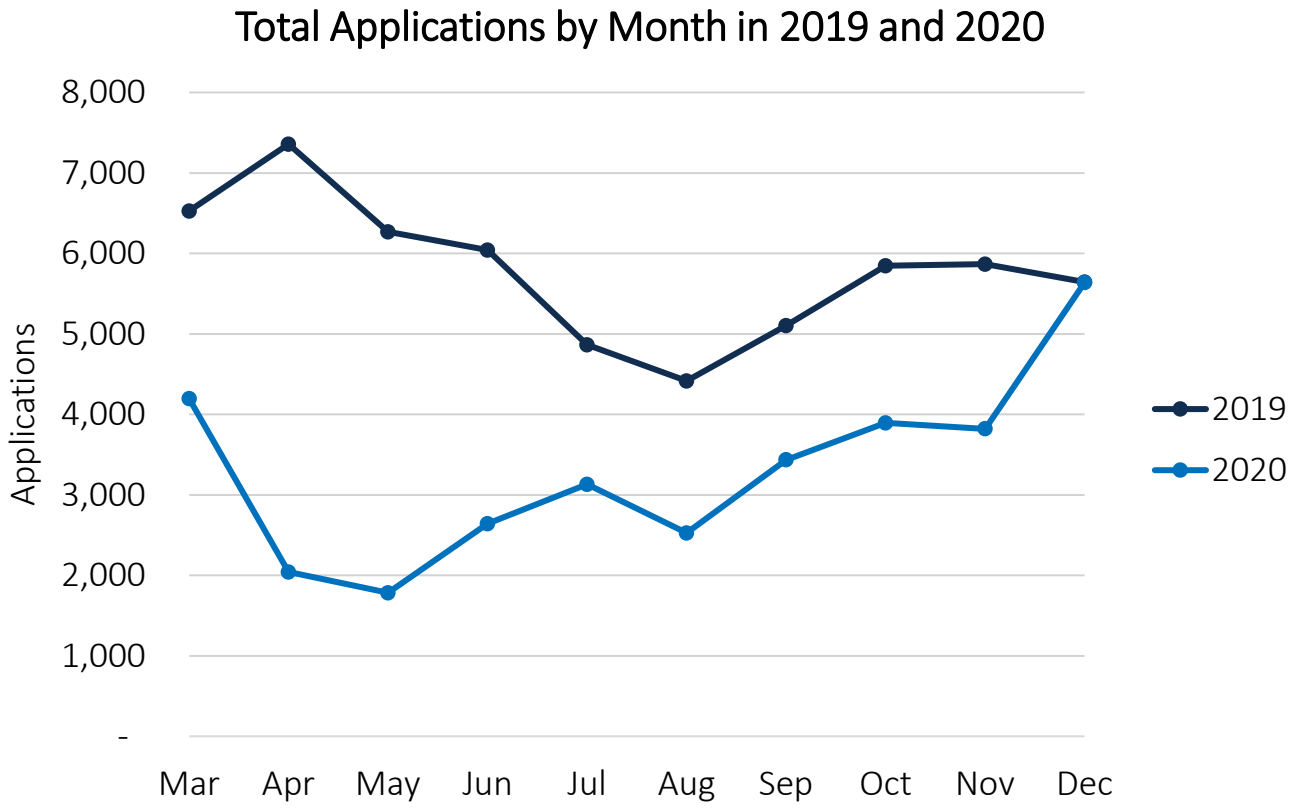
Analysis of Monthly CVRP Applications by Market Segment

- Market is segmented by Tesla and Non-Tesla vehicle share to highlight any potential differences in who is participating
- Applications are segmented by:
  - Income
  - Gender
  - Race
  - Ethnicity
  - Age
  - County
  - Vehicle Category
  - Vehicle Make
  - Vehicle Model
- Summary

Overview of CVRP Applications in 2019 and 2020*

- 43% decrease in applications in 2020
- "Sustained" recovery started in September 2020

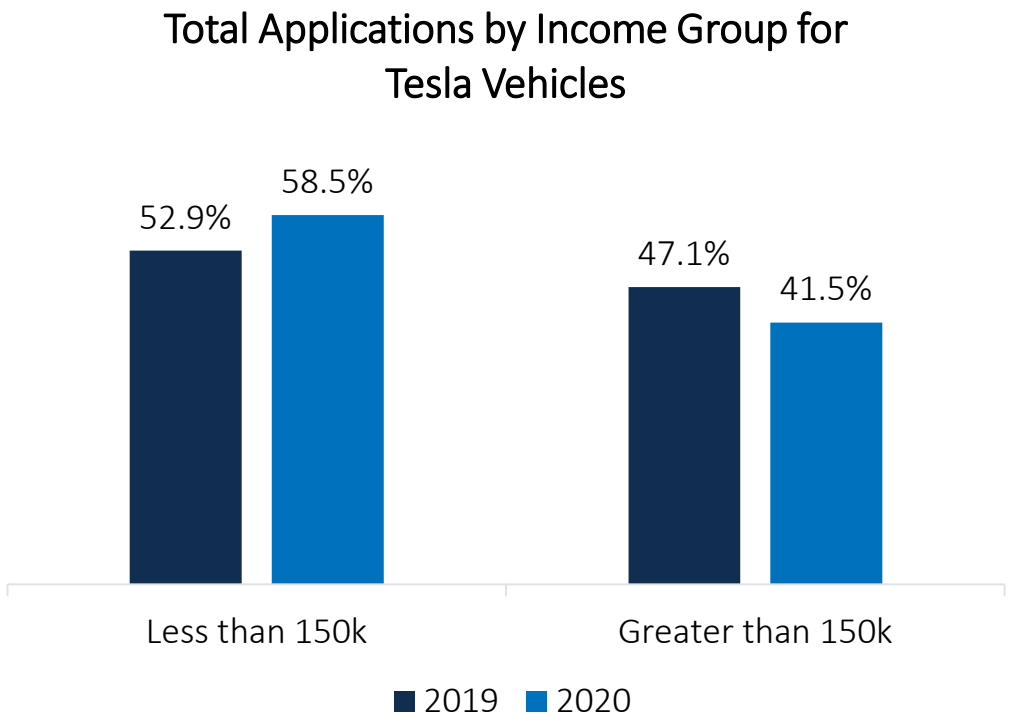
Year	Total Applications*
2019	57,941
2020	33,119

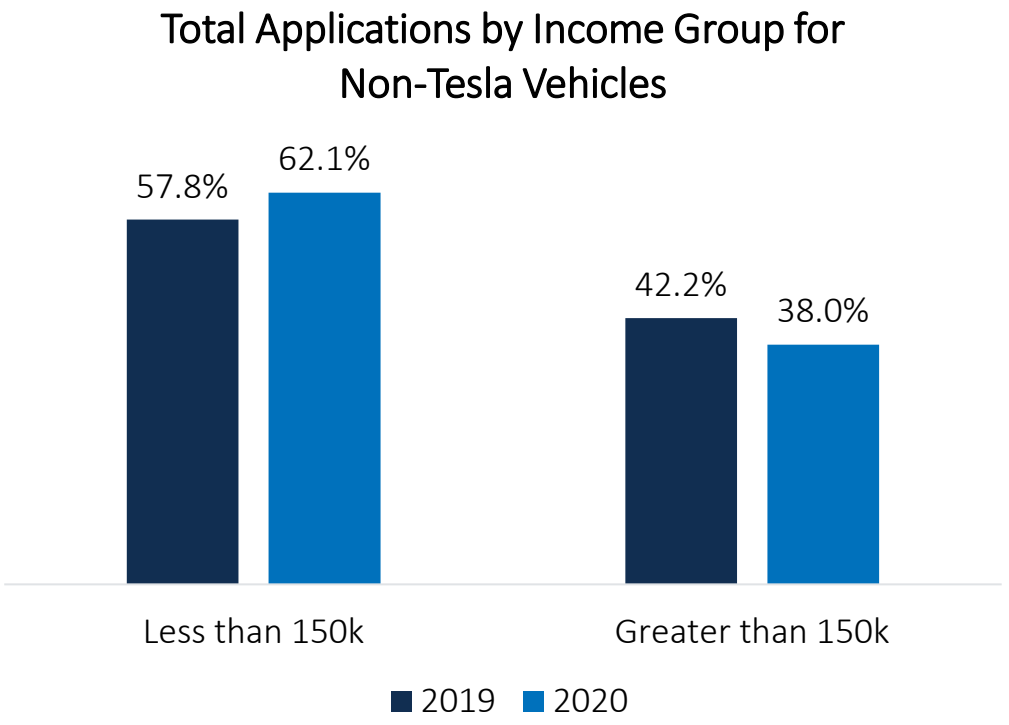


**Applications are aggregated from March through December for year 2019 and 2020*

Percent Share of Applications by Household Income

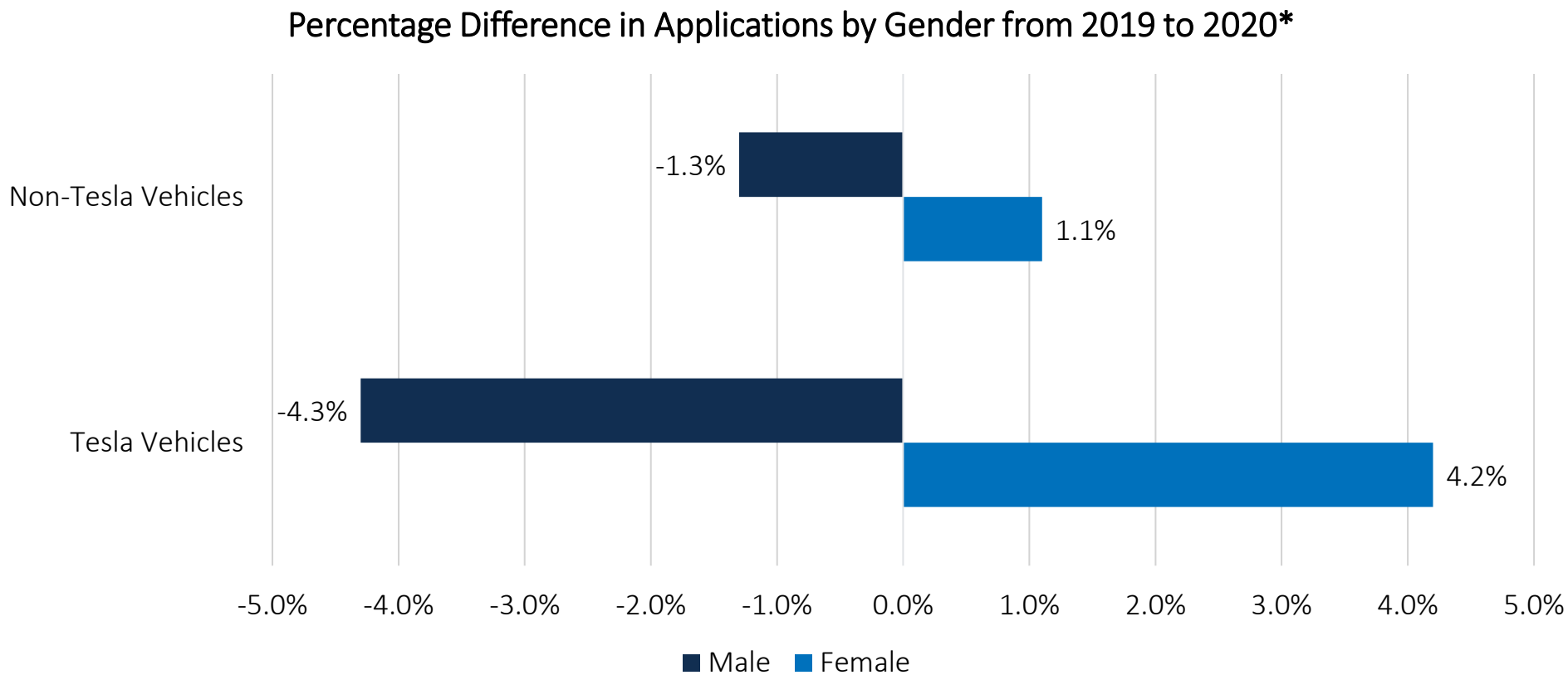
Percent share of applications within **less than $150,000 household income** group **increased** for both Tesla and Non-Tesla vehicles during COVID-19





Percent Share of Applications by Gender

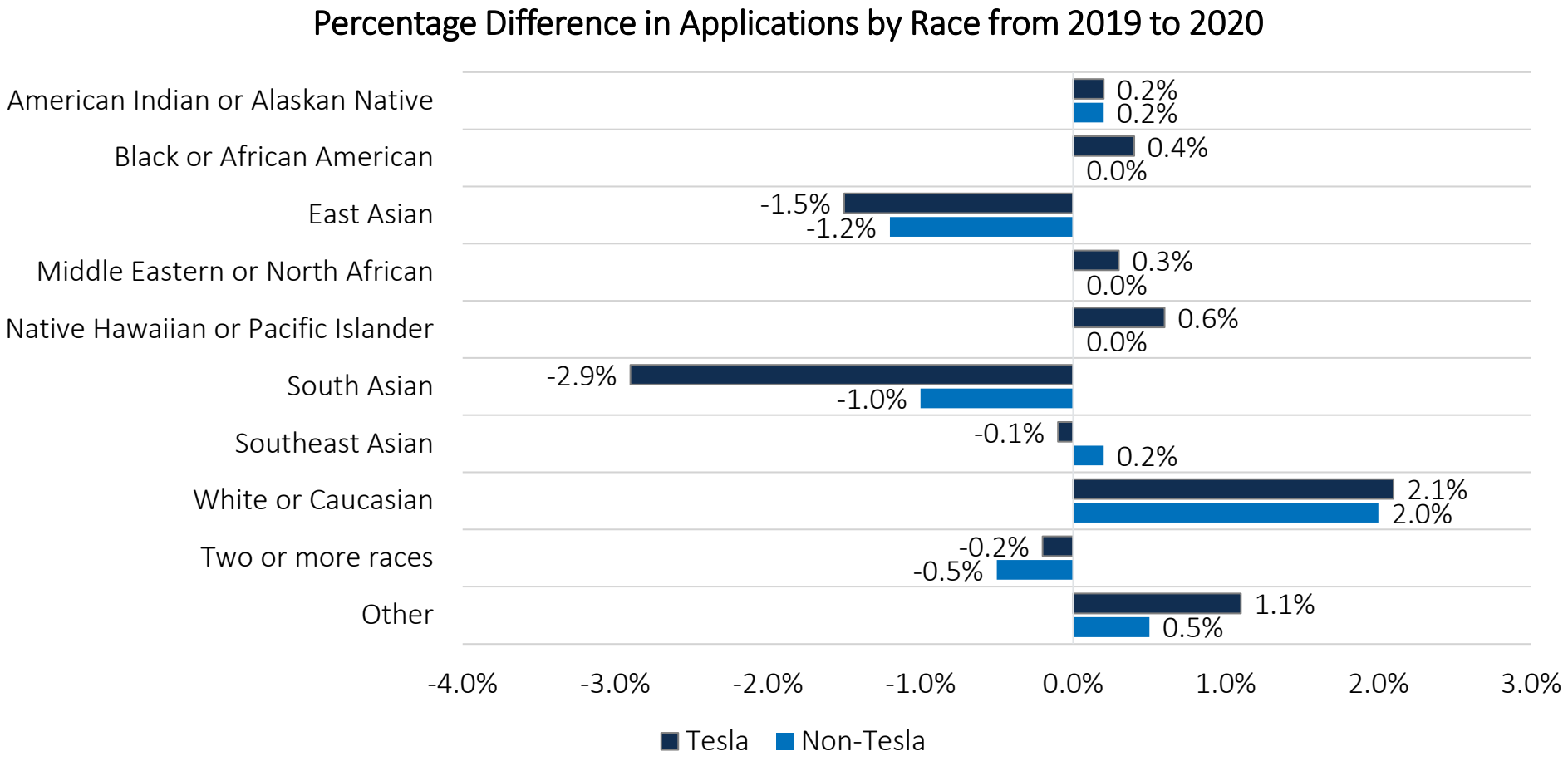
Percent share of **female** applicants **increased** for both Tesla and Non-Tesla vehicles during COVID-19



**Non-binary/Transgender gender type was excluded as the percentage difference was negligible*

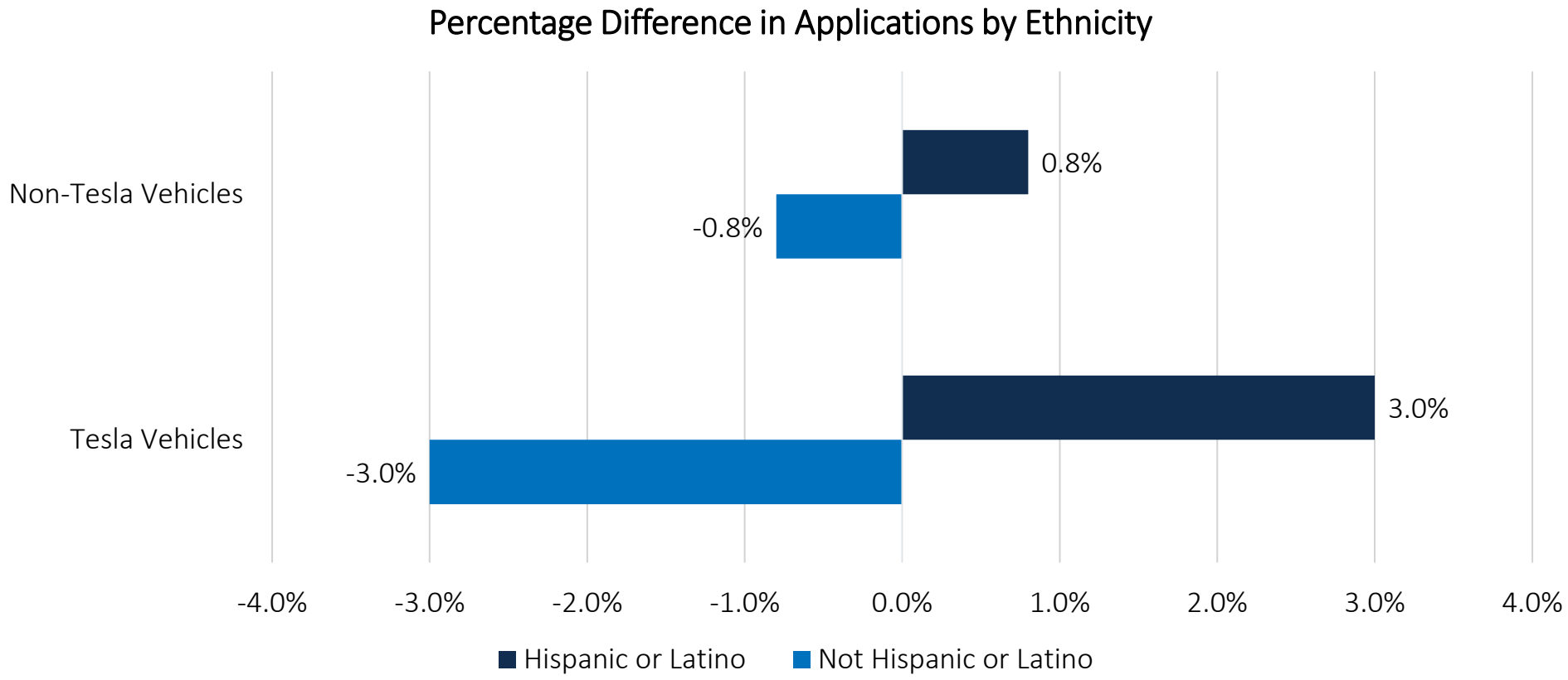
Percent Share of Applications by Race

Percentage share of **South Asian and East Asian** applicants **decreased** for both Tesla and Non-Tesla vehicles during COVID-19



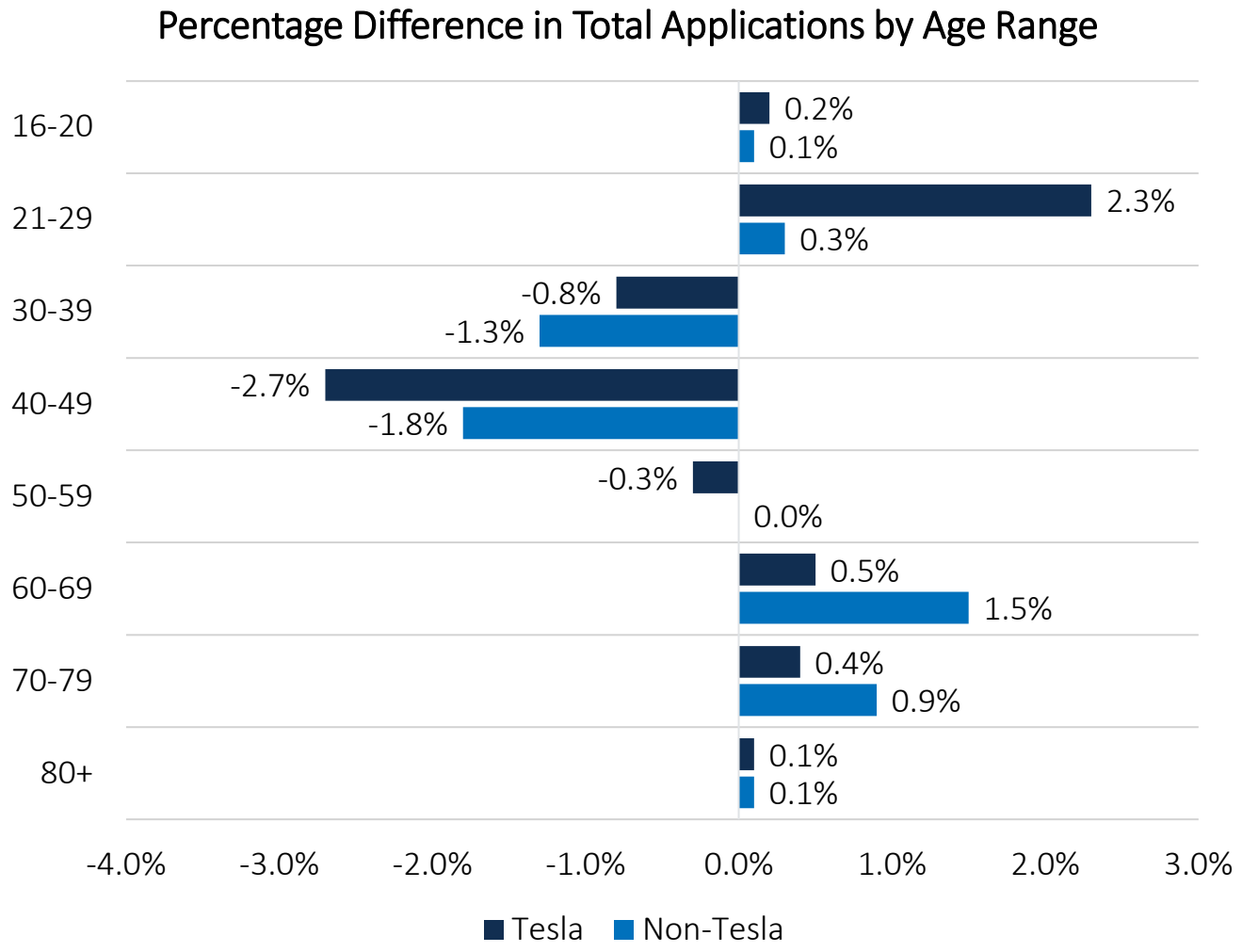
Percent Share of Applications by Ethnicity

Percent share of **Hispanic and Latino** applicants **increased** for both Tesla and Non-Tesla vehicles during COVID-19



Percent Share of Applications by Age

- Share of **Tesla** applications for **21-29** age group **increased** by **2.3%** whereas **Non-Tesla** applications **increased** by **only 0.3%**
- Share of **Tesla** vehicle applications for **40-49** age group **decreased** by **2.7%**
- Share of **Non-Tesla** applications **increased** for ages **60-69** and **70-79**



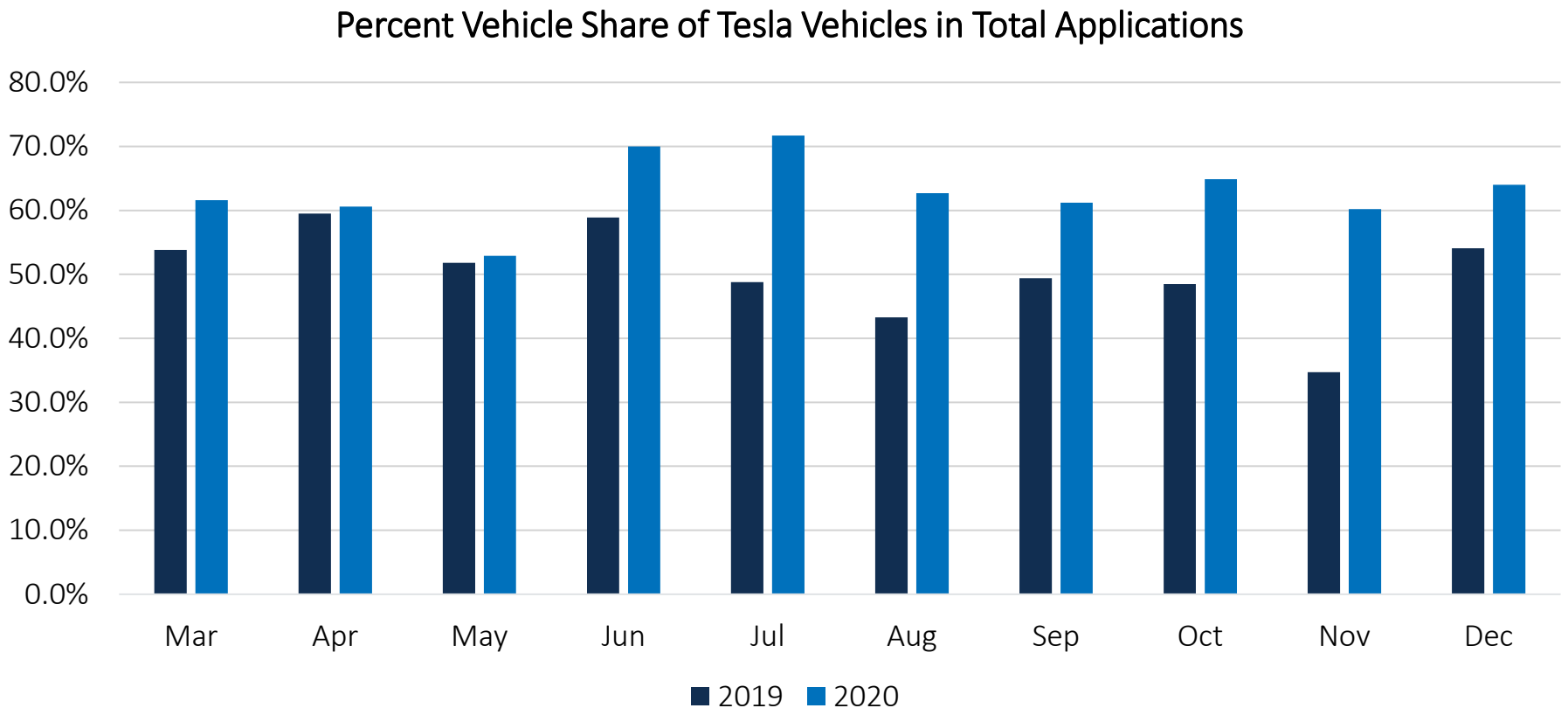
Percent Share of Applications by County

- **Los Angeles** had the **highest increase** of **1.5%** in percent share of CVRP applications during COVID-19
- **Santa Clara** and **Alameda** counties had **more than 1% decrease** in percent share of applications during COVID-19
- Other counties not listed had less than 0.1% increase or decrease in percent share of applications during COVID-19

County	Vehicle Share Difference from 2019
Los Angeles	1.5%
Riverside	0.4%
San Joaquin	0.3%
San Bernardino	0.3%
Contra Costa	0.2%
San Francisco	0.2%
San Luis Obispo	0.2%
Santa Barbara	0.2%
San Mateo	-0.2%
Orange	-0.3%
Alameda	-1.2%
Santa Clara	-2.1%

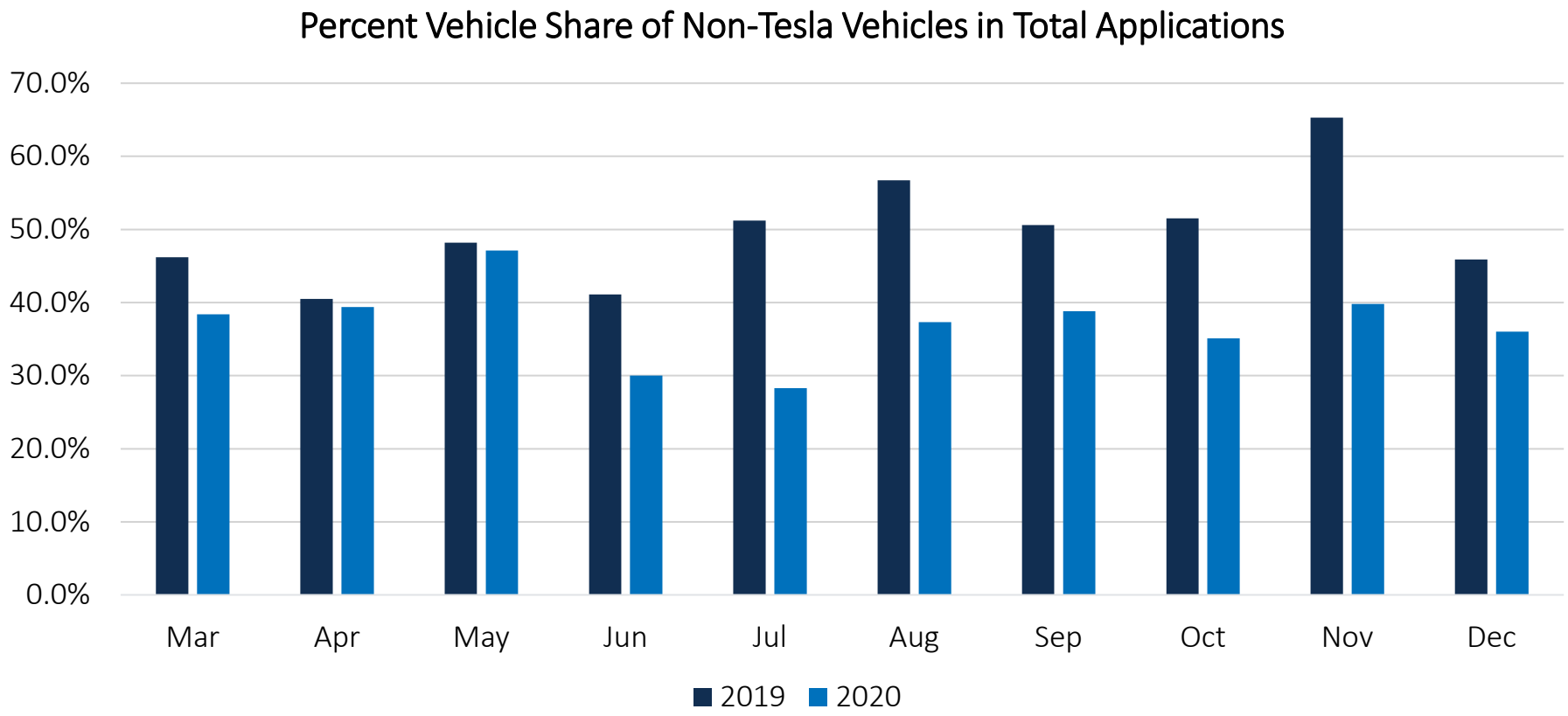
Percent Share of Tesla Applications

Percentage share of **Tesla** applications **increased** from **50.8% in 2019** to **63.4% in 2020**



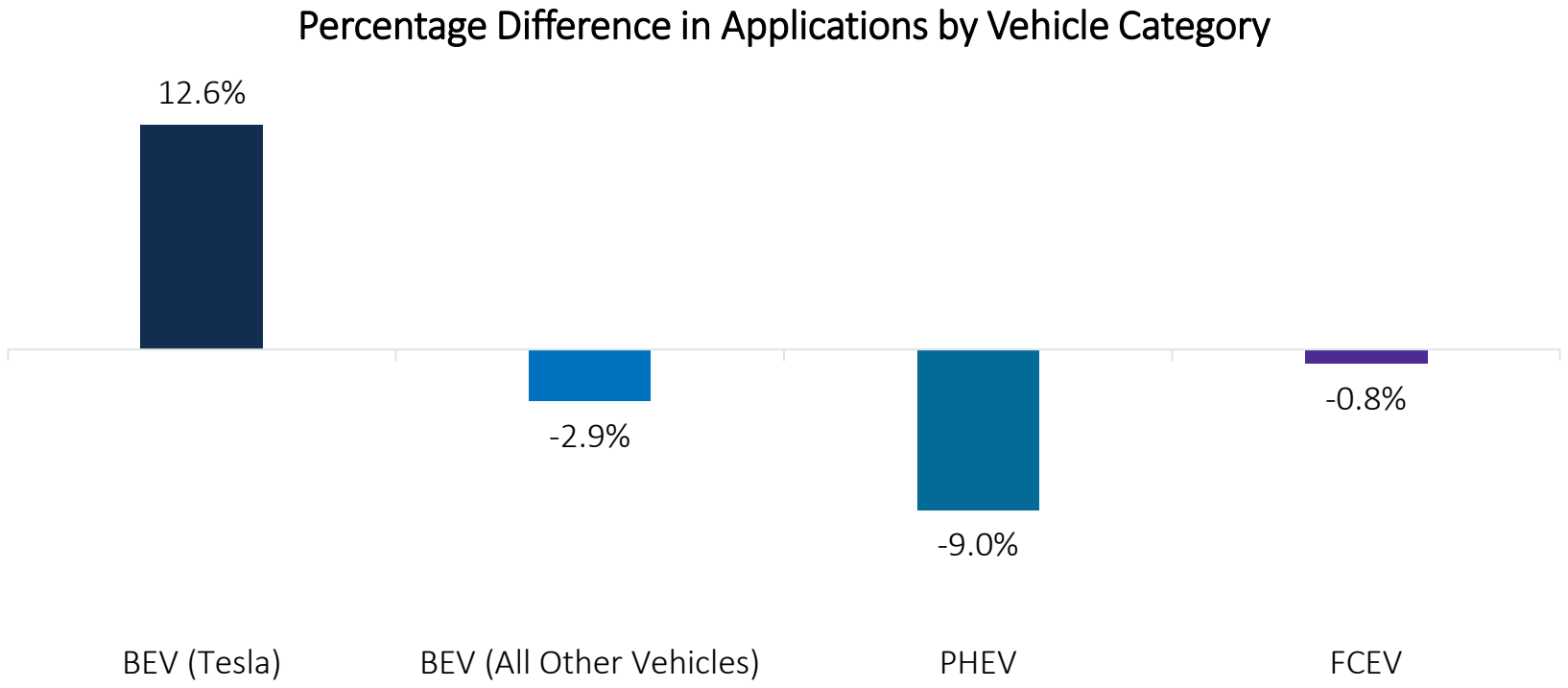
Percent Share of Non-Tesla Applications

Percentage share of **Non-Tesla** applications **decreased** in June to December of 2020



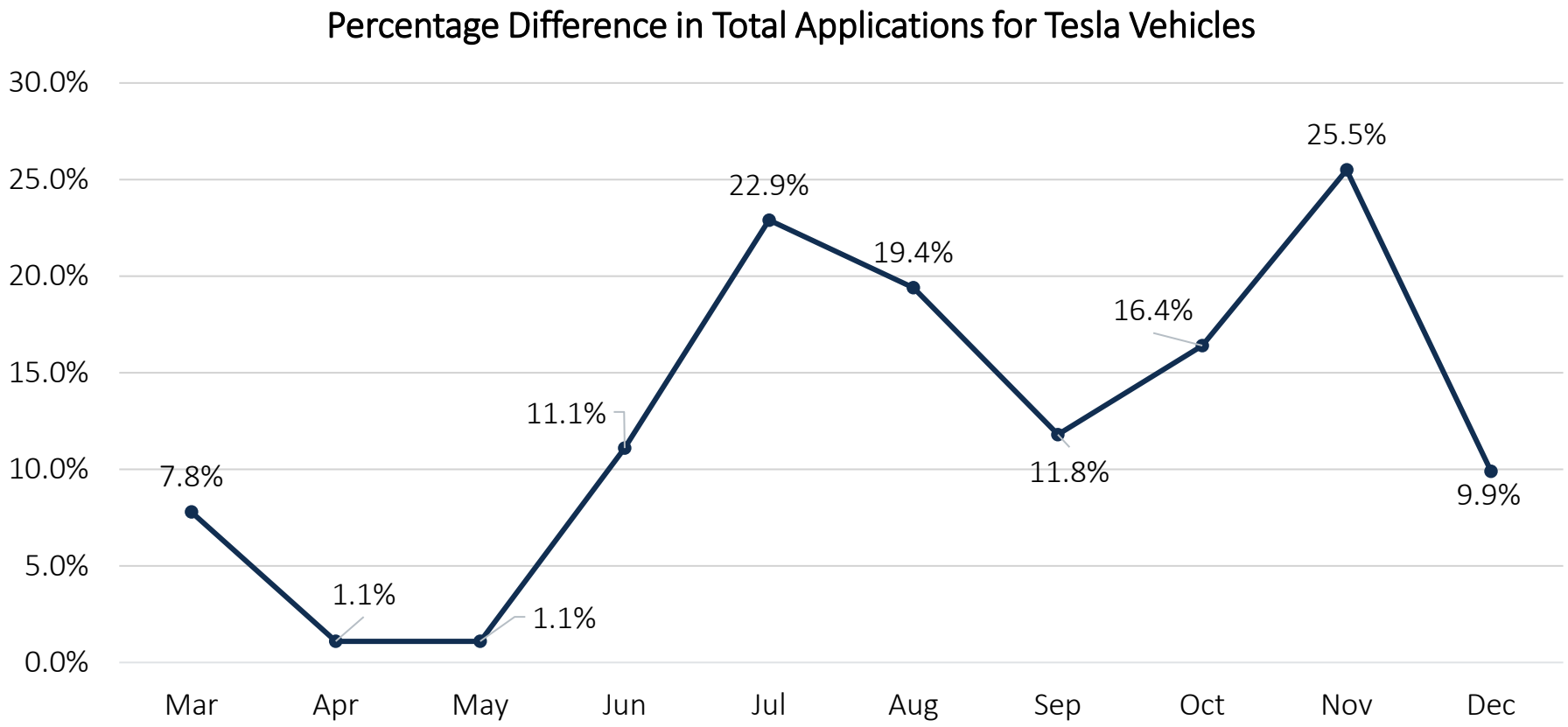
Percent Share of Applications by Vehicle Type

- Percent share of **PHEV** applications **decreased** by **9%** during COVID-19
- Percent share of **Tesla** applications **increased** by **12.6%** during COVID-19



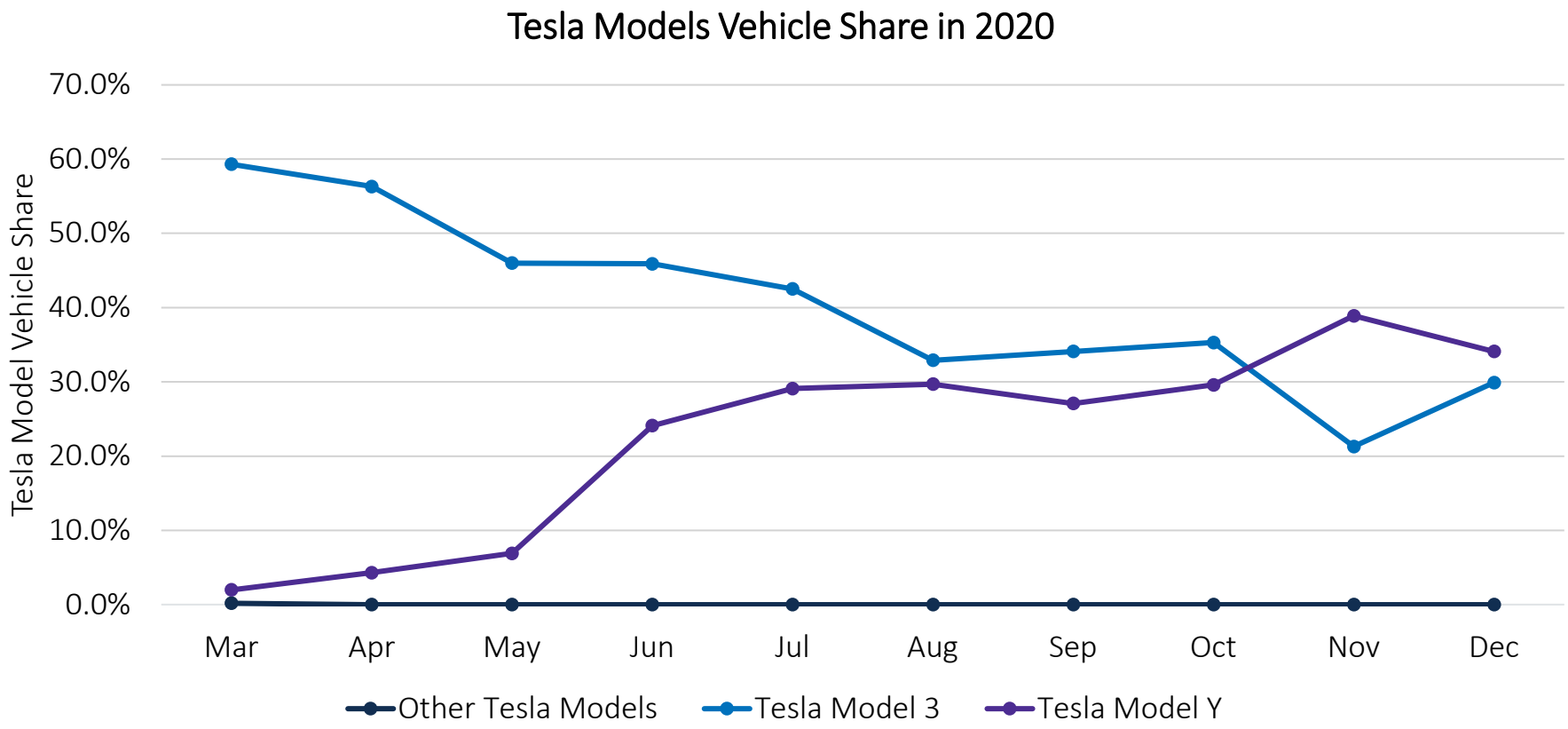
Comparing Percent Share of Tesla Applications in 2019 to 2020

Percent share of **Tesla** applications **increased** by more than **10%** during months June to December



Percent Share of Applications by Tesla Model

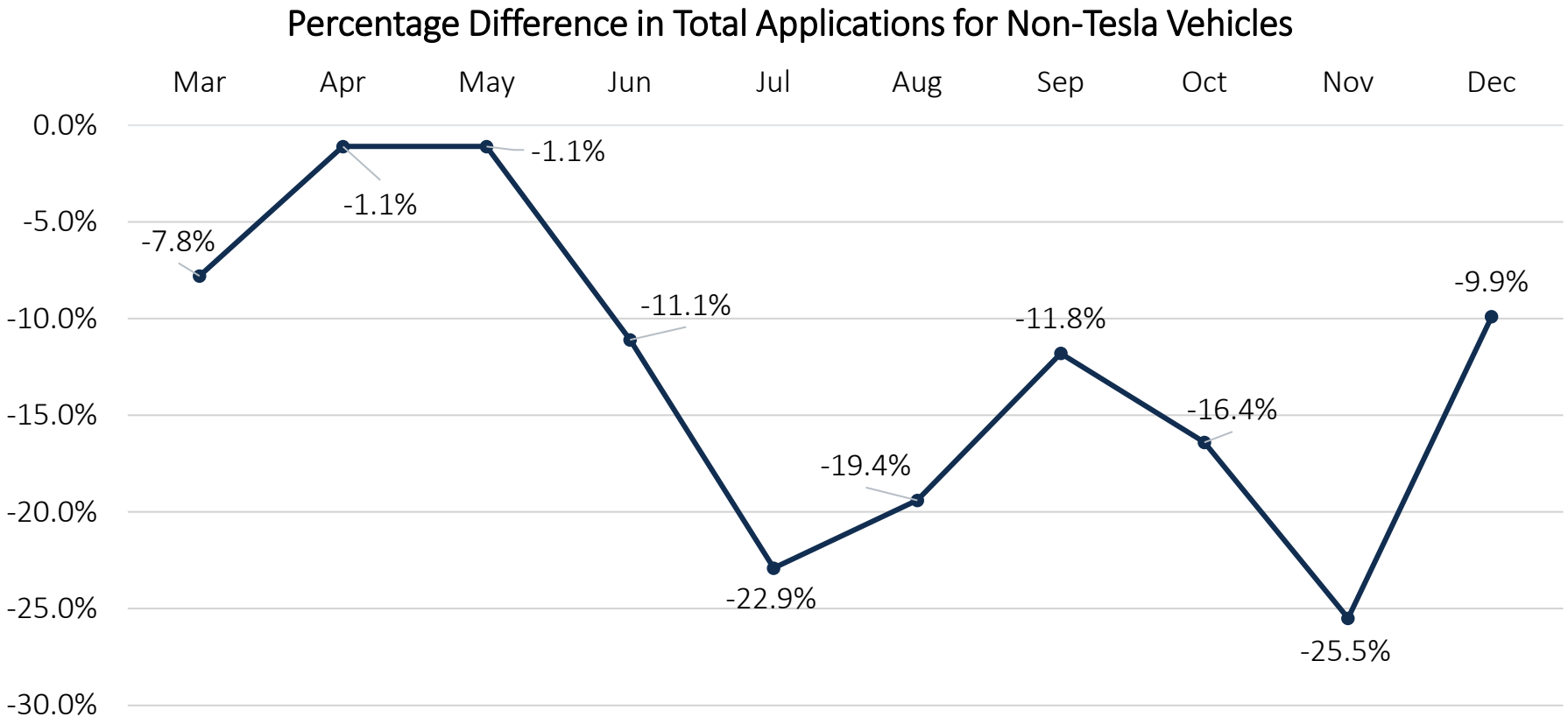
Percent share of **Tesla** vehicle applications **increased** during COVID-19 due to **Tesla Model Y** sales starting in June 2020



"Other Tesla Models" include Tesla Model S and Model X which are no longer eligible due to MSRP cap

Comparing Percent Share of Non-Tesla Applications in 2019 to 2020

Percent share of **Non-Tesla vehicles decreased** during COVID-19



Percent Share of Applications by Vehicle Make in 2019

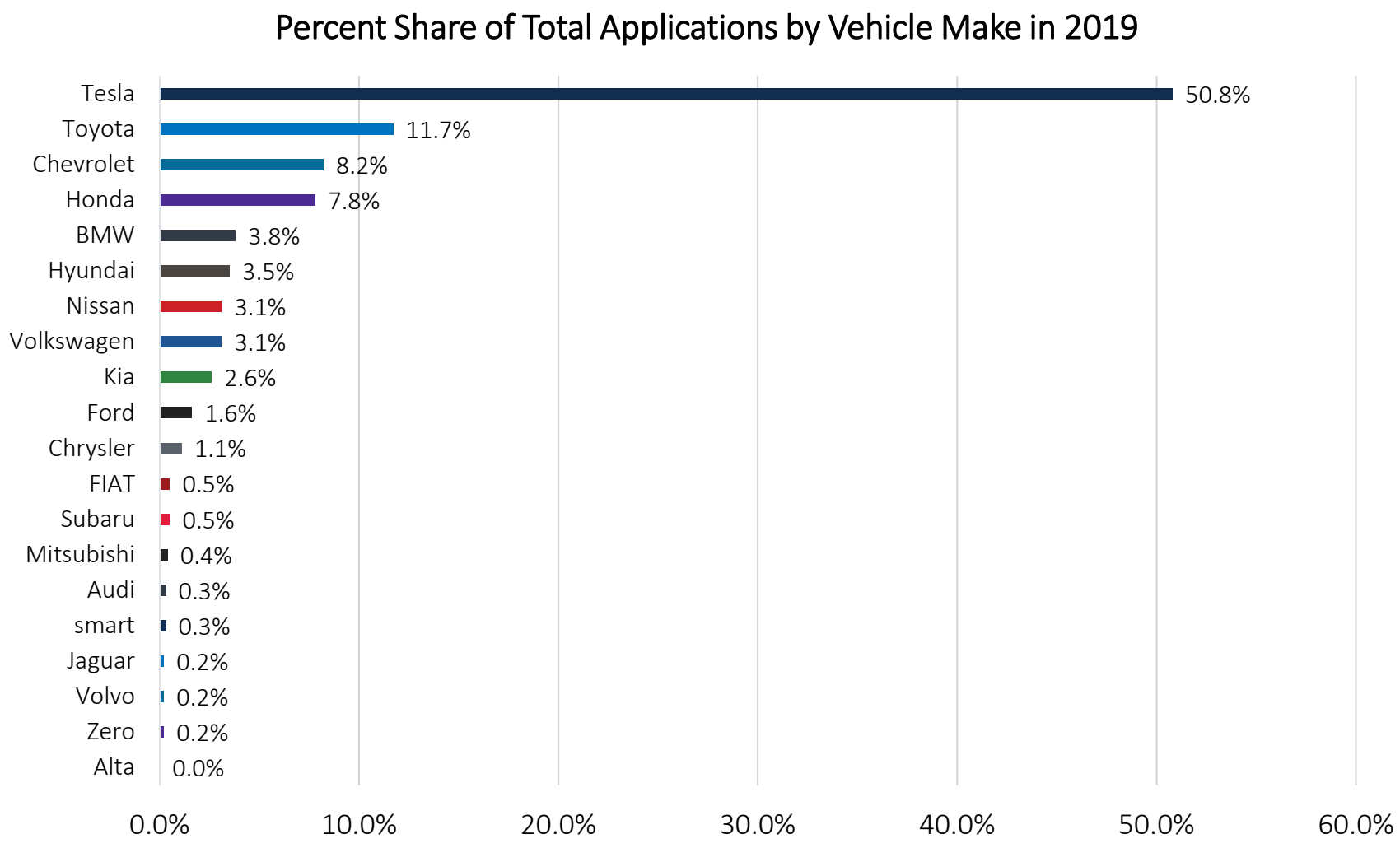


Chart displays the top 20 vehicle makes.

Percent Share of Applications by Vehicle Make in 2020

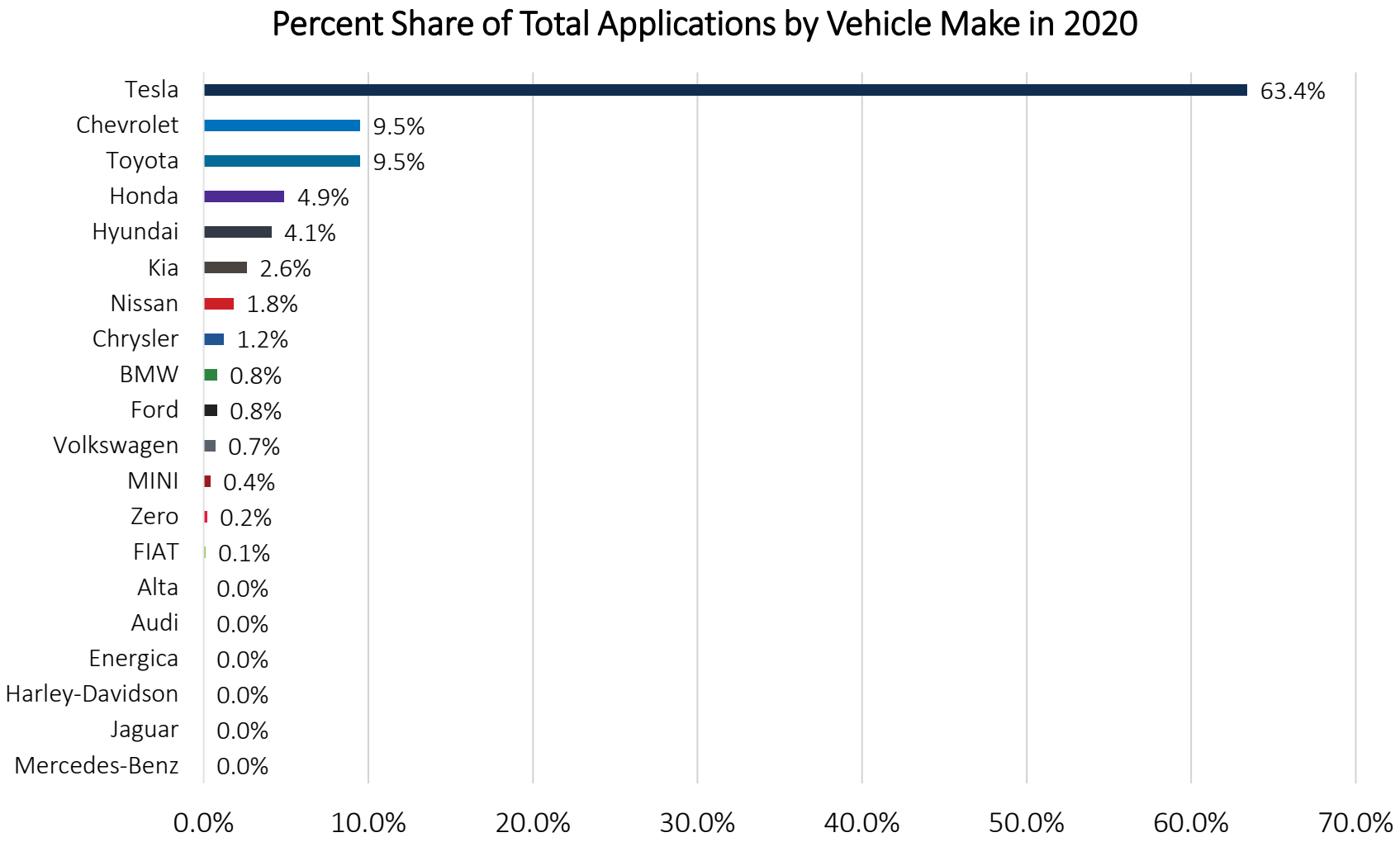


Chart displays the top 20 vehicle makes.

Percent Share of Applications by Vehicle Models in 2019

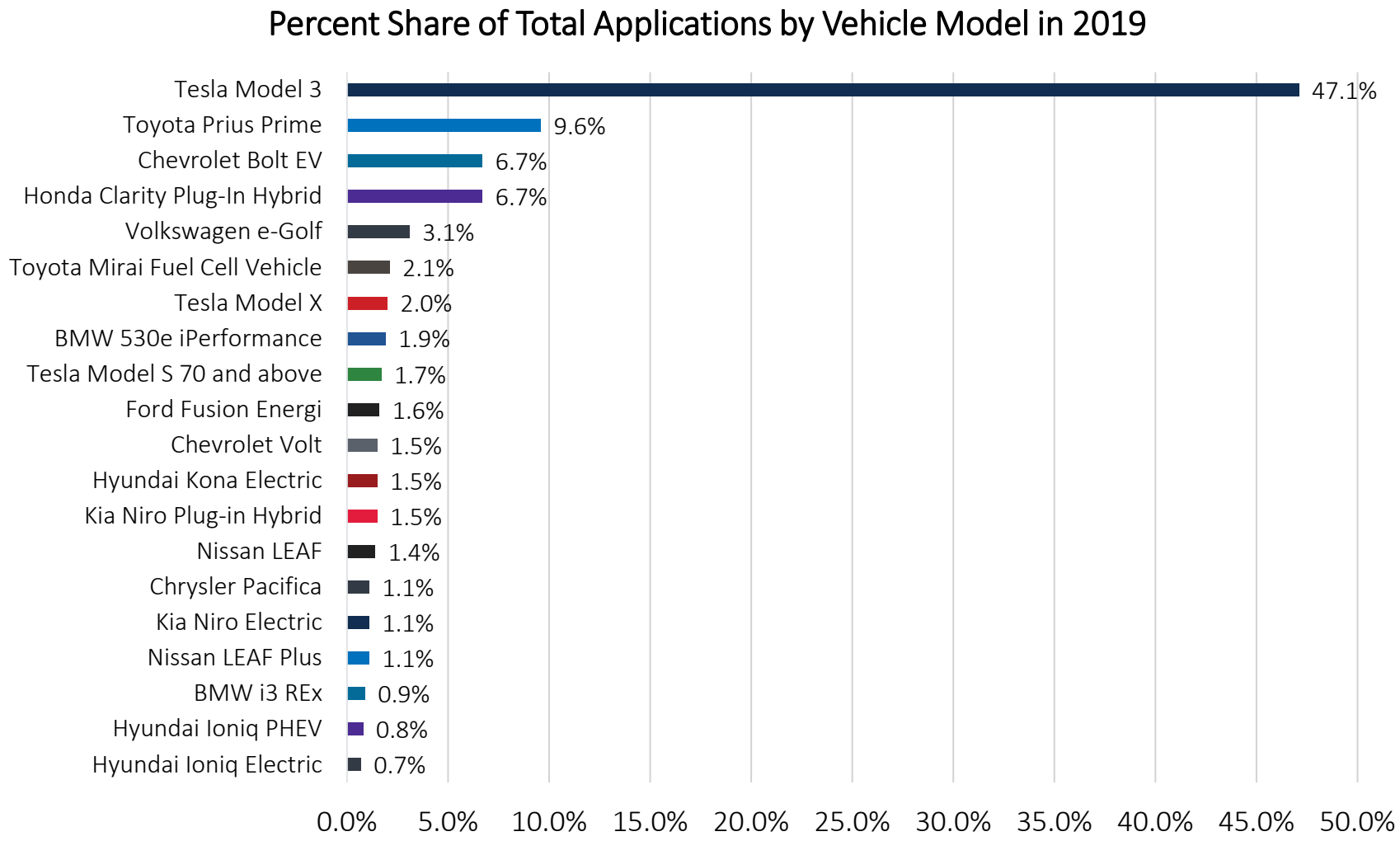


Chart displays the top 20 vehicle models.

Percent Share of Applications by Vehicle Models in 2020

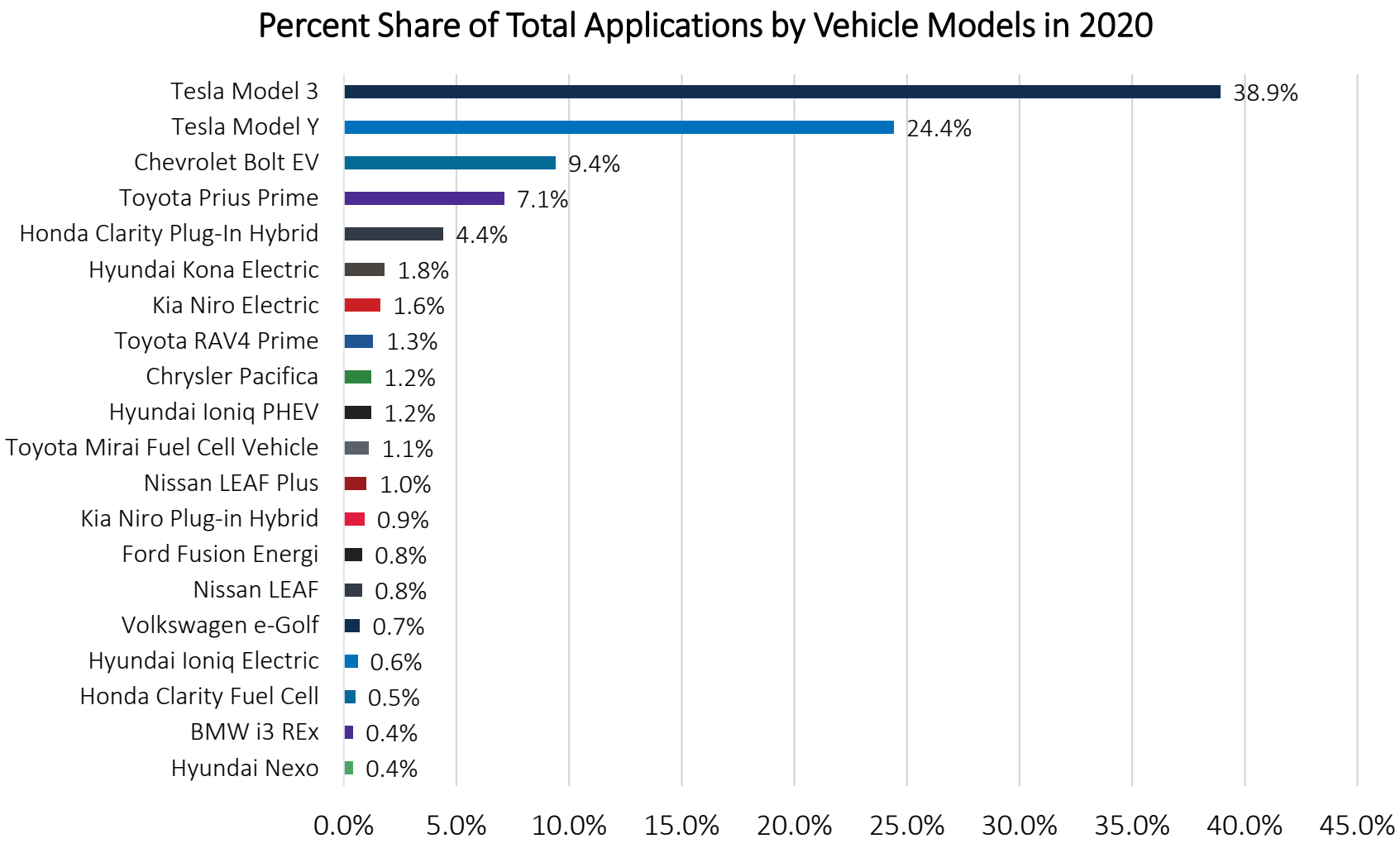


Chart displays the top 20 vehicle models.

Summary

- Total CVRP applications **decreased** during COVID-19 by **43%**
- During COVID-19 most demographic categories **saw little to no change** in the share of applications, indicating that the pandemic did not significantly alter who was purchasing EVs
- The percentage of **female** and **Hispanic and Latino** applicants **increased** during COVID-19 for both Tesla and Non-Tesla vehicle applications.
- The percentage of **Asian** applicants **decreased** during COVID-19 for both Tesla and Non-Tesla vehicles *except* **Southeast Asian** applicants, whose percentage share for Non-Tesla vehicles slightly **increased**. Tesla's vehicle share of CVRP applications **increased** from **51% Pre-COVID-19** to **63% during COVID-19**.
- Growth in Tesla vehicle applications can be attributed to the addition of **Model Y** sales in 2020.

9. CVRP LMI Composition Summary: Changes during COVID-19

The following slide deck analyzes the trends and compositional changes of CVRP LMI applications during the COVID-19 pandemic. Applications are reported on a monthly basis and include demographic data and information about each rebated vehicle. For the purposes of this study, COVID-19 is defined as March-December 2020. While March-December 2019 is considered Pre-COVID-19. This report compares these two periods for participation changes among LMI. Data from January-March 2021 is also reported but it is not used for comparison because it is a different subset of months.

During COVID-19 there was a 33% decrease in total CVRP LMI applications. However, most demographics saw little or no change in their share of LMI applications, suggesting that while the total volume of applications decreased, there was no significant change in who was buying EVs. Applications by women and for Tesla vehicles had the largest percent change of any demographic, increasing their share of applications by 5.8%. There was no percentage change in applications among racial and ethnic identities greater than 3%. Hispanic and Latino LMI applicants increased their percent share of applications during COVID-19 for both Tesla and non-Tesla vehicles. Across all Asian identities, the percentage of applicants decreased during COVID-19 for Tesla vehicles. Southeast Asian and South Asian applicants saw an increase in percent share of non-Tesla vehicles. The share of CVRP applications for Tesla vehicles increased from 38.5% to 48.5% during COVID-19. This growth can be attributed to the addition of Model Y sales in 2020.

In the first three months of 2021, 51% of LMI applications were for Tesla Vehicles. A preference for Tesla vehicles is shared by applicants who identify as the following: 21-39 years old, male, Hispanic or Latino, all racial identities aside from white and Middle Eastern or North African. While those identifying as 40 years old, female, white, Middle Eastern, North African and not Hispanic or Latino preferred non-Tesla vehicles during this period. BEVs commanded 71% of all LMI applications during this period. This is reflected in the application breakdown by model which shows that three of the top four models were BEVs.

CVRP LMI Composition Summary: Changes During COVID-19

Comparing LMI Applications from March to December, 2019 versus 2020 and January to March 2021

Charlie Good, Keir Havel, Anjelica Thang

Center for Sustainable Energy®

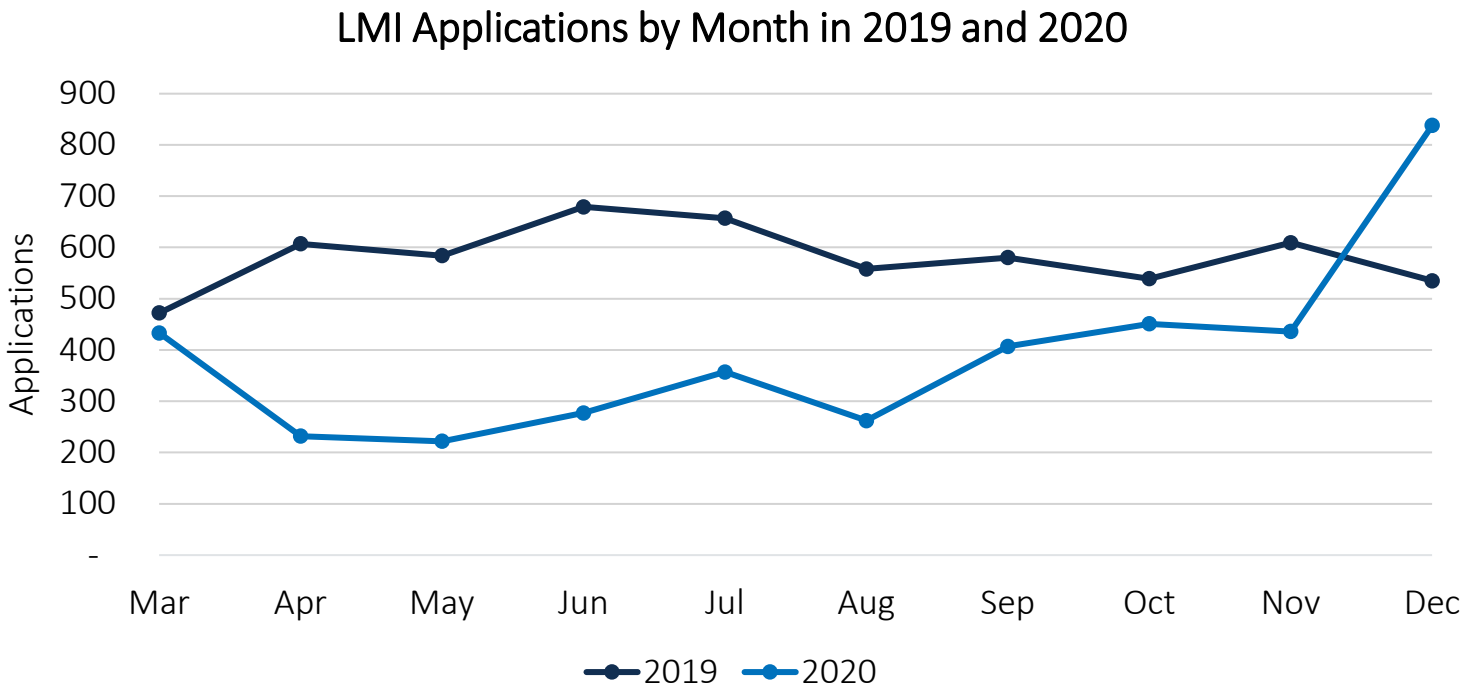
Analysis of Monthly CVRP LMI Applications by Market Segment

- Market is segmented by Tesla and Non-Tesla vehicle share to highlight any potential differences in who is participating
- LMI Applications are segmented by:
  - Gender
  - Race
  - Ethnicity
  - Age
  - County
  - Vehicle Category
  - Vehicle Make
  - Vehicle Model
- Summary

Overview of CVRP LMI Applications in 2019 and 2020*

- 33% **decrease** in applications in 2020
- "Sustained" recovery started in September 2020

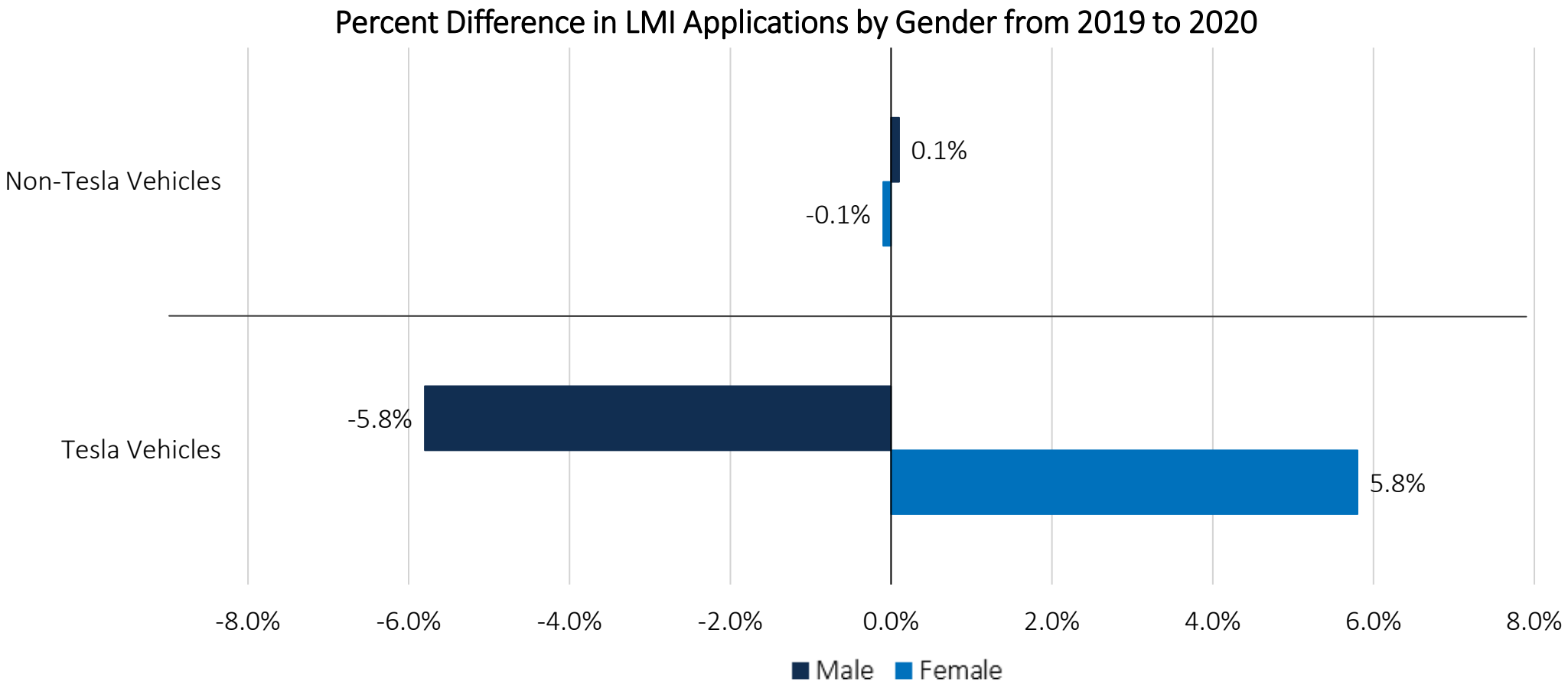
Year	Total Applications*
2019	5,820
2020	3,915



**Applications are aggregated from March– December for year 2019 and 2020*

Percent Share of LMI Applications by Gender

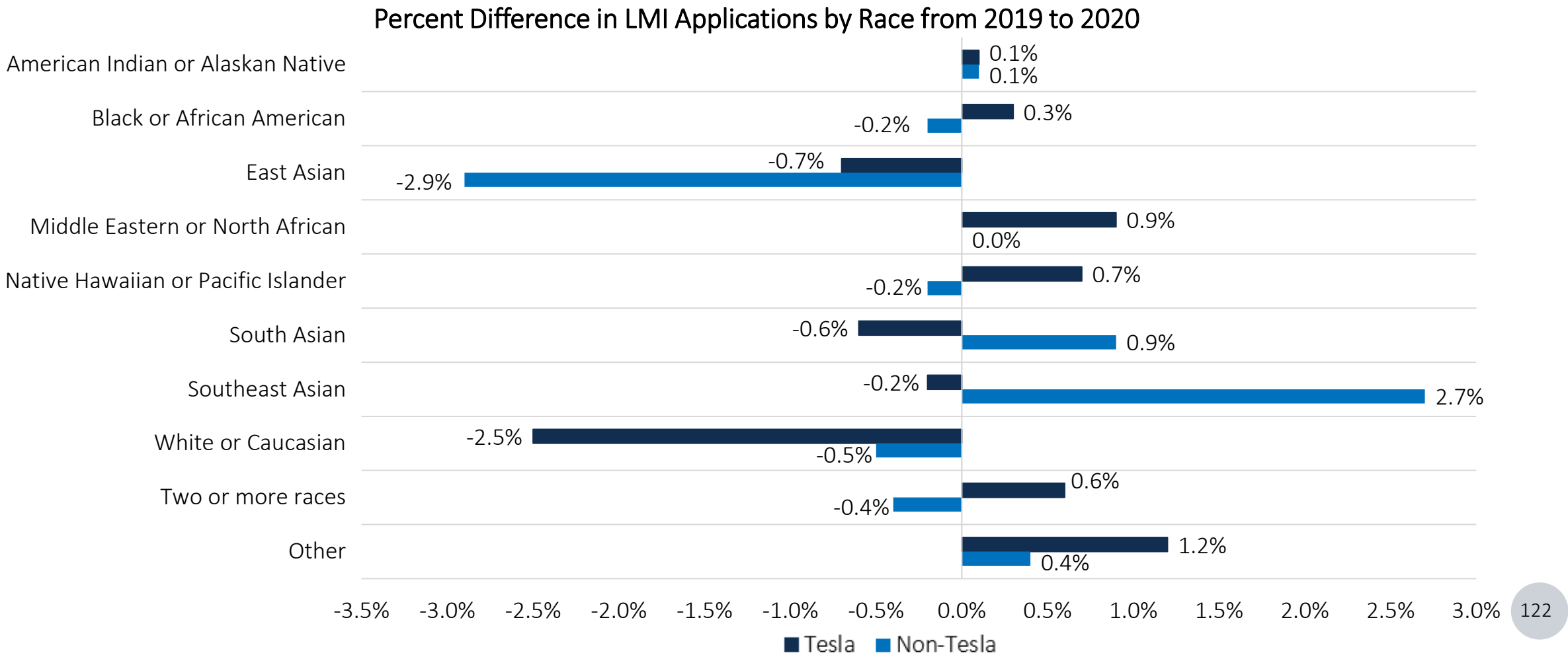
Percent share of **female** LMI applicants **increased** for Tesla vehicles during COVID-19



**Non-binary/Transgender gender type was excluded as the percentage difference was negligible*

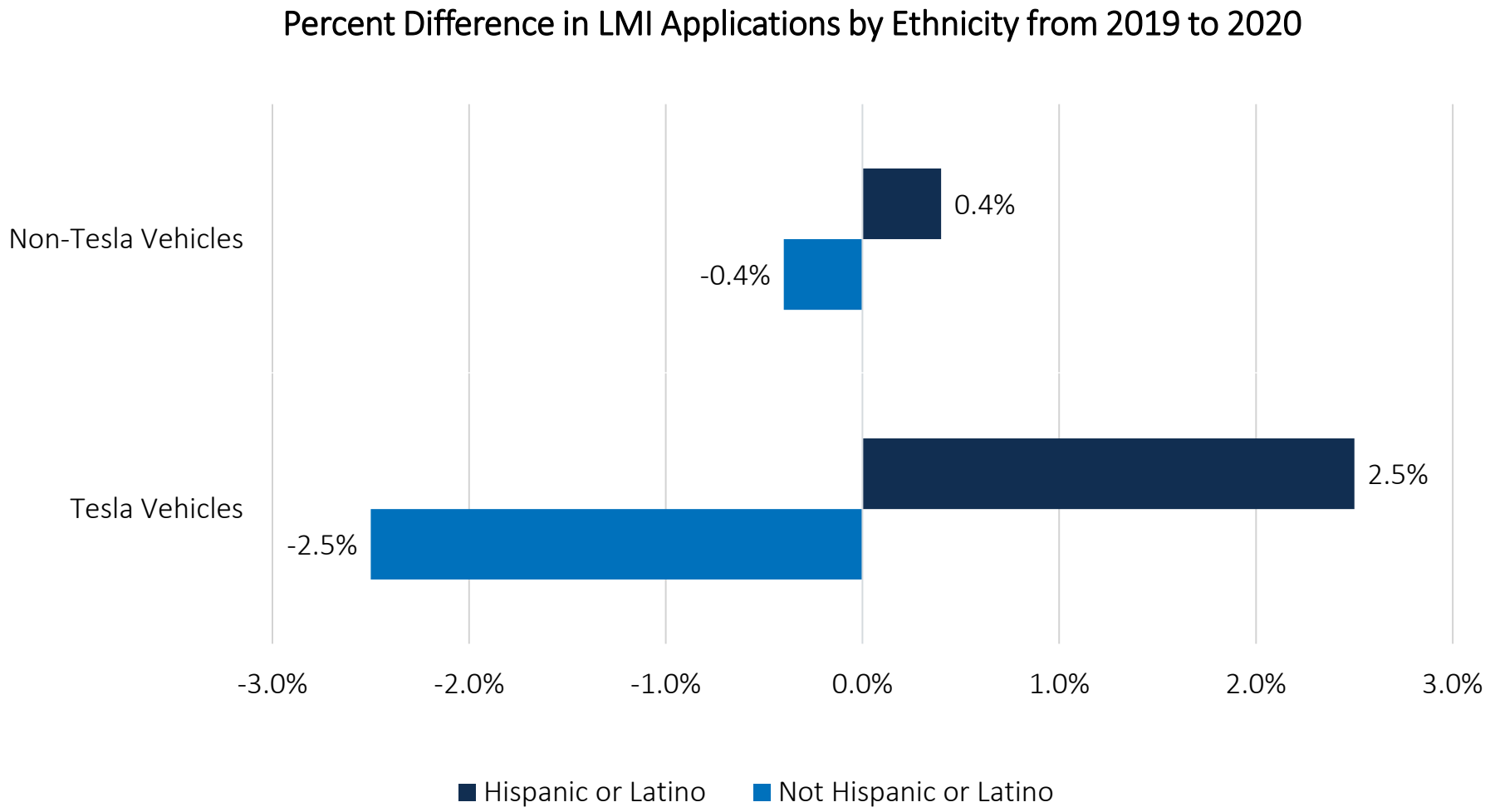
Percent Share of LMI Applications by Race

Percentage share of **East Asian and Caucasian** LMI applicants **decreased** for Tesla and Non-Tesla vehicles during COVID-19



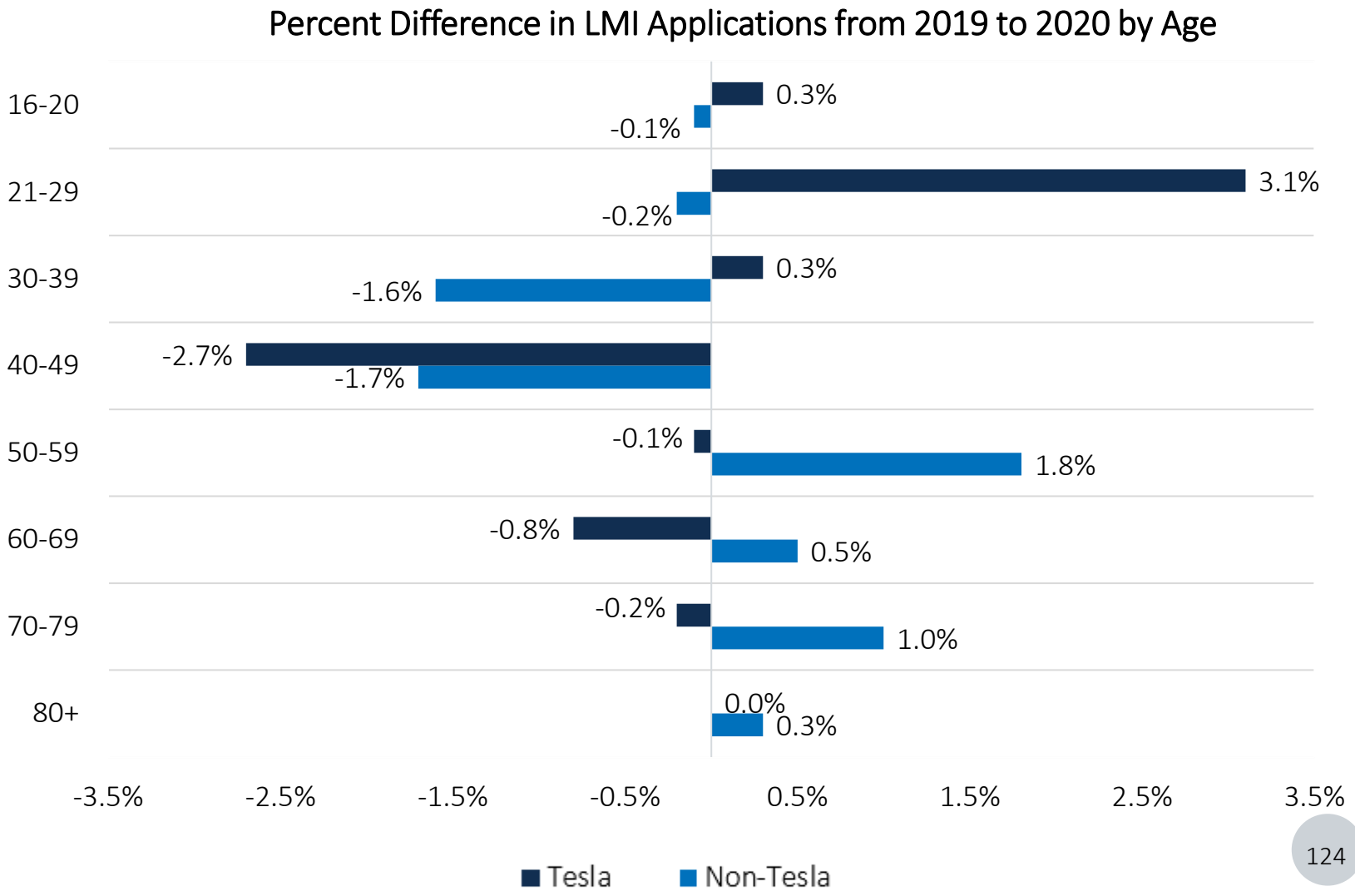
Percent Share of LMI Applications by Ethnicity

Percent share of **Hispanic and Latino** LMI applicants **increased** for both Tesla and Non-Tesla vehicles during COVID-19



Percent Share of LMI Applications by Age

- Share of **Tesla** LMI applications for **21-29** age group **increased** by **3.1%** whereas **Non-Tesla** applications **decreased** by **0.2%**
- Share of **Tesla** vehicle applications for **40-49** age group **decreased** by **2.7%**
- Share of **Non-Tesla** applications **increased** for age groups above 50



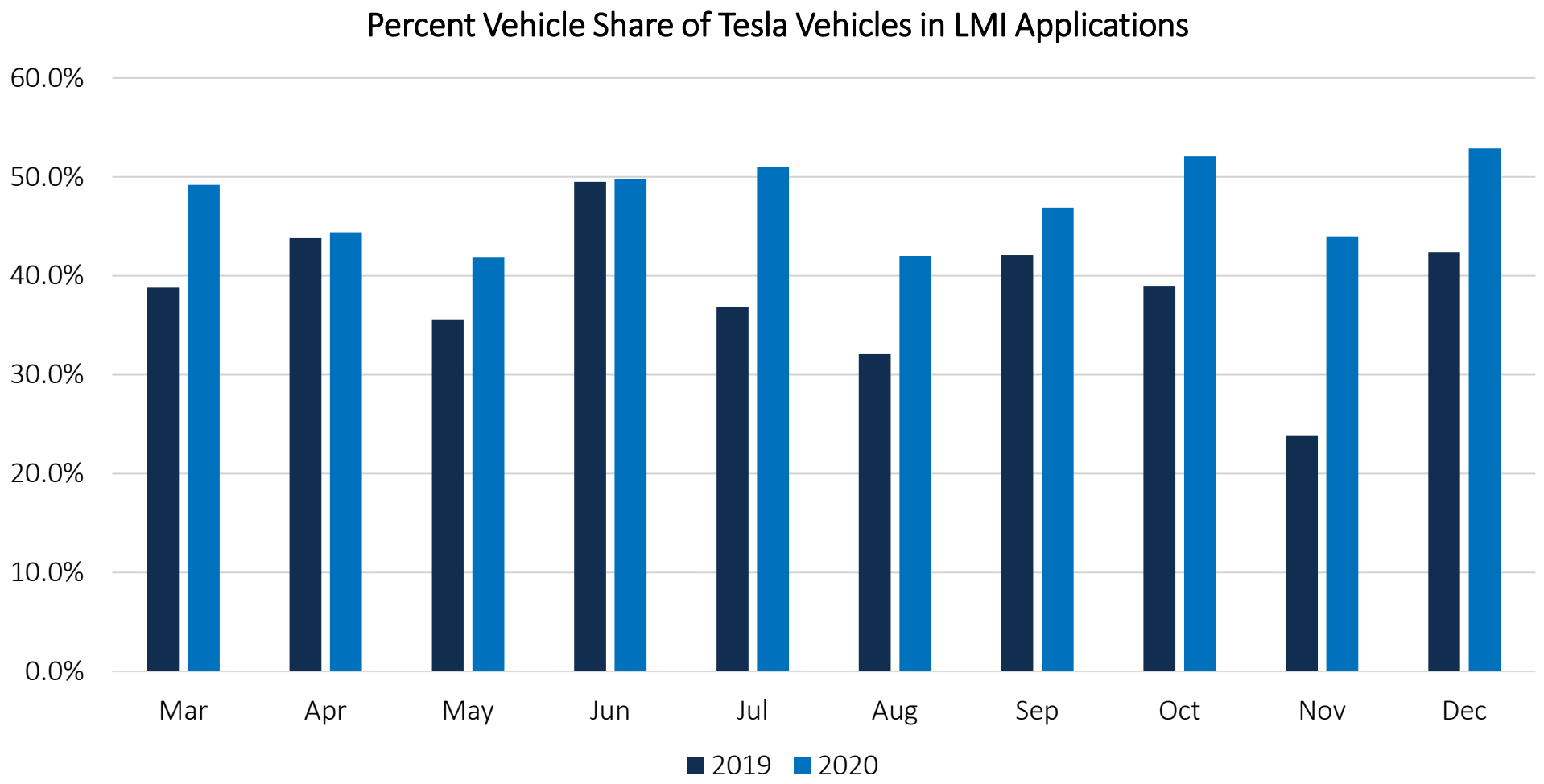
Percent Share of LMI Applications by County

- **Santa Clara and Alameda** counties had the **highest increase** in percent share of LMI applications during COVID-19
- **Los Angeles** and **Orange** counties both had a **decrease** of **more than 1%** in percent share of LMI applications during COVID-19
- Counties not listed had a less than 0.3% increase or decrease in percent share of LMI applications during COVID-19

County	Vehicle Share Difference from 2019
Alameda	1.2%
Santa Clara	1.2%
Sacramento	0.8%
San Diego	0.5%
San Francisco	0.5%
Sonoma	-0.4%
Riverside	-0.6%
San Bernardino	-0.6%
Los Angeles	-1.2%
Orange	-1.6%

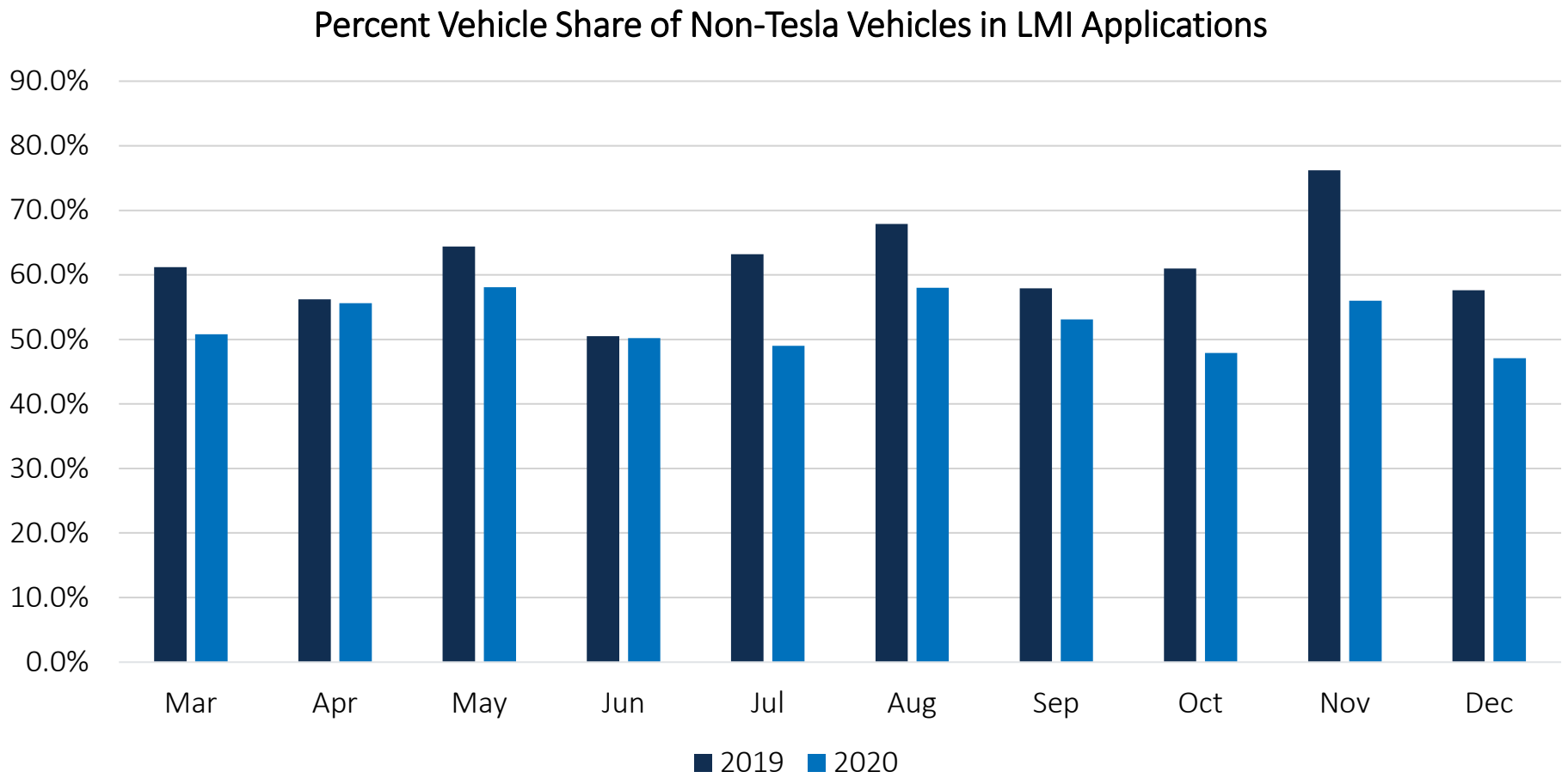
Percent Share of Tesla Applications

Percentage share of **Tesla** LMI applications **increased** from **38.5%** in 2019 to **48.5%** in 2020



Percent Share of Non-Tesla LMI Applications

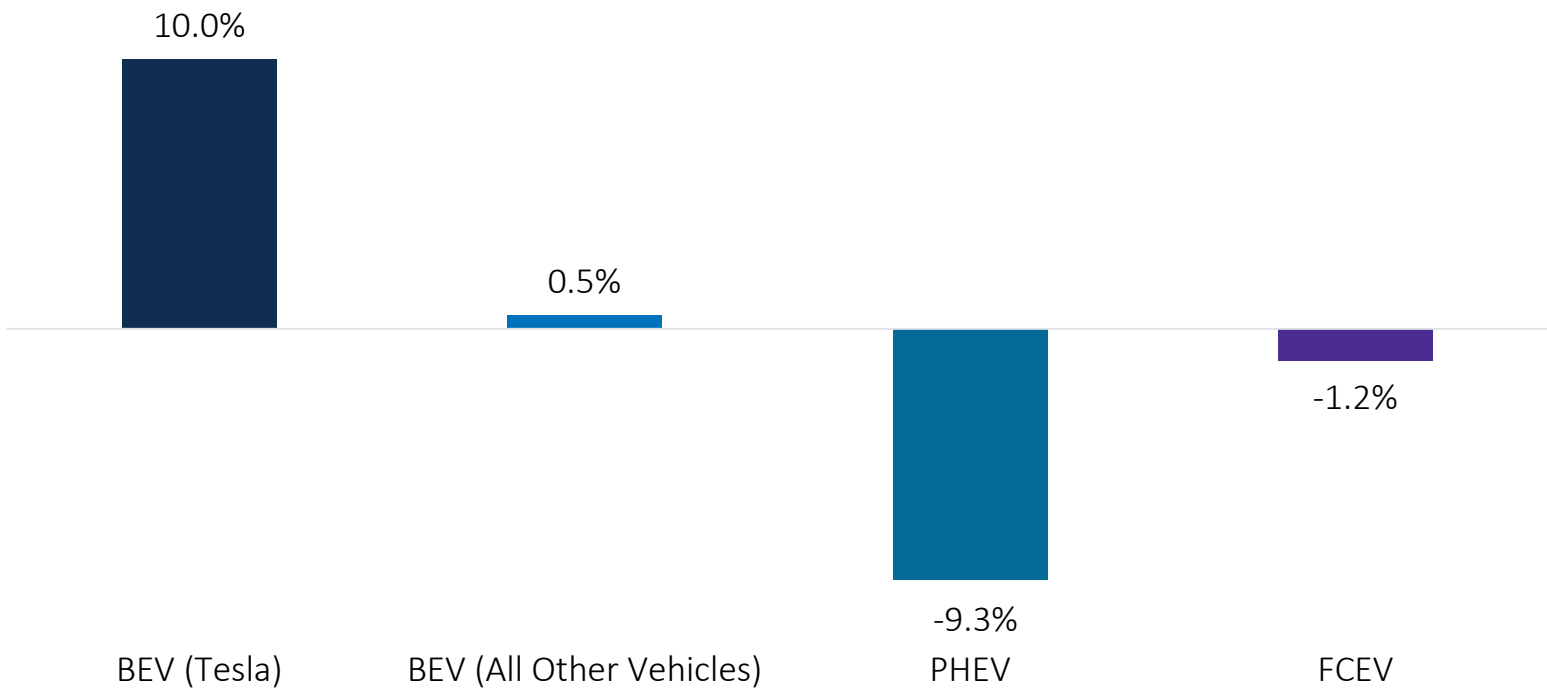
The percentage share of **Non-Tesla** applications remained **lower** throughout 2020



Percent Share of LMI Applications by Vehicle Type

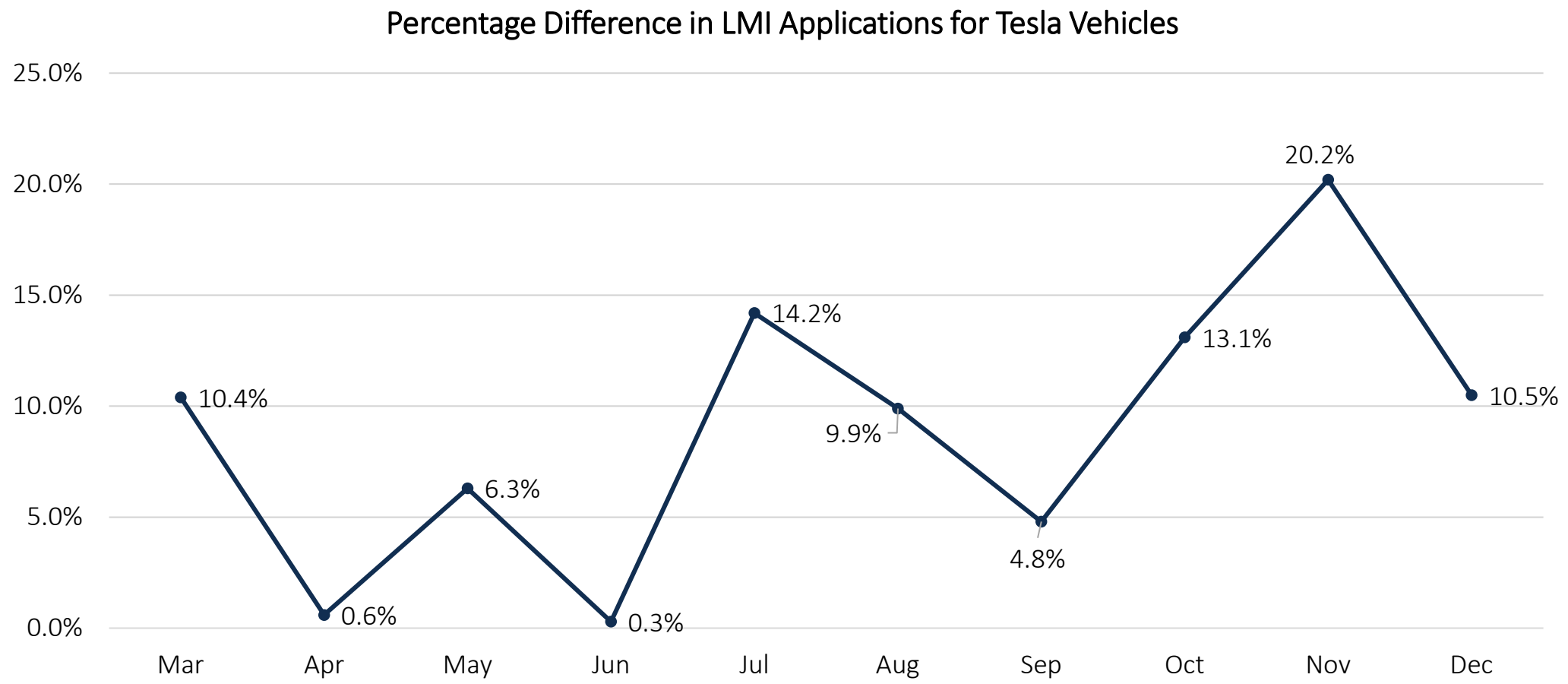
- Percent share of **PHEV** LMI applications **decreased** by **9.3%** during COVID-19
- Percent share of **Tesla** LMI applications **increased** by 10**%** during COVID-19

Percent Difference in LMI Applications by Vehicle Category from 2019 to 2020



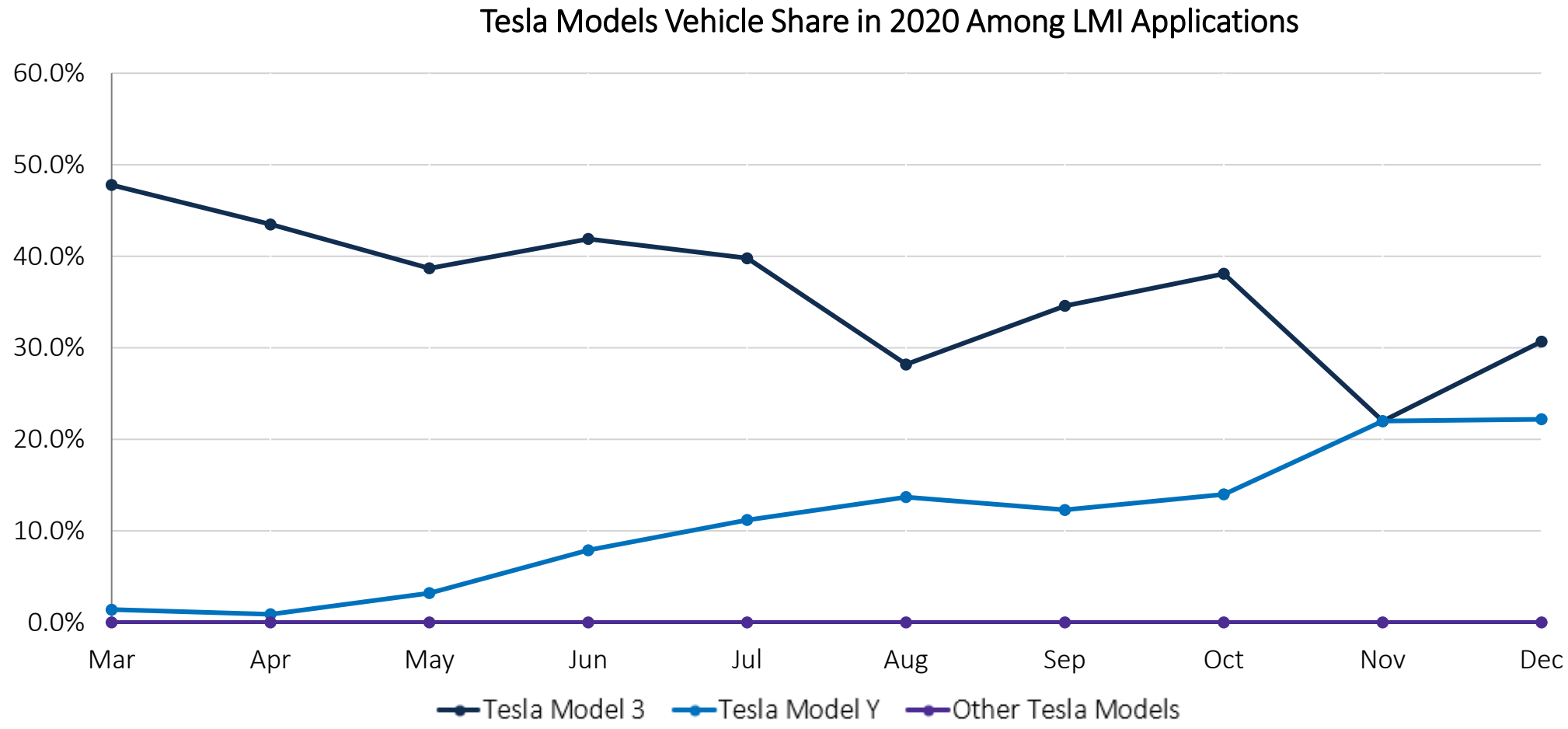
Comparing Percent Share of Tesla LMI Applications in 2019 to 2020

Percent share of applications for **Tesla vehicles increased** throughout COVID-19



Percent Share of LMI Applications by Tesla Model

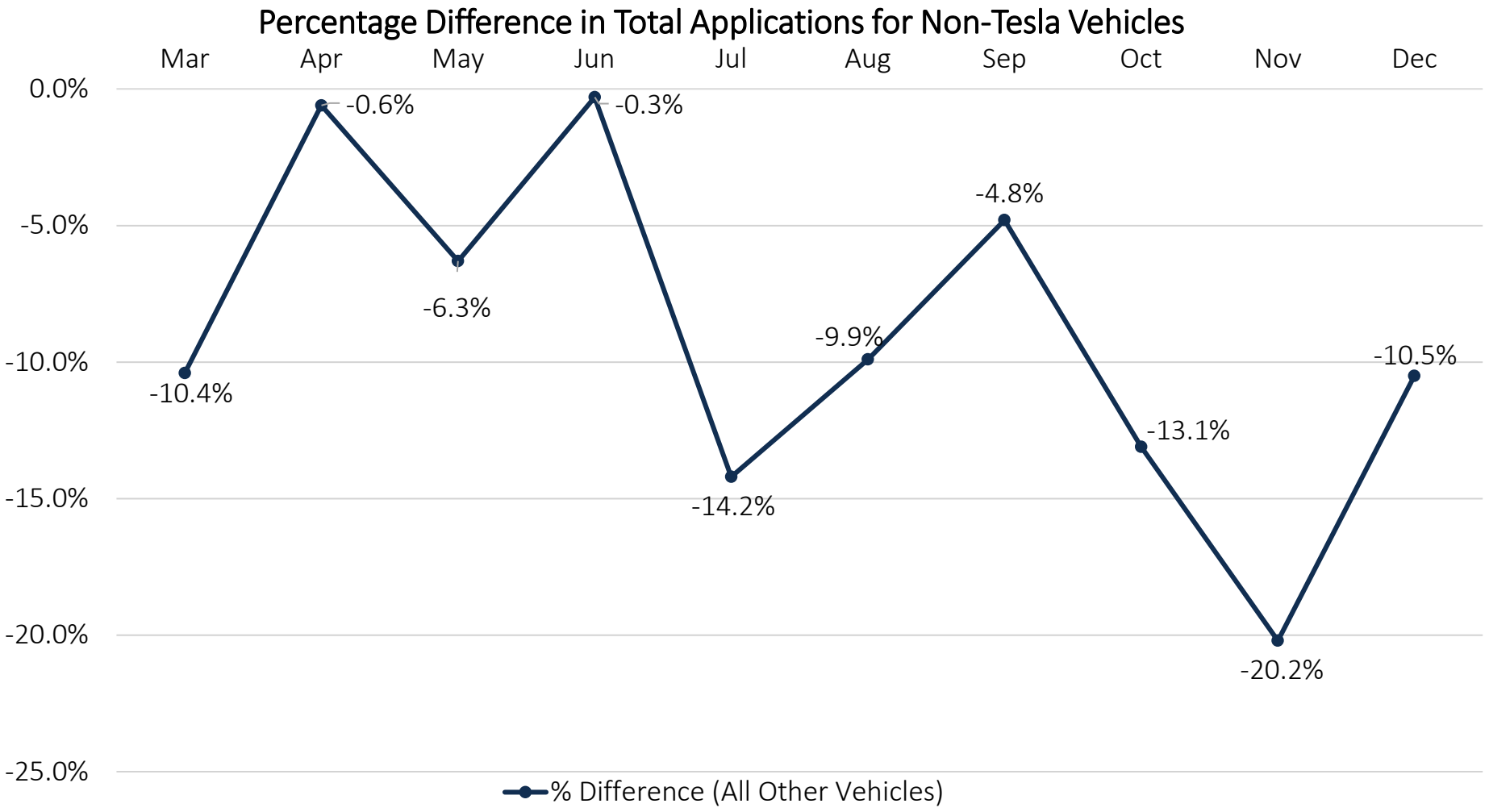
Percent share of **Tesla** LMI applications **increased** during COVID-19 partially due to **Tesla Model Y** sales starting in June 2020



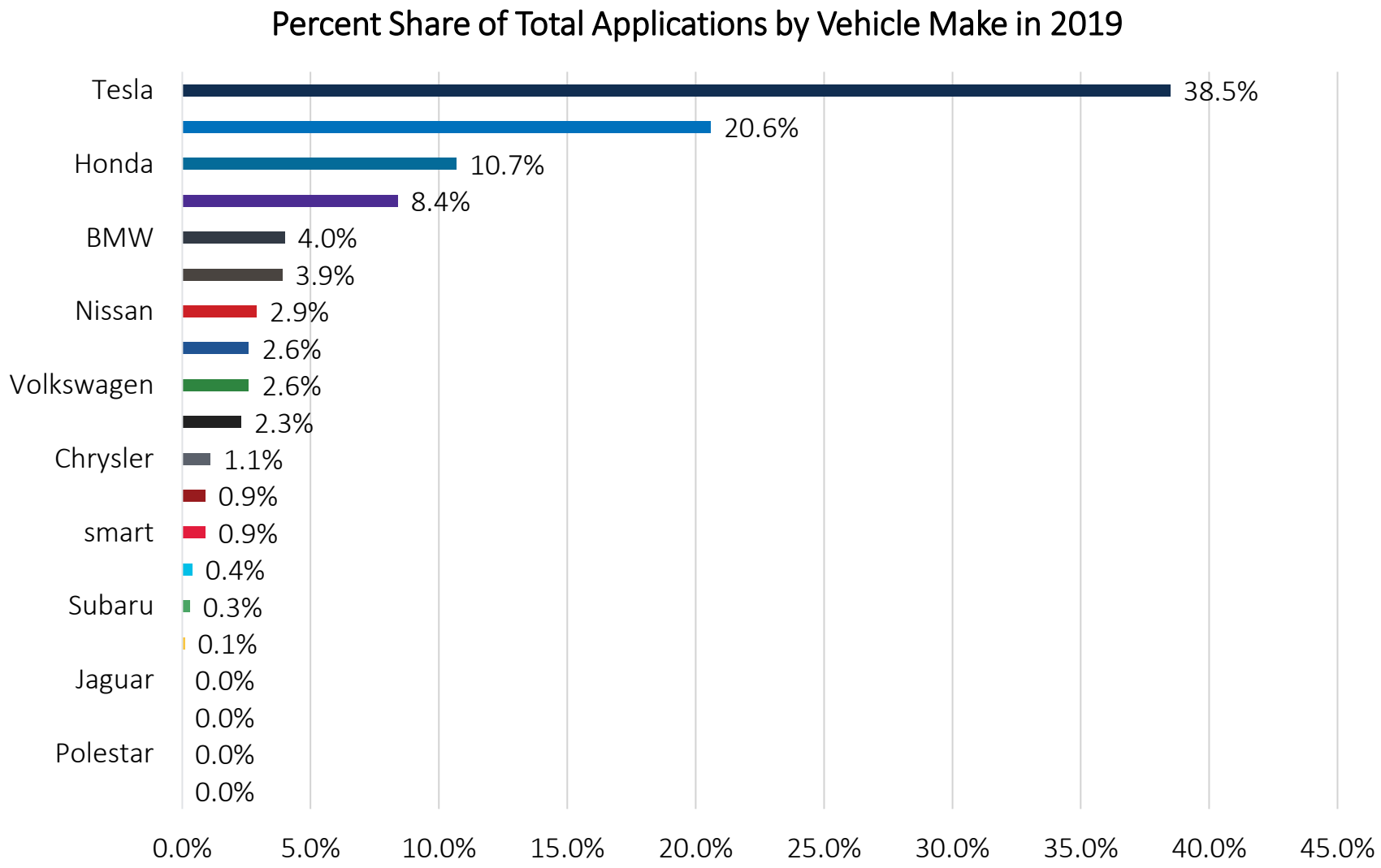
"Other Tesla Models" include Tesla Model S and Model X which are no longer eligible due to MSRP cap

Comparing Percent Share of Non-Tesla LMI Applications in 2019 to 2020

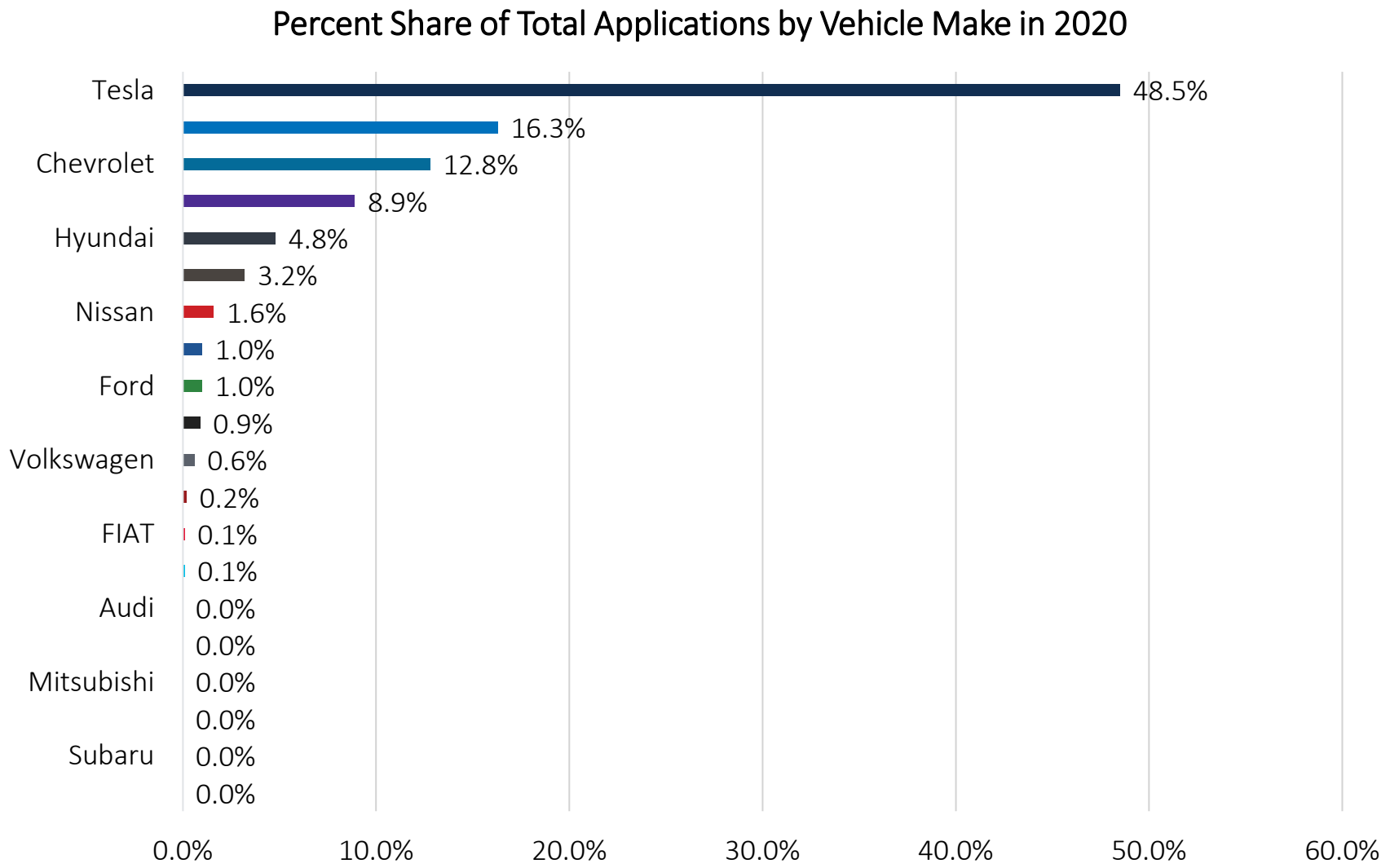
Percent share of **Non-Tesla vehicles decreased** during COVID-19



Percent Share of LMI Applications by Vehicle Make in 2019



Percent Share of LMI Applications by Vehicle Make in 2020



Percent Share of LMI Applications by Vehicle Models in 2019

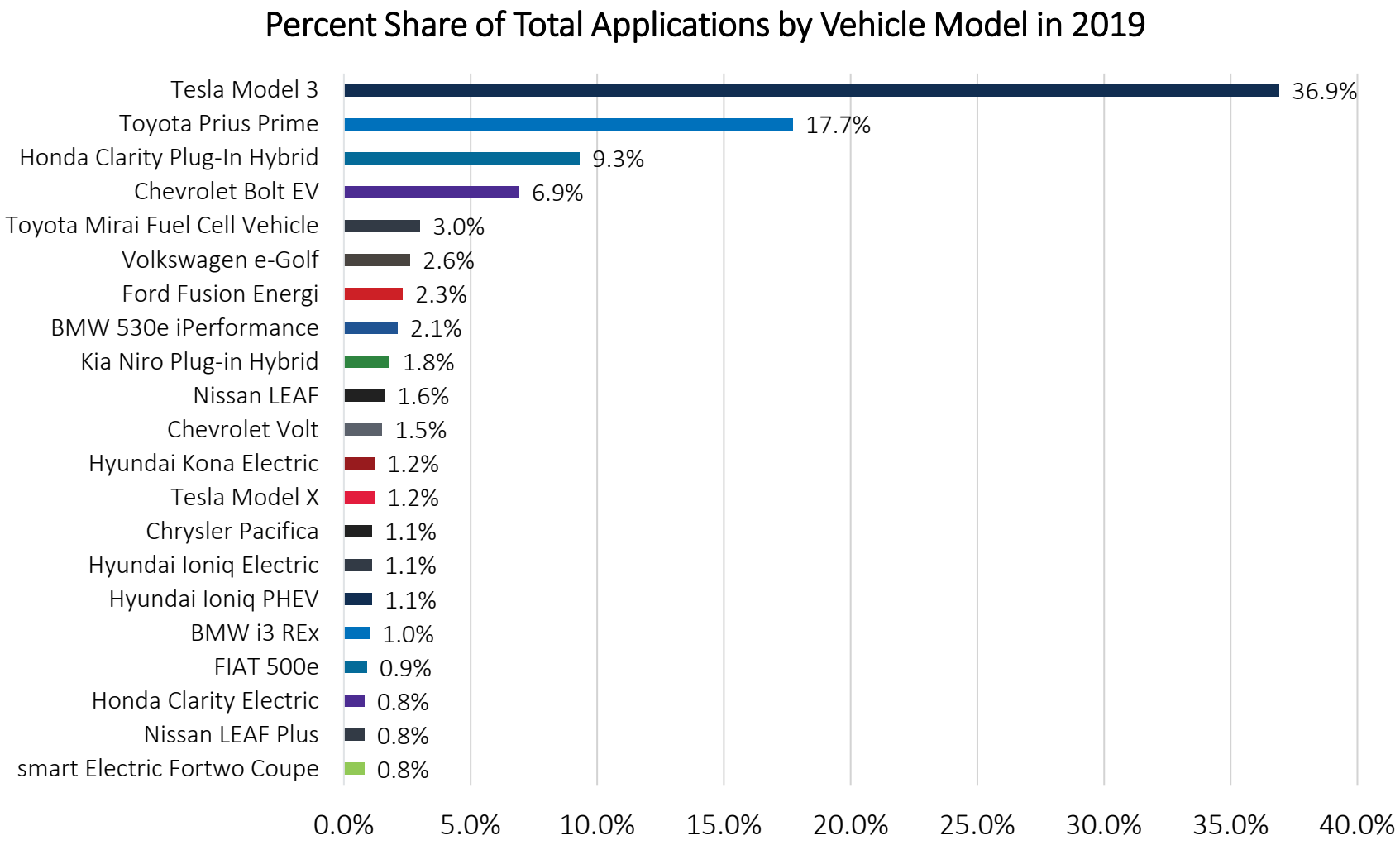


Chart displays the top 20 vehicle models.

Percent Share of LMI Applications by Vehicle Models in 2020

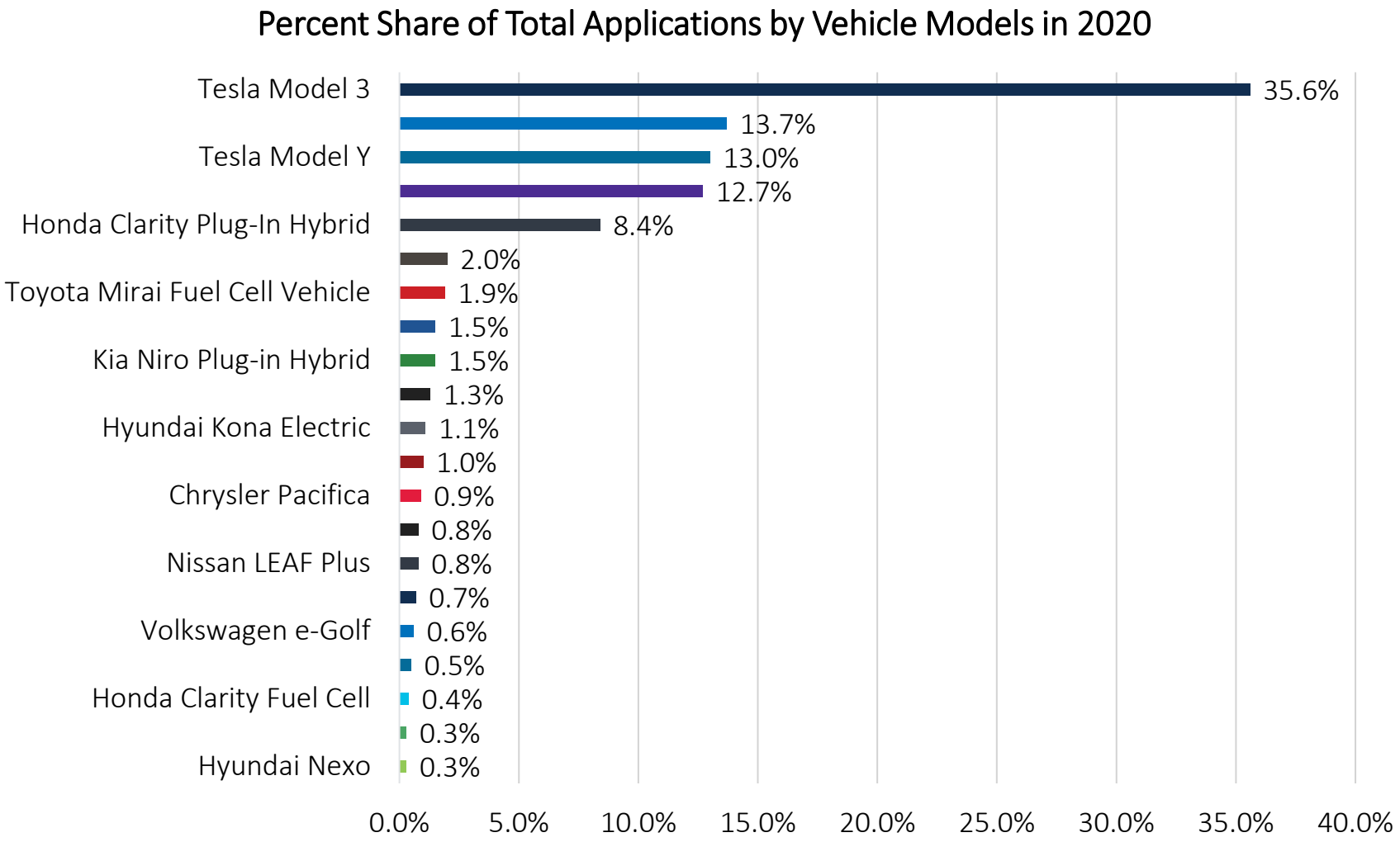
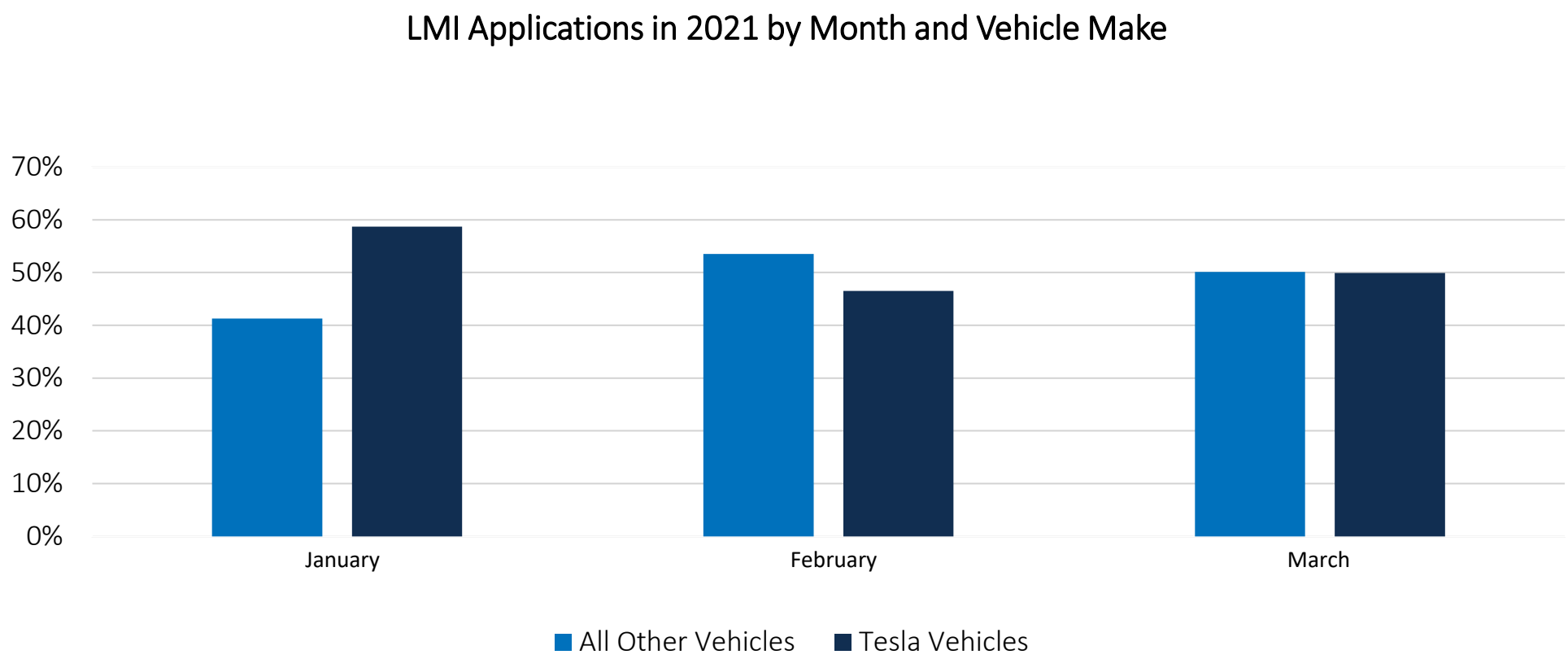


Chart displays the top 20 vehicle models.

LMI Applications in 2021

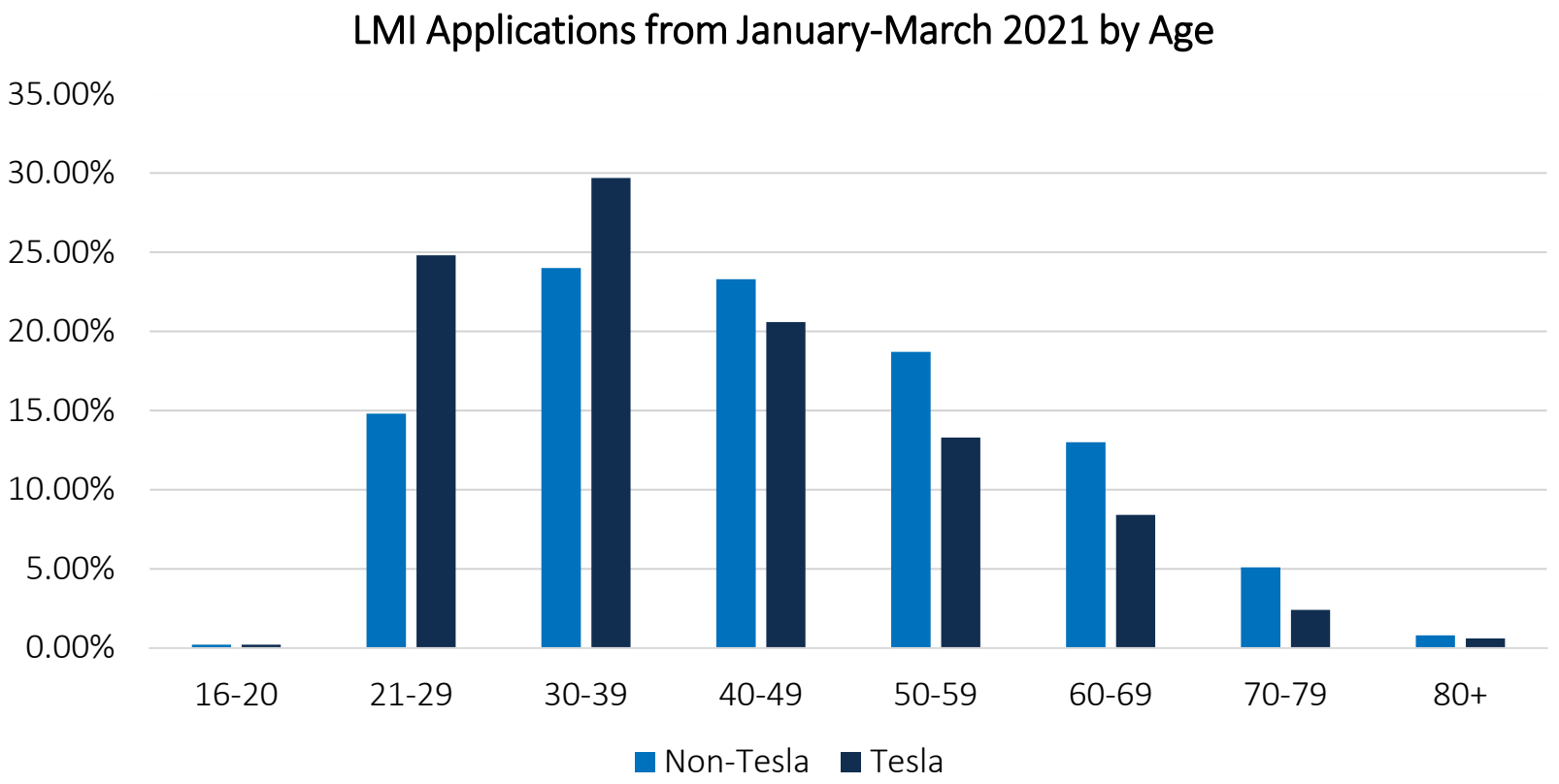
Tesla vehicles had a slightly **greater** share of LMI applications during this time



**For the purposes of this research, we are only interested in January-March 2021*

LMI Applications in 2021 by Age

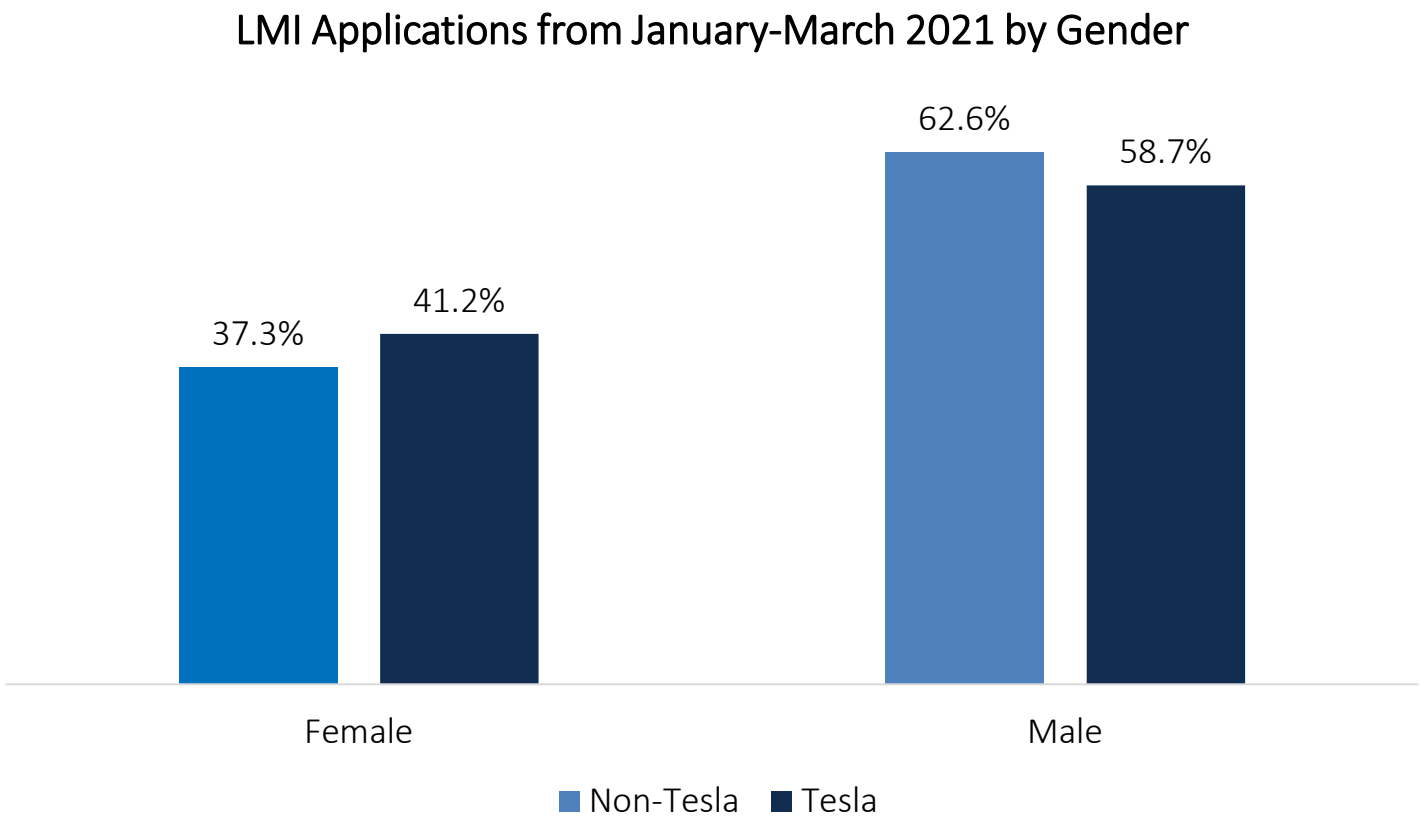
- Applicants between **21 and 39 years** purchased **more** Tesla vehicles
  - Those **over 40** purchased **more** Non-Tesla Vehicles



**Non-binary/Transgender gender type was excluded as there was a negligible number of LMI applications*

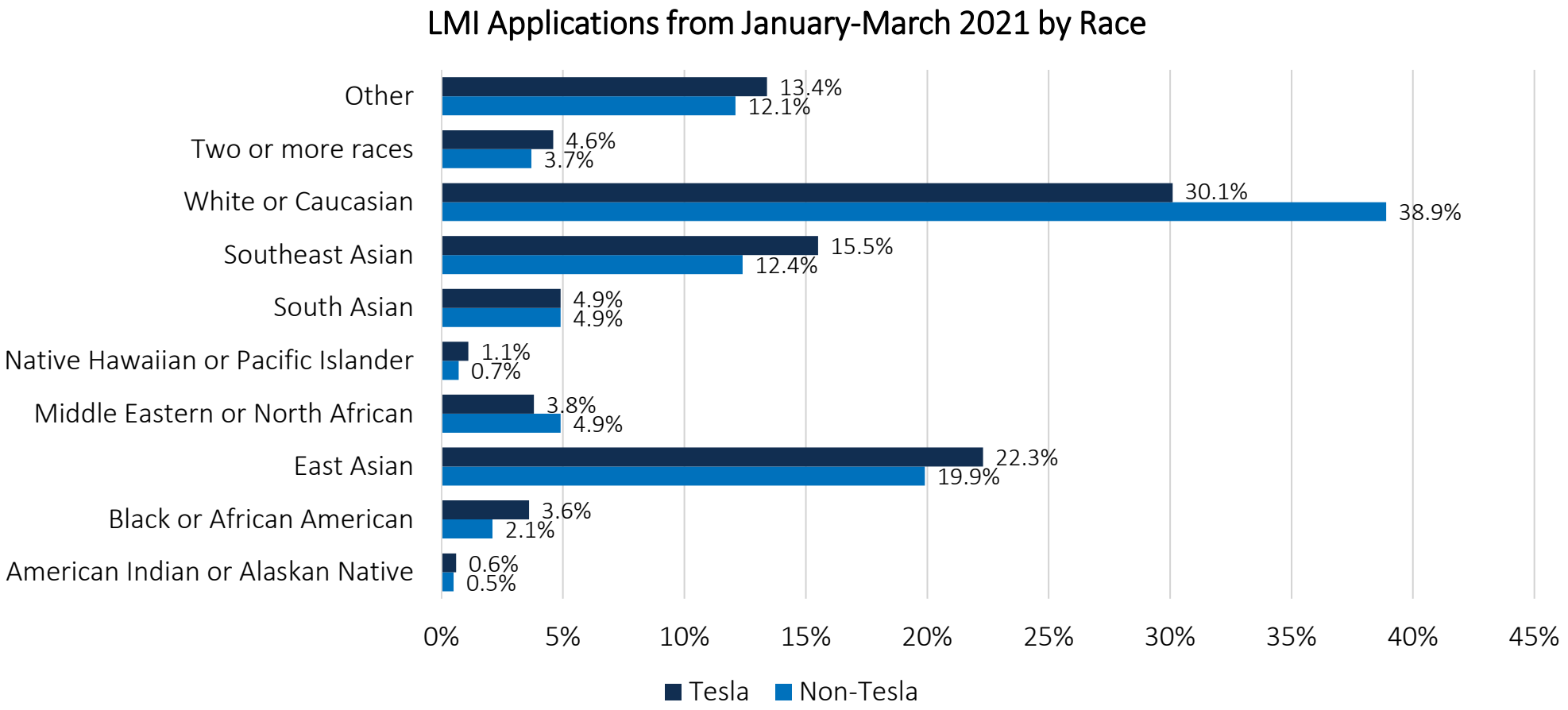
LMI Applications in 2021 by Gender

Men demonstrated a preference for Non-Tesla vehicles, while women preferred Tesla vehicles



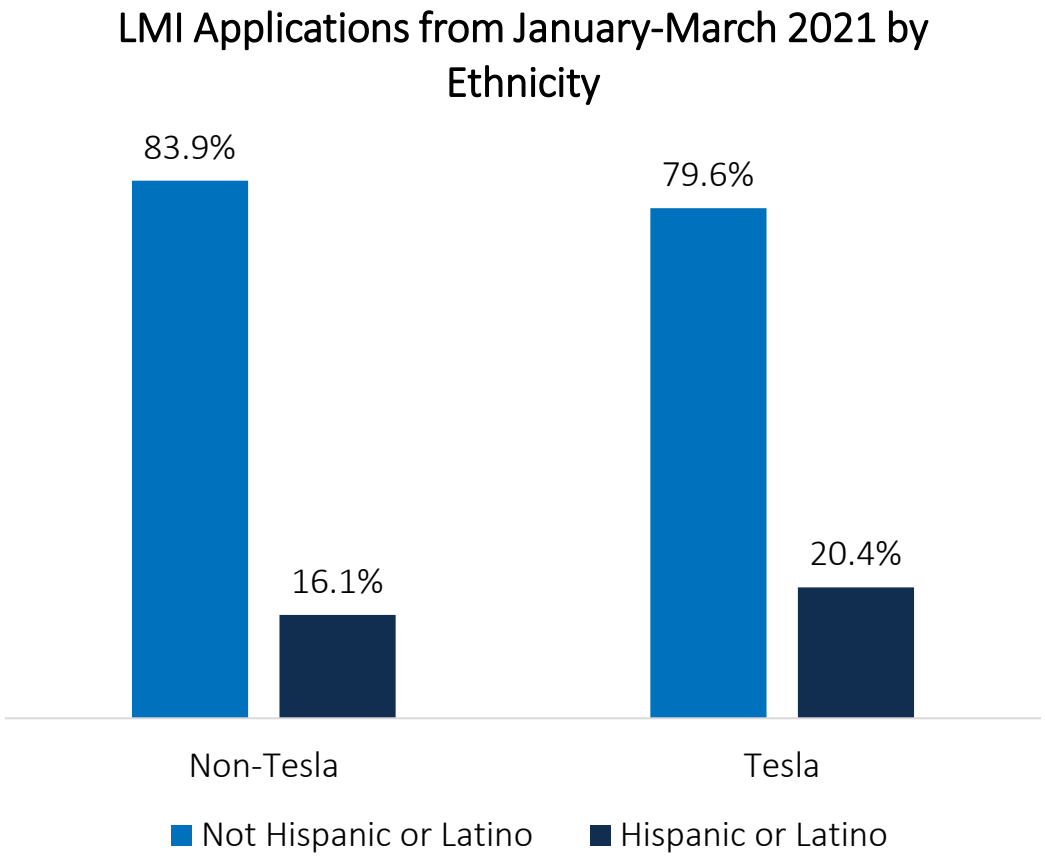
LMI Applications in 2021 by Race

Only those identifying as **White** or **Middle Eastern or North African** purchased more Non-Tesla vehicles than Tesla Vehicles



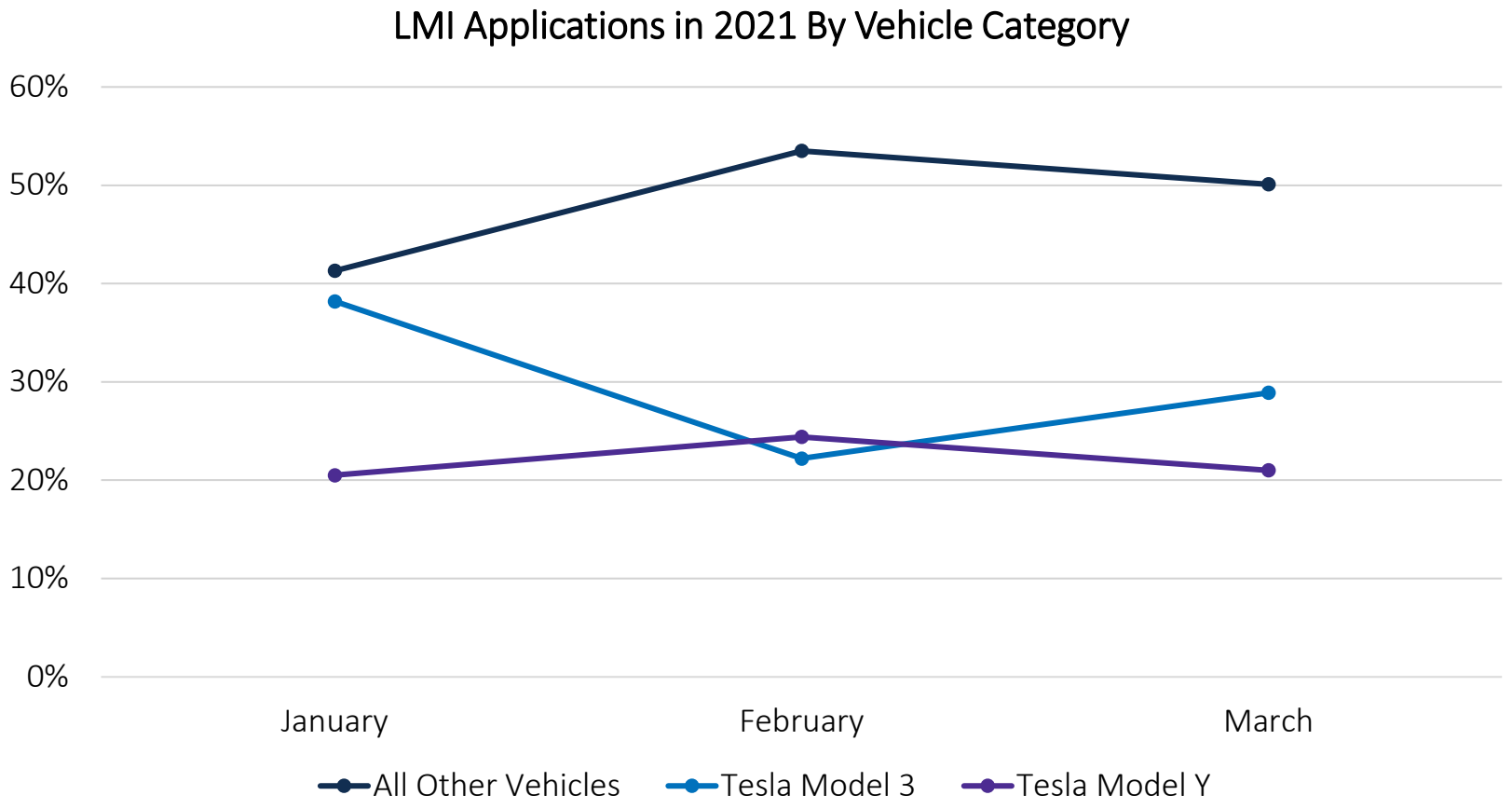
LMI Applications in 2021 by Ethnicity

Hispanic or Latino individuals accounted for 18% of all LMI applications



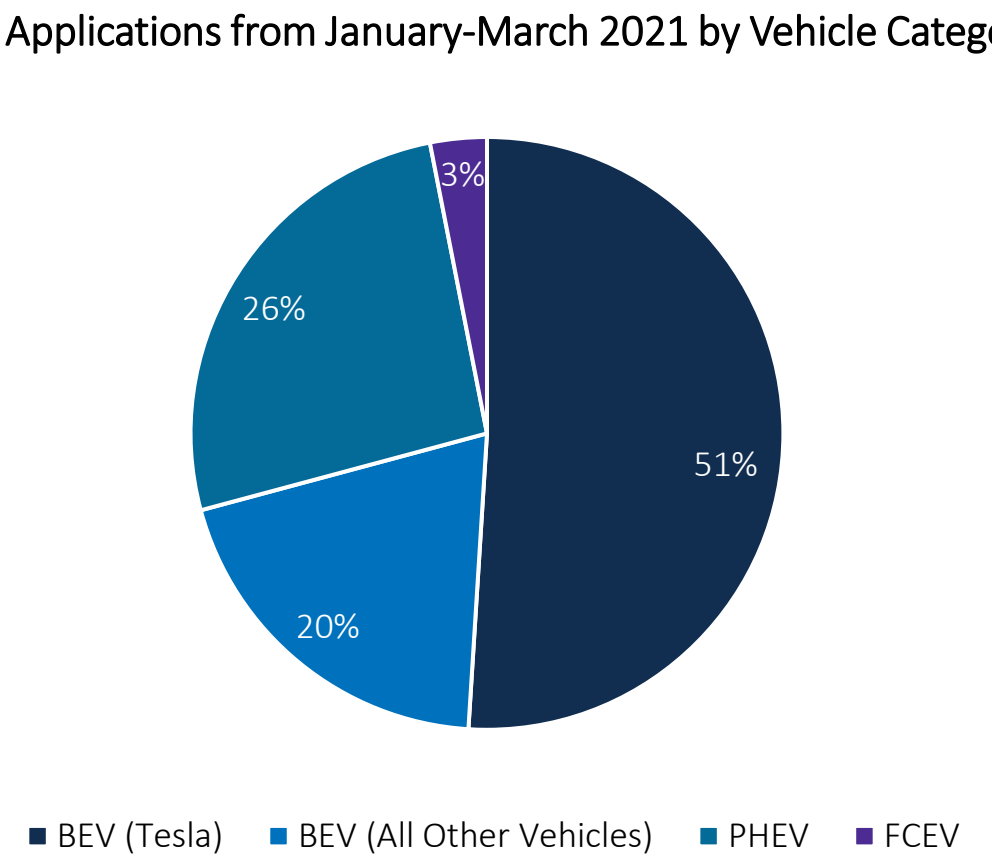
LMI Applications in 2021 by Vehicle Category

There were more than twice as many applications in March, compared to January or February.



LMI Applications in 2021 by Vehicle Type

71% of LMI applications were for **Battery Electric Vehicles**

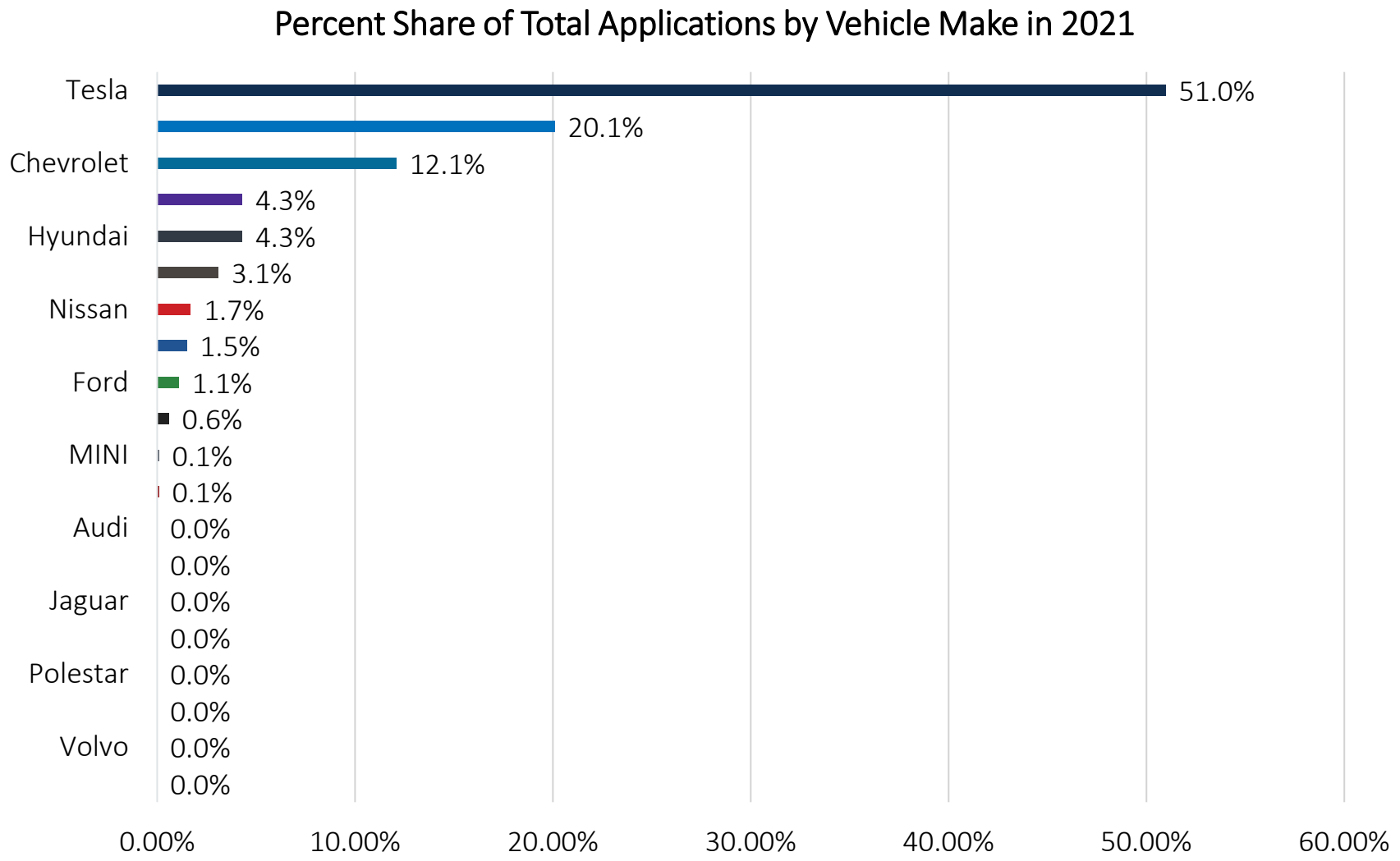


Percent Share of LMI Applications by County 2021

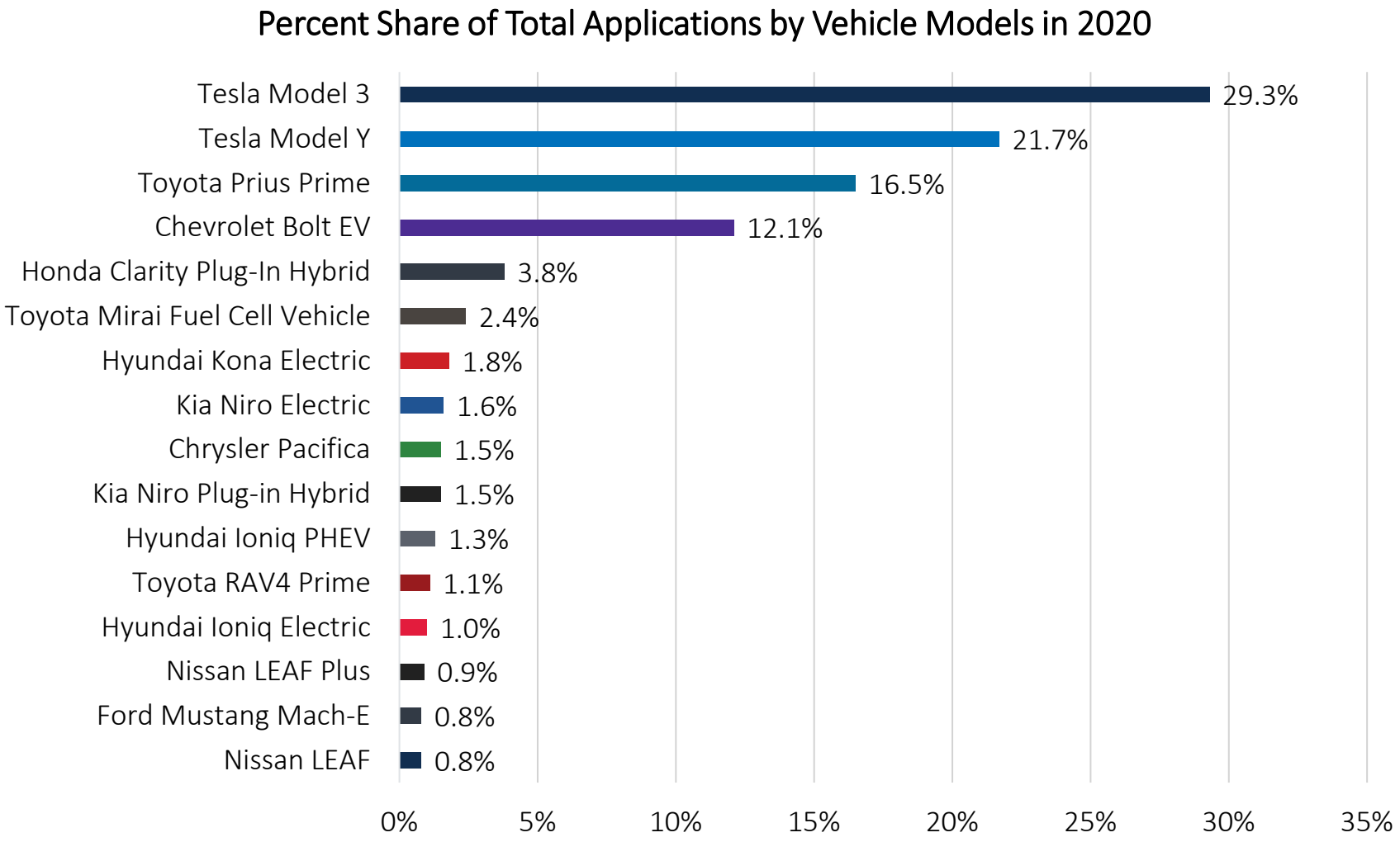
- **Los Angeles and Orange counties** had the **highest** percent share of LMI applications during January-March 2021
- **82%** of LMI applications occurred in the nine counites listed in this table
- Other counties not listed had less than **3%** of applications during January-March 2021

County	Percent share of LMI Applications in 2021 (January-March)
Los Angeles	32%
Orange	14%
San Diego	9%
Riverside	6%
Santa Clara	5%
San Bernardino	5%
Alameda	4%
Sacramento	4%
Contra Costa	3%

Percent Share of LMI Applications by Vehicle Make in 2021



Percent Share of LMI Applications by Vehicle Model in 2021



Summary

- Total CVRP LMI applications **decreased** by **33%** from 2019 to 2020.
- During COVID-19, most demographic categories **saw little to no change** in the share of LMI applications, indicating that the pandemic did not significantly alter who was purchasing EVs
- The percentage of **female** and **Hispanic and Latino LMI** applicants **increased** during COVID-19 for both Tesla and non-Tesla vehicle applications.
- The percentage of **Asian** applicants generally **decreased** during COVID-19 or both Tesla and non-Tesla vehicles *except* **Southeast Asian and South Asian** applicants, whose percentage share for non-Tesla vehicles **increased**.
- Tesla's vehicle share of CVRP applications **increased** from **38.5% pre COVID-19** to **48.5% during COVID-19**.
- Growth in Tesla vehicle applications can be attributed to the addition of **Model Y** sales in 2020.

10. COVID-19 Survey

The following slide deck summarizes findings from a survey administered by CSE during COVID-19. The survey was administered March 10, 2021 through April 12, 2021. Over 2,200 Californians responded. Survey questions included preferences for travel, changes to purchasing and/or leasing vehicles as well as perspectives on EVs. Topics covered included the following.

- Work from home driving behaviors
- Commuting changes during COVID-19
- Impacts on income
- Moving trends
- Vehicle acquisition plans
- Awareness of EV incentives
- Environmental concerns

Survey participants reported that COVID-19 reduced their travel in general, commuting to work and air travel. Participants also increased their use of personal vehicles compared to other modes of transportation. Decreased commuting contrasts with increased use of personal vehicles and is likely associated with other travel needs.

Approximately 29% of participants also reported that COVID-19 affected their vehicle purchases. Of this group, about two thirds delayed their purchase. This contributed to the decrease in sales in 2020 as well as pent up demand and the early 2021 sales surge. About 40% of all respondents said that their income was reduced with the LMI population more significantly impacted. Nearly half of the LMI participants considered current BEV options unaffordable, and incentives remained influential to buyers. In contrast, higher income individuals were more likely to consider air quality when considering acquiring a ZEV.

Despite the decrease in sales, 14% of the respondents reported that they acquired a vehicle during the pandemic. About a third of these respondents acquired a vehicle less expensive than originally planned. Most of those who acquired a vehicle acquired ICEVs; 12% of LMI members of this group and 13% of non-LMI acquired EVs.

Additionally, despite Section CVRP Lease Behavior During COVID-19 showing that leasing increased during the pandemic, especially among the Increased Rebate group, this survey reported that LMI in California are likely to purchase instead of lease their next vehicle.

COVID-19 Survey

Assessing behaviors and attitudes towards transportation since the onset of COVID-19

Anjelica Thang, Meghna Eluganti, John Gartner

Center for Sustainable Energy®

Outline

- Introduction
- Impacts of COVID-19
- Future Vehicle Purchases
- Awareness of EV Incentives
- Environmental Concerns
- Survey Participant Characteristics
  - Household Demographics
  - Residence
  - Employment
  - Vehicle Ownership

Introduction

Purpose of Study

- The spread of COVID-19 and subsequent mandated and voluntary restrictions in activity outside of the home resulted in significant economic impacts and greatly reduced the amount of commuting and other trips
- CSE designed and executed a survey of licensed drivers in California to understand how the swift expansion of remote work and health concerns about the use of public has influenced consumers' views towards transportation options and EVs
- Consumers were asked about their interactions with transportation and vehicle purchasing commencing with the State's Executive Order declaring a statewide emergency that set forth travel and other restrictions
- Survey responses are differentiated between individuals who are under 400% of the Federal Poverty Line and those above to understand how different income levels were influenced by COVID-19

Survey Administration Summary

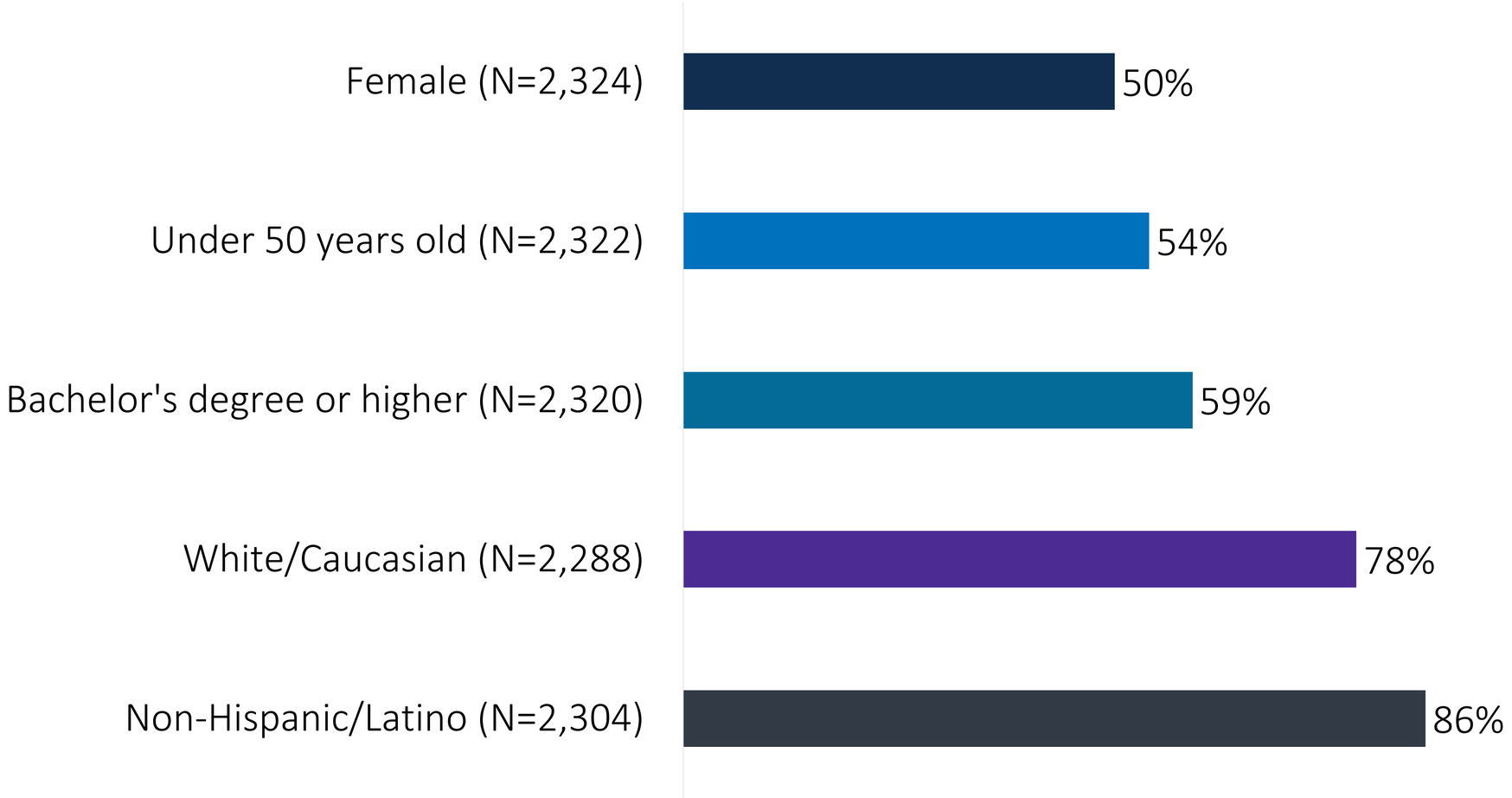
- Target population: 18 and over licensed drivers in California
- Dates of administration: March 10, 2021 thru April 12, 2021
- Number of responses collected: 2,330
- Number of respondents who reported household income and household size: 2,233
- Number of respondents by income brackets:
  - **At or under 400% FPL**: 1,229 (55%)
  - **Over 400% FPL**: 1,004 (45%)

Geography

County	Proportion of survey responses
Los Angeles	26%
San Diego	8%
Orange	7%
Sacramento	5%
Riverside	5%
Alameda	5%
Santa Clara	5%
San Francisco	5%
San Bernardino	4%
Contra Costa	4%

74% of responses collected from 10 counties*
**N=2,330*

Majority Demographic Characteristic of Survey Respondents*



**Blank responses are excluded.*

Household Characteristics*

- **Average household size** of survey respondents was **3** (N=2,233)

- Respondents had an average of **less than 2 household vehicles** (N=2,232)**
  - **81%** are a primary driver of **gasoline vehicles** (N=2,155)

- **64%** of respondents live in **detached homes**, with **23%** living in **apartments/condos** (N=2,205)

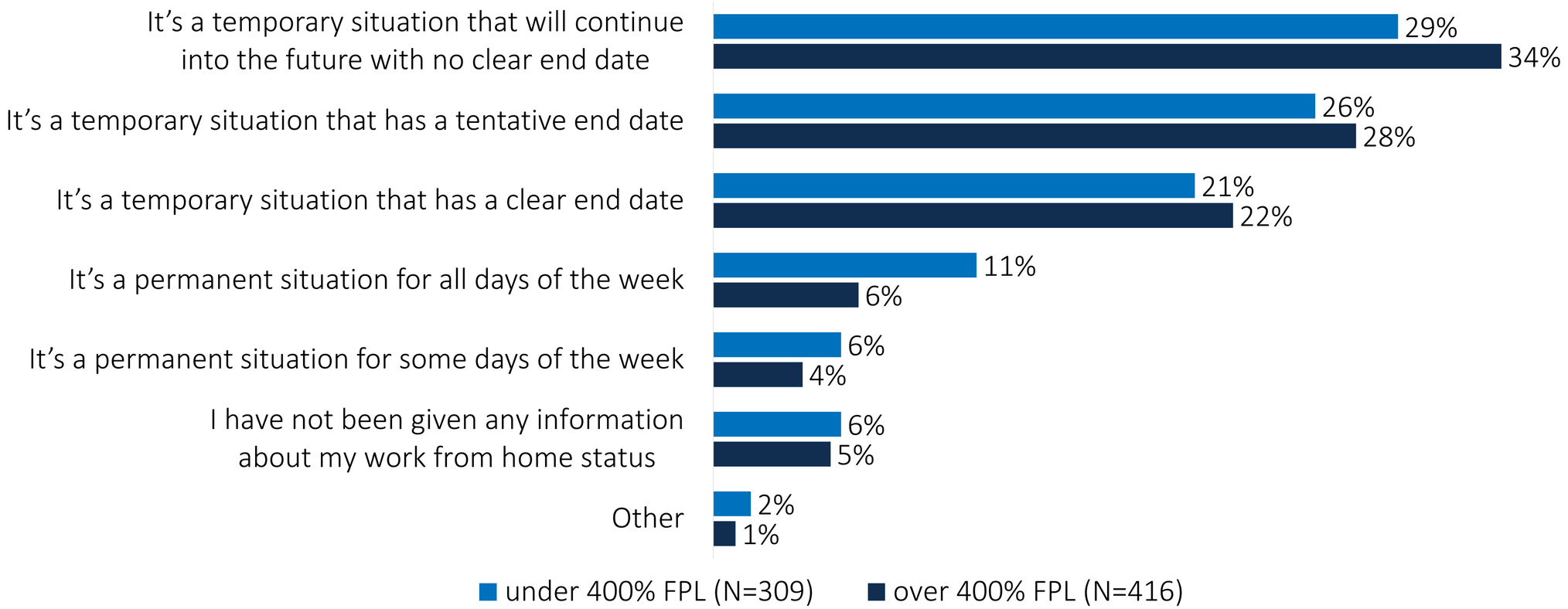
- **68%** own their home, with **29%** renting (N=2,218)

**"Prefer not to answer" and blank responses are excluded.*
***Average of responses with 10 vehicles or less in the household. One response of owning 616 vehicles in the household is excluded.*

Impacts of COVID

Working Situation During COVID

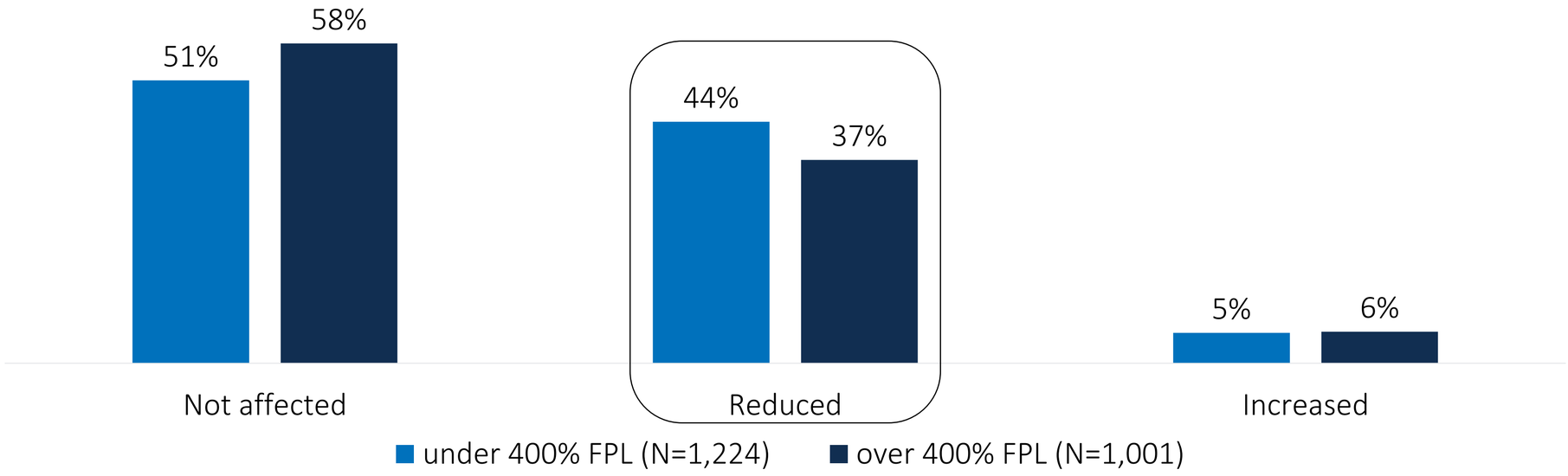
- Working from home is a **temporary situation** for both income groups



*"Not applicable" and blank responses are excluded.

COVID Impact on Household Income

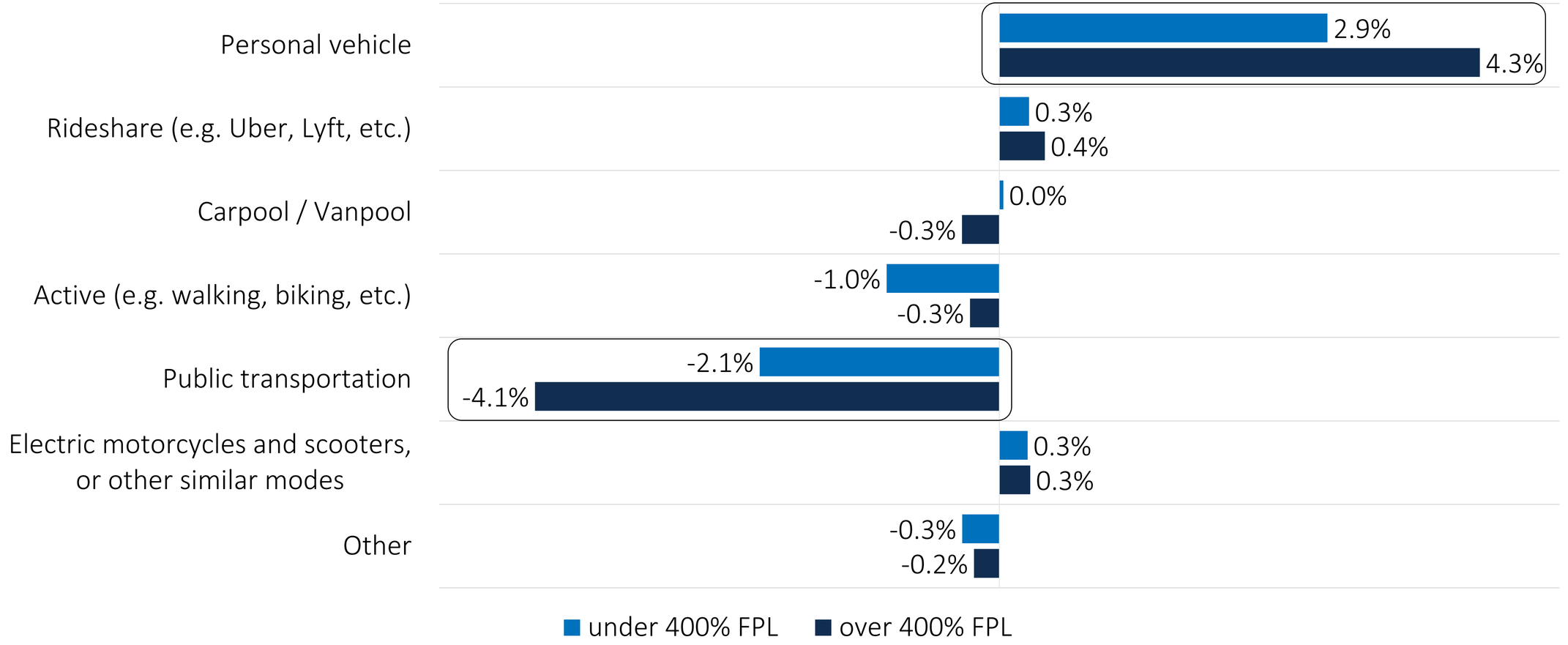
- **54%** of all respondents said that their income was **not affected** during the pandemic
- **40%** of all respondents said that their income was **reduced**, with the **LMI** population more significantly impacted



**Blank responses are excluded.*

Commuting Changes During COVID

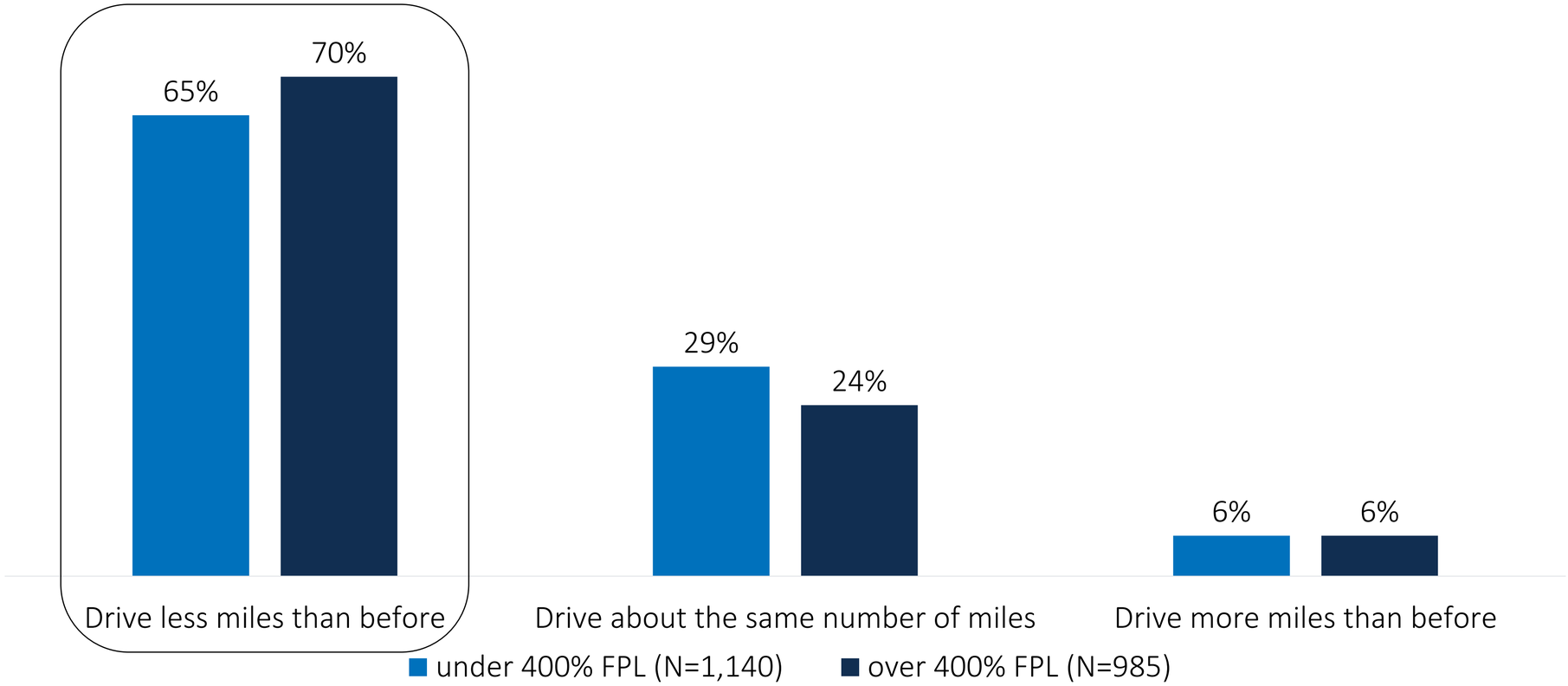
- **Increase** in personal vehicle use is similarly reflected to the **decrease** in use of public transportation



**Before pandemic, under 400% FPL N=672, over 400% FPL N=644. During pandemic, under 400% FPL N=397, over 400% FPL N=364. Blank responses are excluded.*

Majority of Respondents Traveled Less During COVID

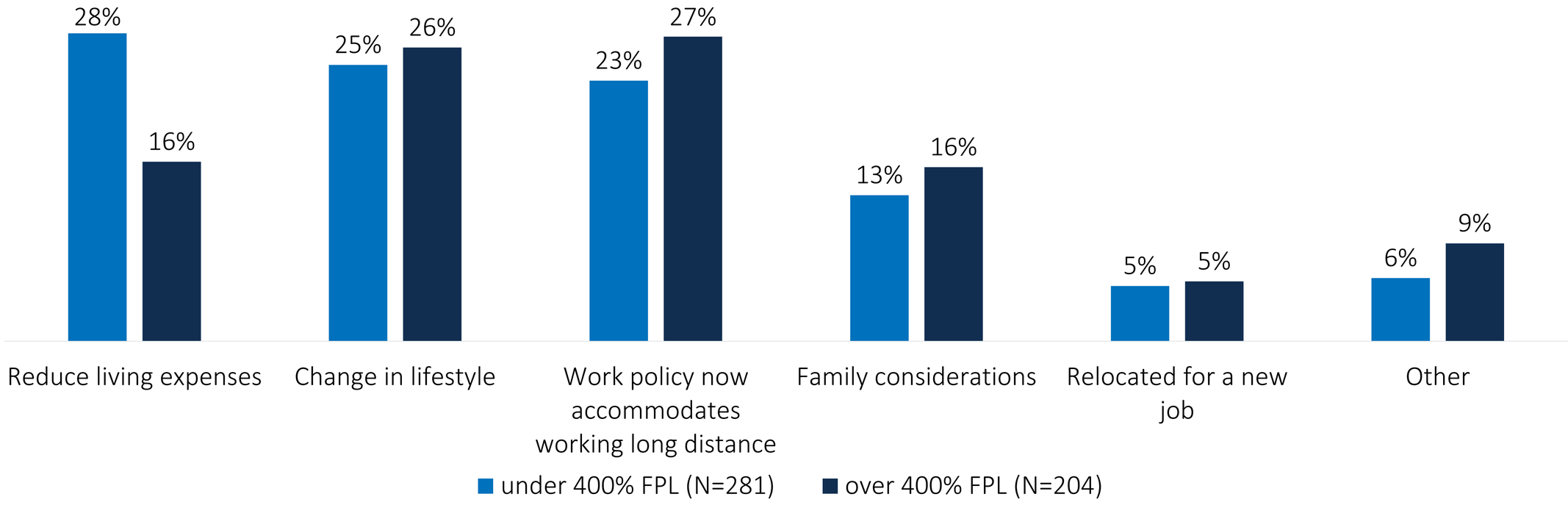
- Miles driven since the start of the pandemic decreased for all economic groups



*"Not sure", "Not applicable", and blank responses are excluded.

Motivations for Moving

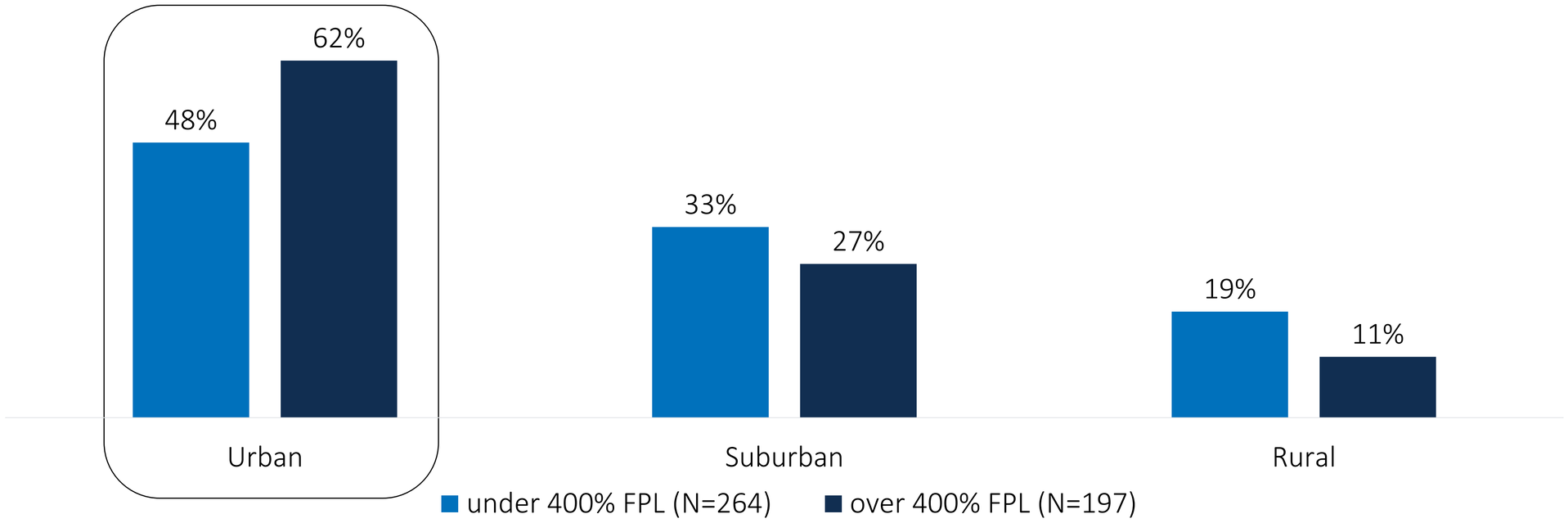
- **22%** of all respondents have **moved within CA** since the start of the pandemic (N=2,231)
- **58%** of those that **moved** were **LMI** (N=484)



**Blank responses are excluded.*

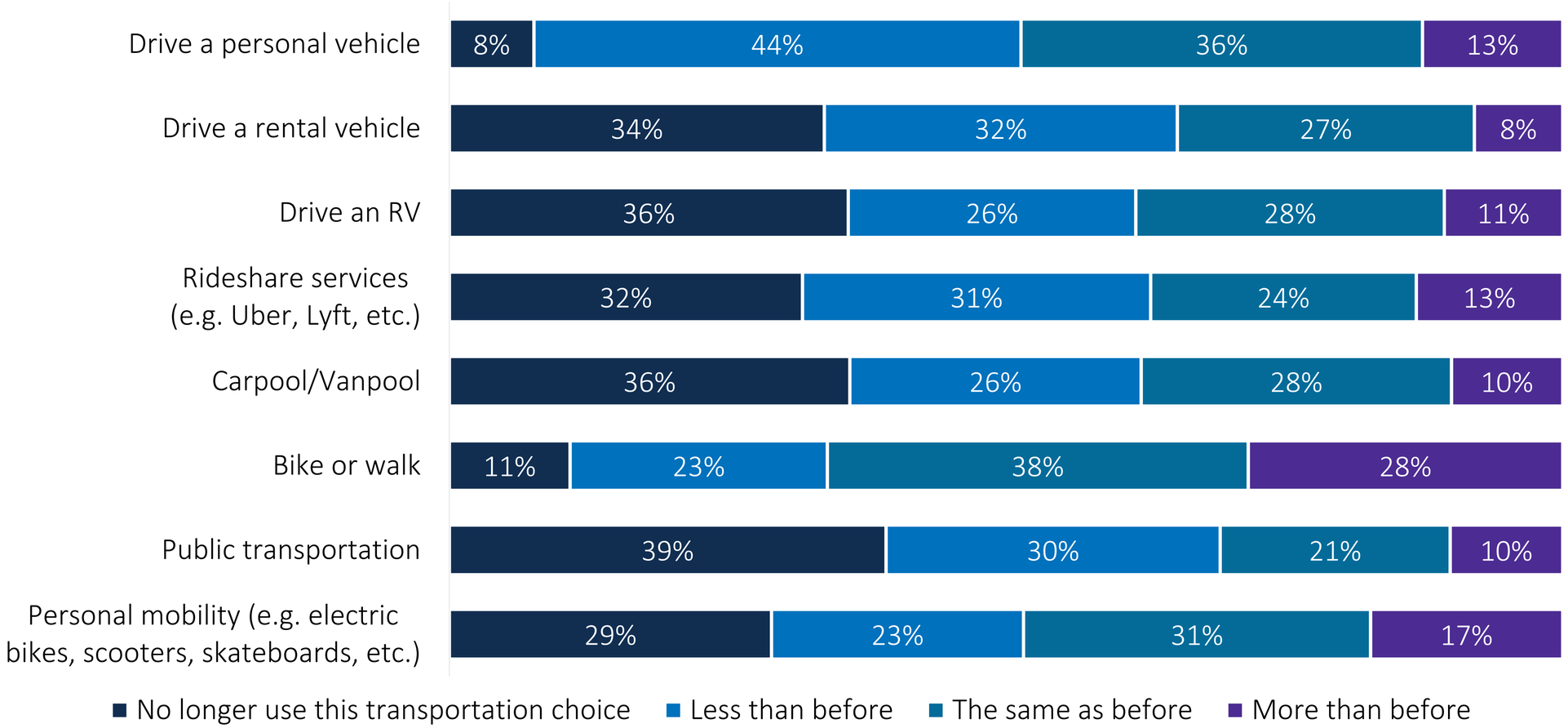
Type of Area Moved To

- **59%** of all respondents that have moved said that the **pandemic did influence their decision** (N=465)
- **Moving to an urban area** has **increased** during the pandemic



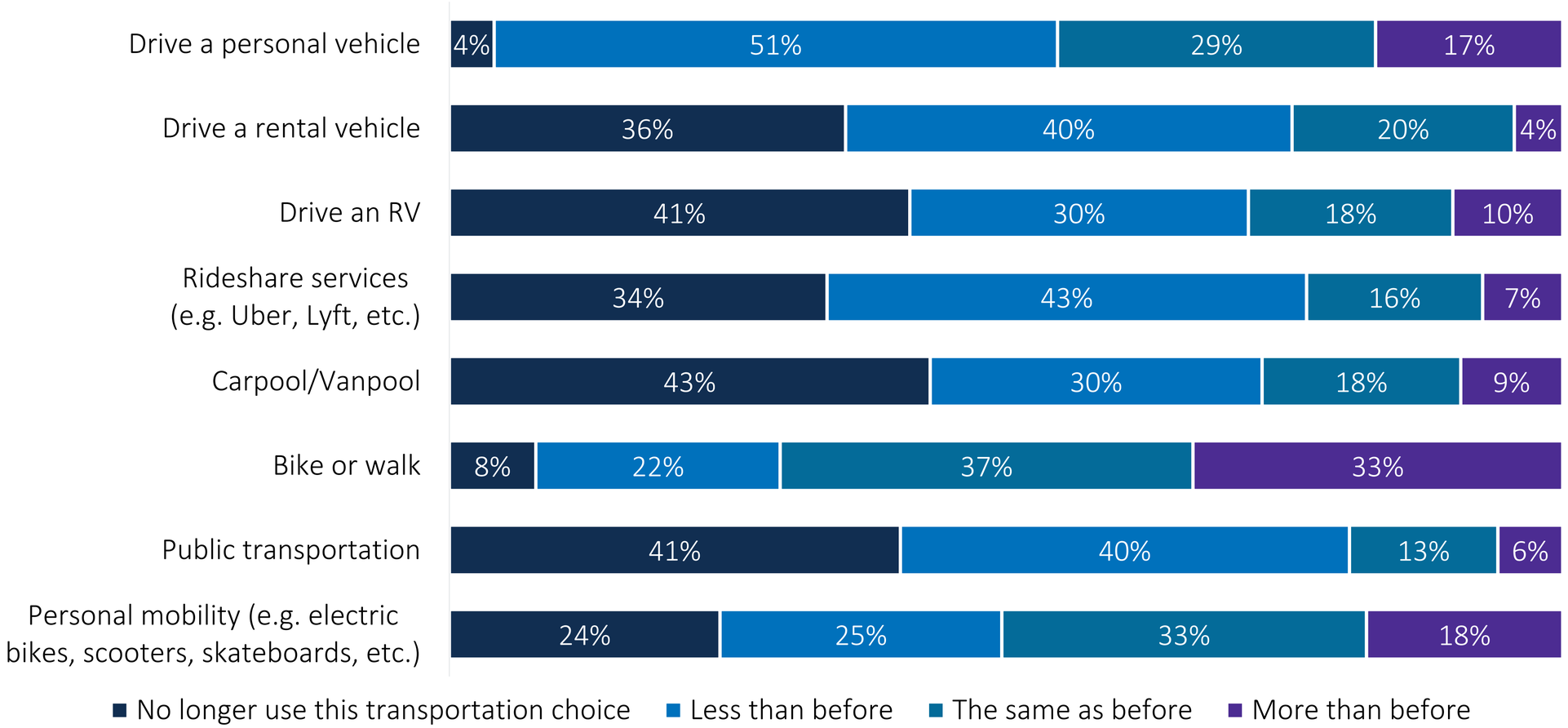
*"Not sure" and blank responses are excluded.

Changes in the Frequency of Transportation Choices for LMI Respondents



"Not applicable" and blank responses are excluded.

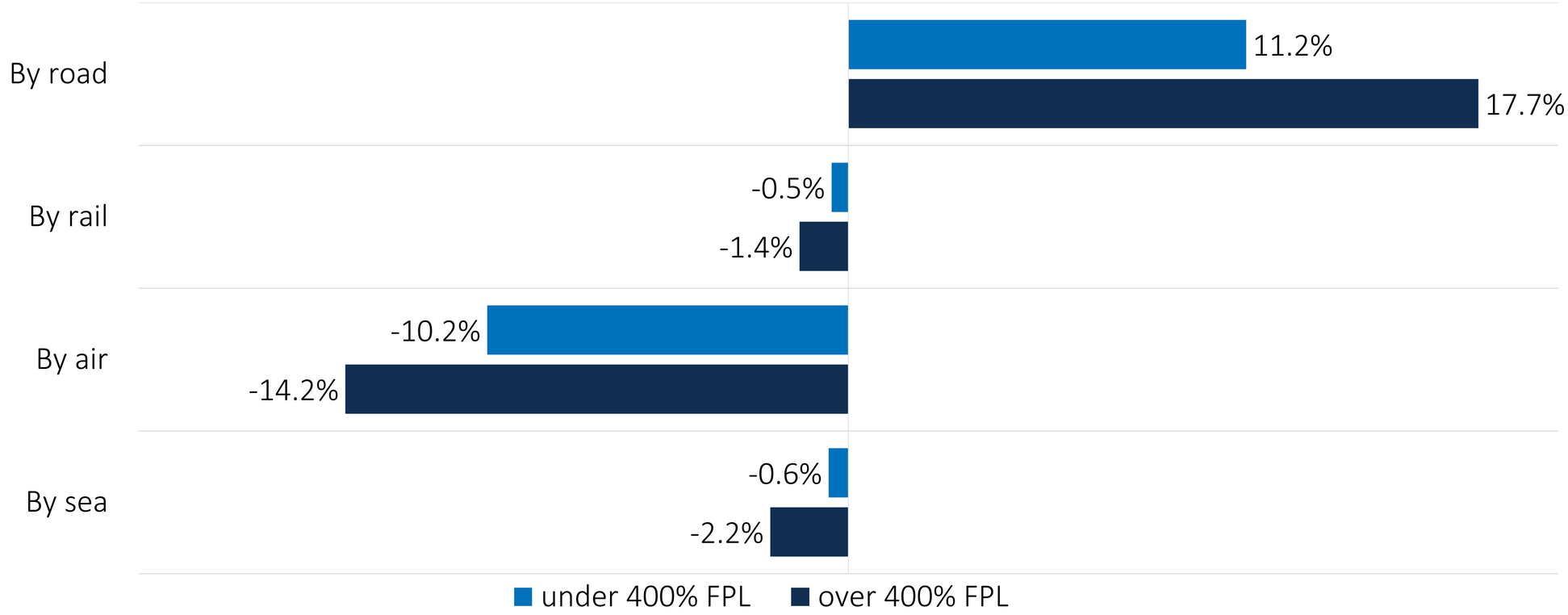
Changes in the Frequency of Transportation Choices for Non-LMI Respondents



"Not applicable" and blank responses are excluded.

Preferred Modes of Travel for Long-distance Trips

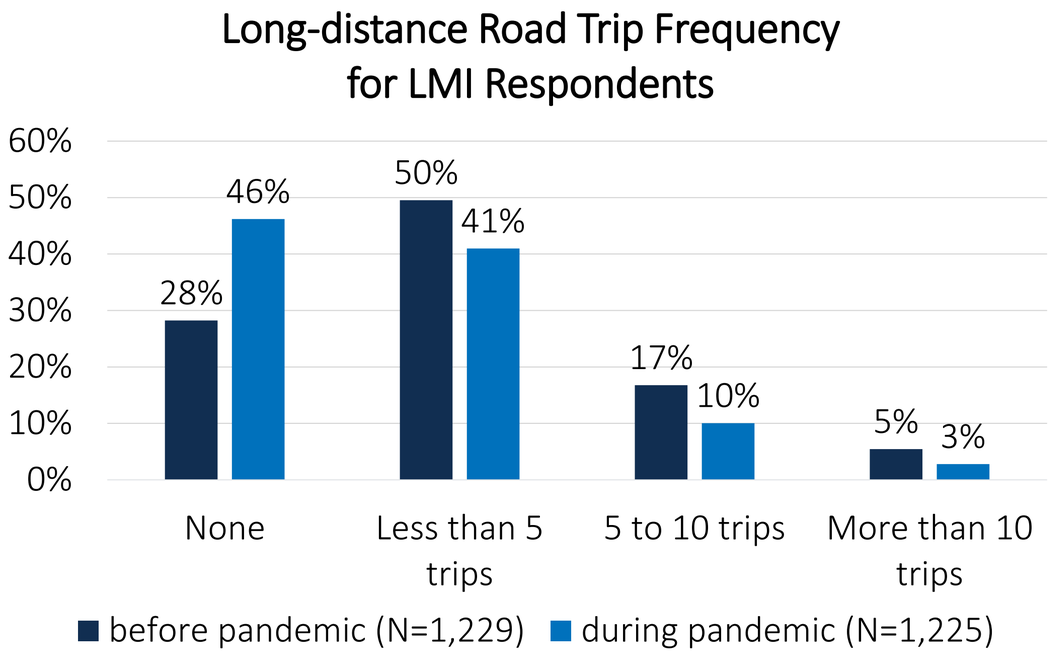
- **Increase** in preference for **road travel**
- **Decrease** in preference for **air travel**

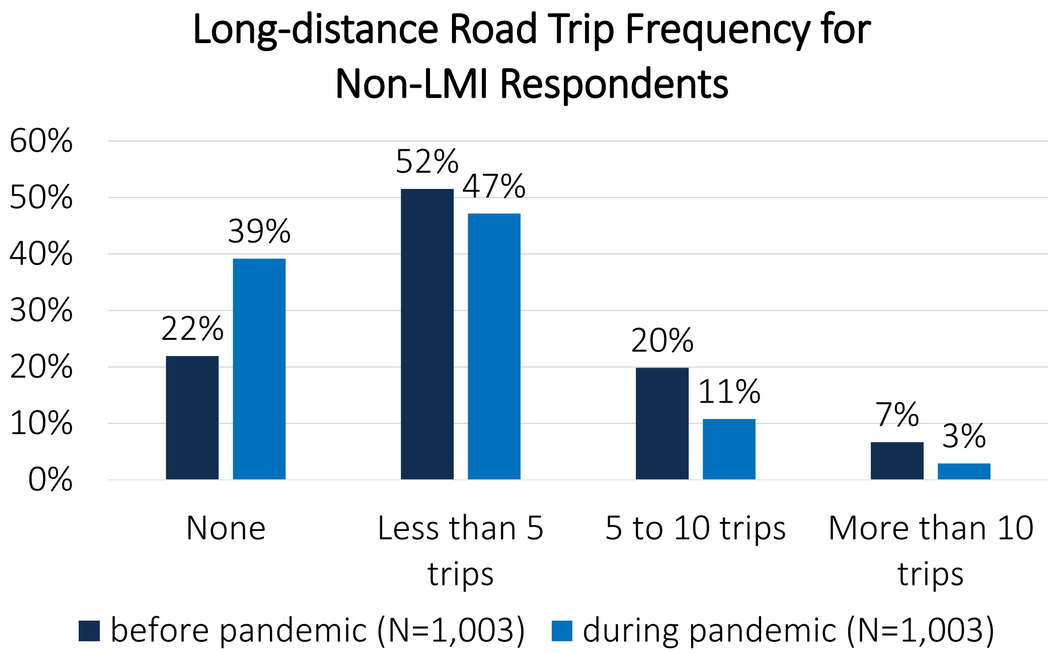


**Before the pandemic, under 400%FPL N=1,484, over 400% FPL N=1,383. During the pandemic, under 400% FPL N=1,212, over 400% FPL N=1,061. Blank responses are excluded.*

Long-distance Road Trip Frequency*

- **Slight decrease** for 5 or more long-distance trips category
- **Increase** in not taking long-distance trips

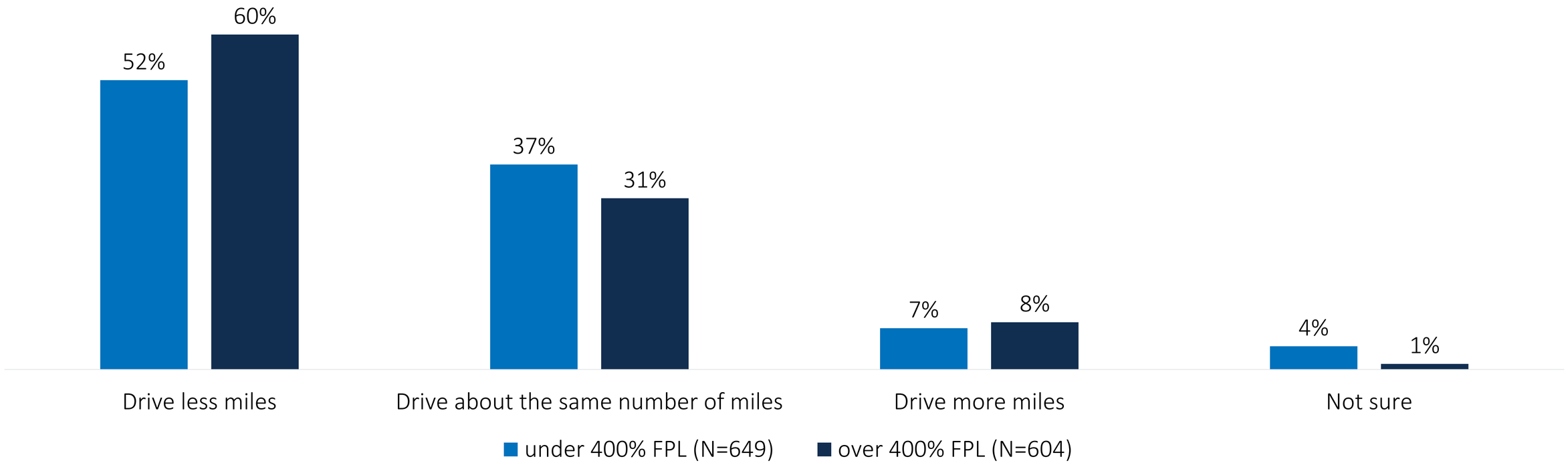




**Number of trips taken before the pandemic was within 12 months prior to March 2020. Blank responses are excluded.*

Change in Length of Long-distance Driving Trips

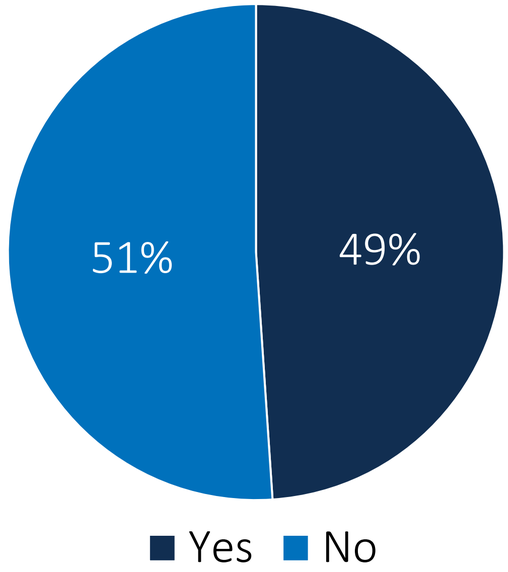
- Both **LMI and non-LMI** respondents have **driven less miles** since the start of the pandemic



**Blank responses are excluded.*

Long Distance Travel for EV Owners

- EV owner sample size was small (N=94)
- Almost equal portions of those under/over 400% FPL
- **51%** of EV owners are **not concerned** that their EV cannot make long distance trips during the pandemic



*”Not sure” and blank responses are excluded.

Long Distance Travel for EV Owners

- **77%** of EV owners have used, or considered using, a **public charging station** during the pandemic (N=96)
  - **85%** of these responses have used, or considered using, a public charging station for **long distance travel** during the pandemic (N=71)

- **77%** of EV owners are **aware** that their **utility company may offer charging programs and incentives** when they purchase or lease an electric vehicle (N=92)

*”Not sure” and blank responses are excluded.

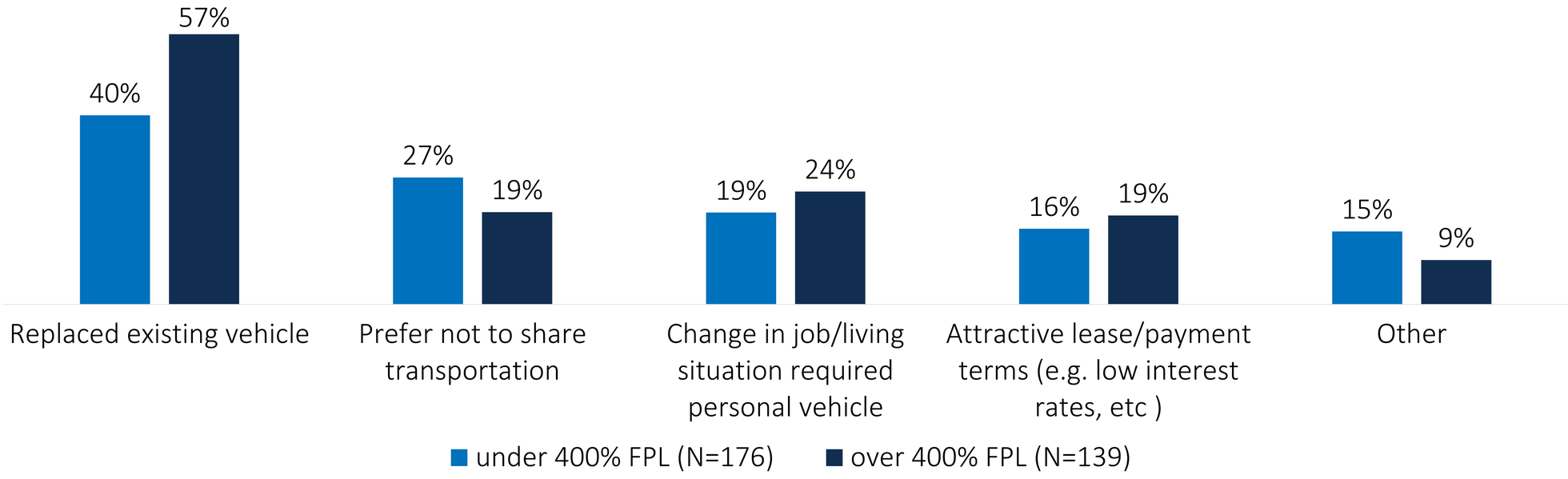
Vehicle Purchasing Plans During Pandemic

- **45%** of respondents planned to **acquire a vehicle before the pandemic** (N=2,228)
- **29%** of respondents said that the pandemic **affected their plans to acquire a vehicle** (N=2,227)
- Of the group that bought a vehicle before the pandemic and the pandemic changed their plans to acquire another vehicle, **66% decided to delay their purchase** (N=540)
  - Of those that decided to delay their vehicle purchase, **56% of LMI respondents plan to acquire a less expensive vehicle** as compared to **38%** for **non-LMI** (N=356)

**Blank responses are excluded.*

Vehicle Acquisition During COVID

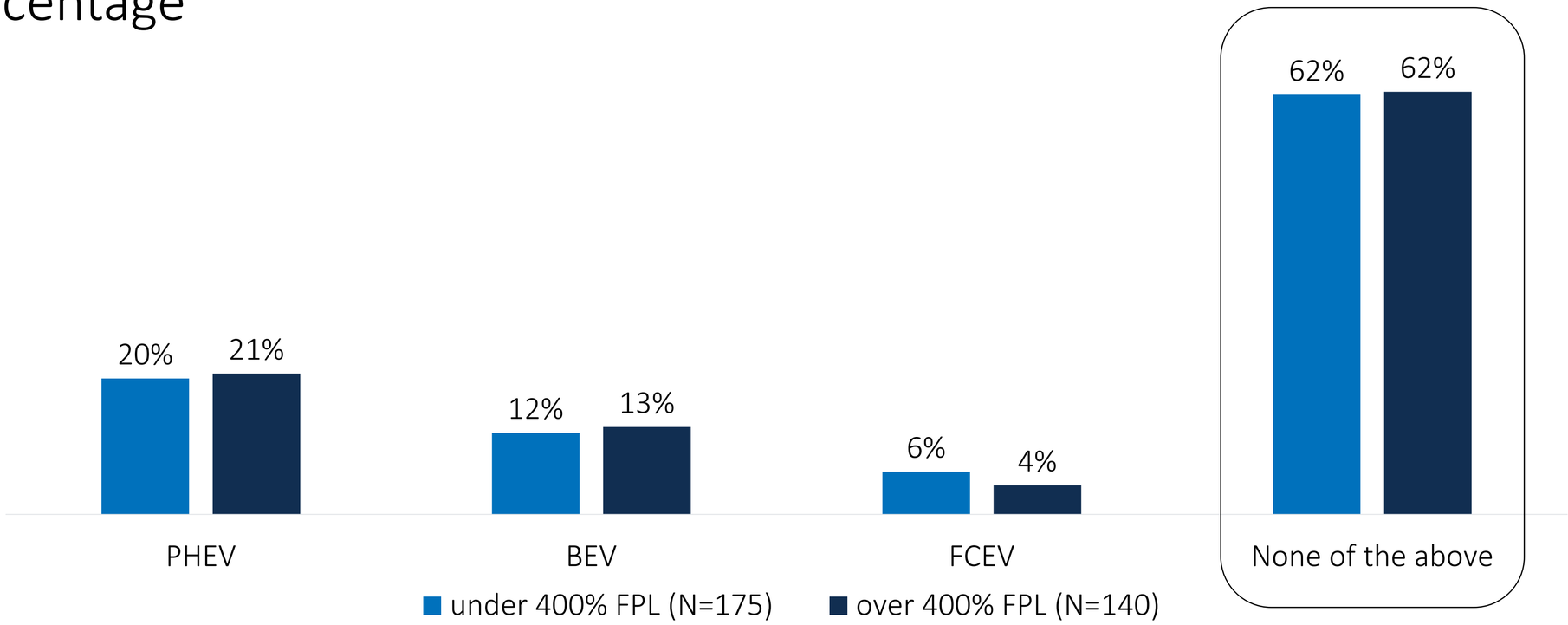
- **14%** of all respondents acquired a vehicle during the pandemic (N=2,224)
  - **34%** of the **non-LMI** population acquired a vehicle that was **less expensive** than originally planned (N=314)
  - **41%** of the **LMI** population acquired a vehicle that was **less expensive** than originally planned (N=314)



**Blank responses are excluded.*

Segmentation of Vehicles Acquired During COVID

- **38%** of all respondents above 400% FPL who acquired a vehicle during the pandemic **acquired a ZEV**
- "None of the above" include all non-ZEVs which may factor into the high percentage

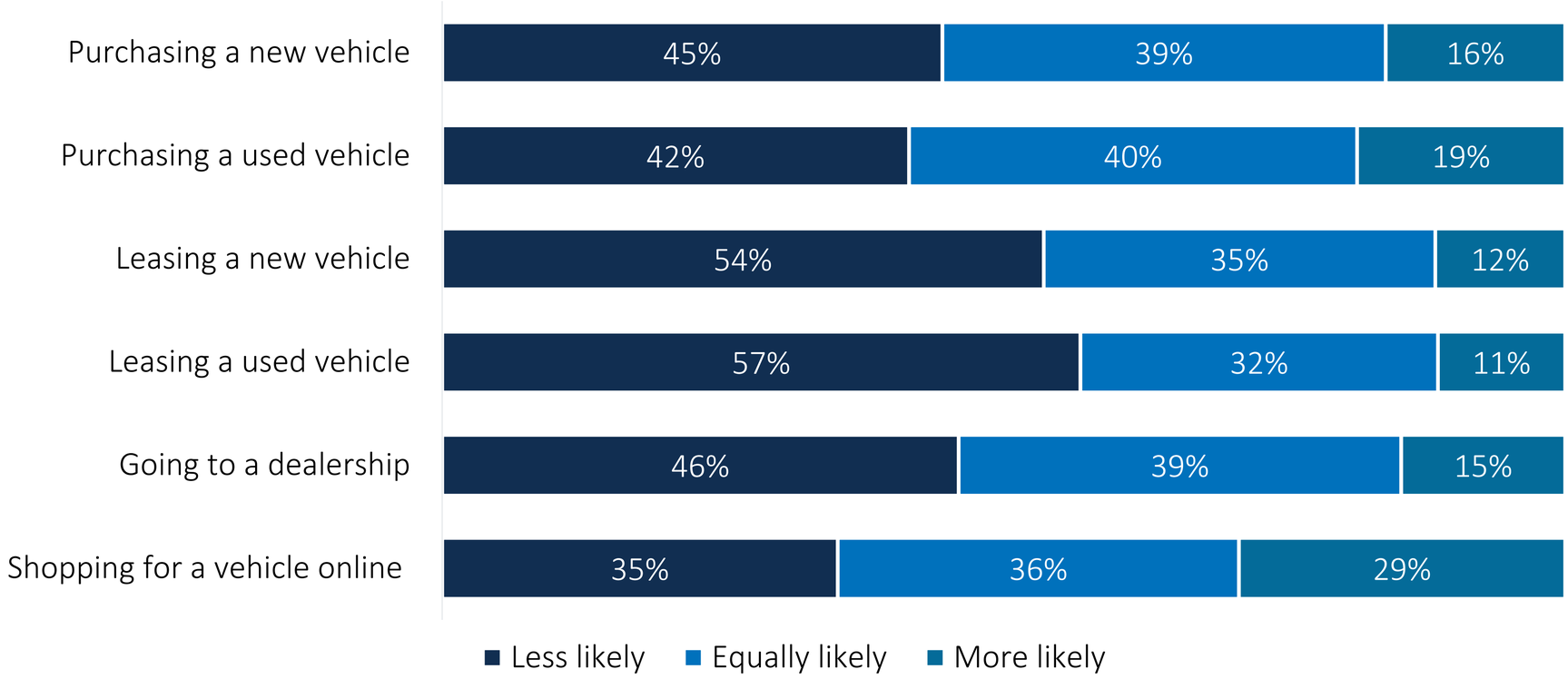


**Blank responses are excluded.*

Future Vehicle Purchases

Changes in Vehicle Shopping Preference for LMI respondents

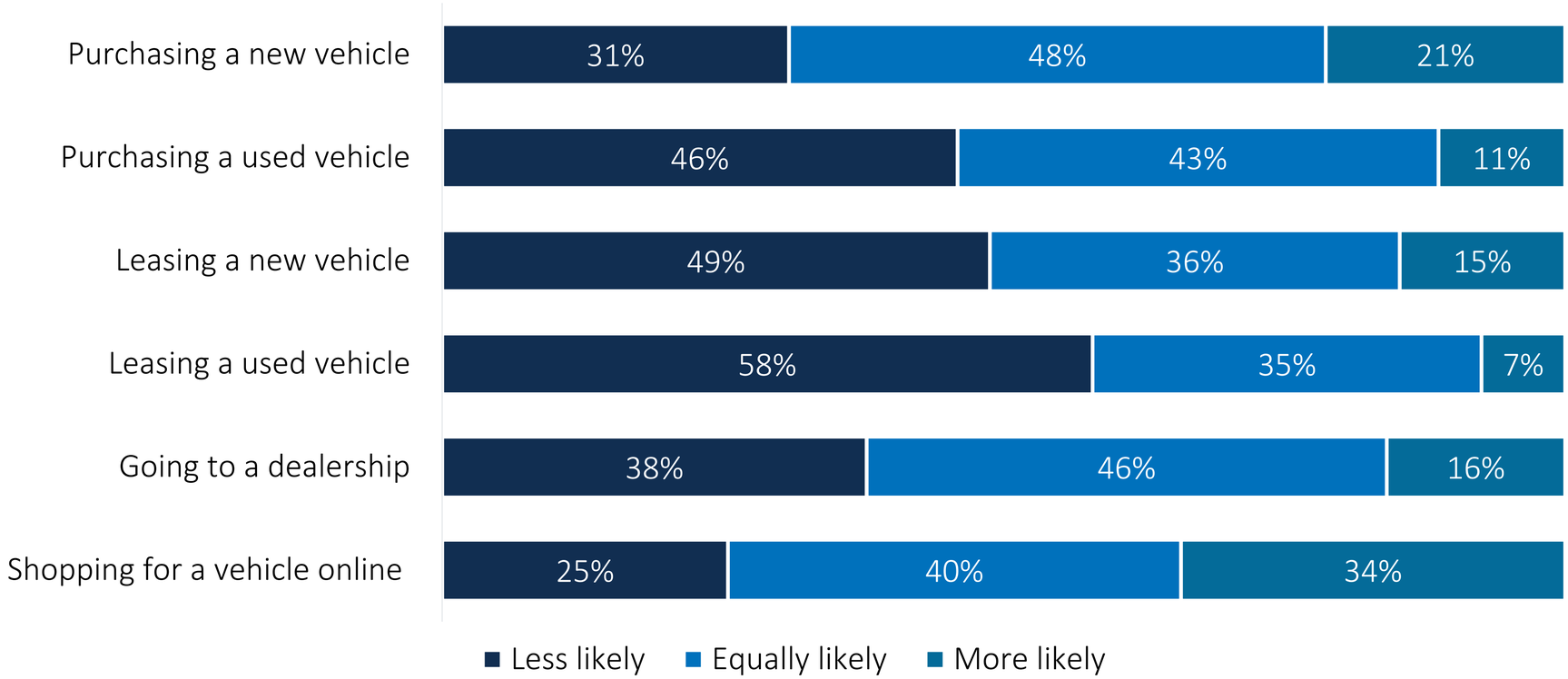
- **LMI** are likely to **purchase** instead of lease their next vehicle
- **LMI** prefer to **shop online**, but a large percentage are still likely to go to a dealership



"Not sure" and blank responses are excluded.

Changes in Vehicle Shopping Preference for Non-LMI Respondents

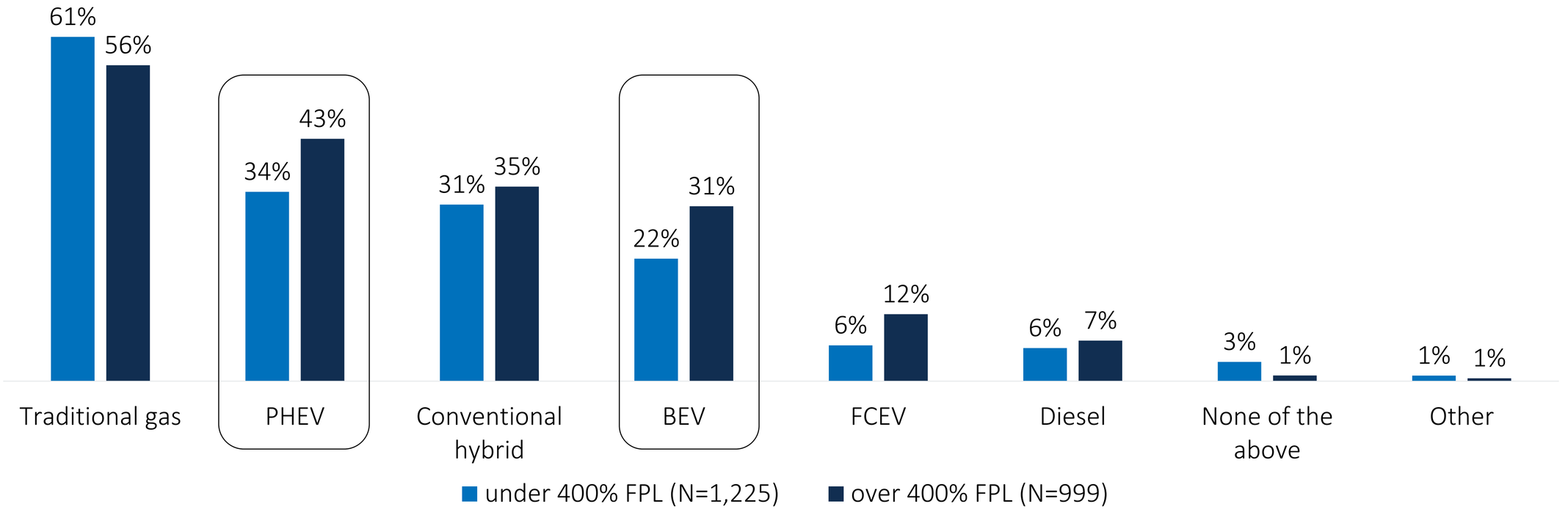
- **Non-LMI** are likely to **purchase** instead of lease their next vehicle
- **Non-LMI** prefer to **shop online**, but a large percentage are still likely to go to a dealership



"Not sure" and blank responses are excluded.

Fuel Type Consideration for Next Vehicle

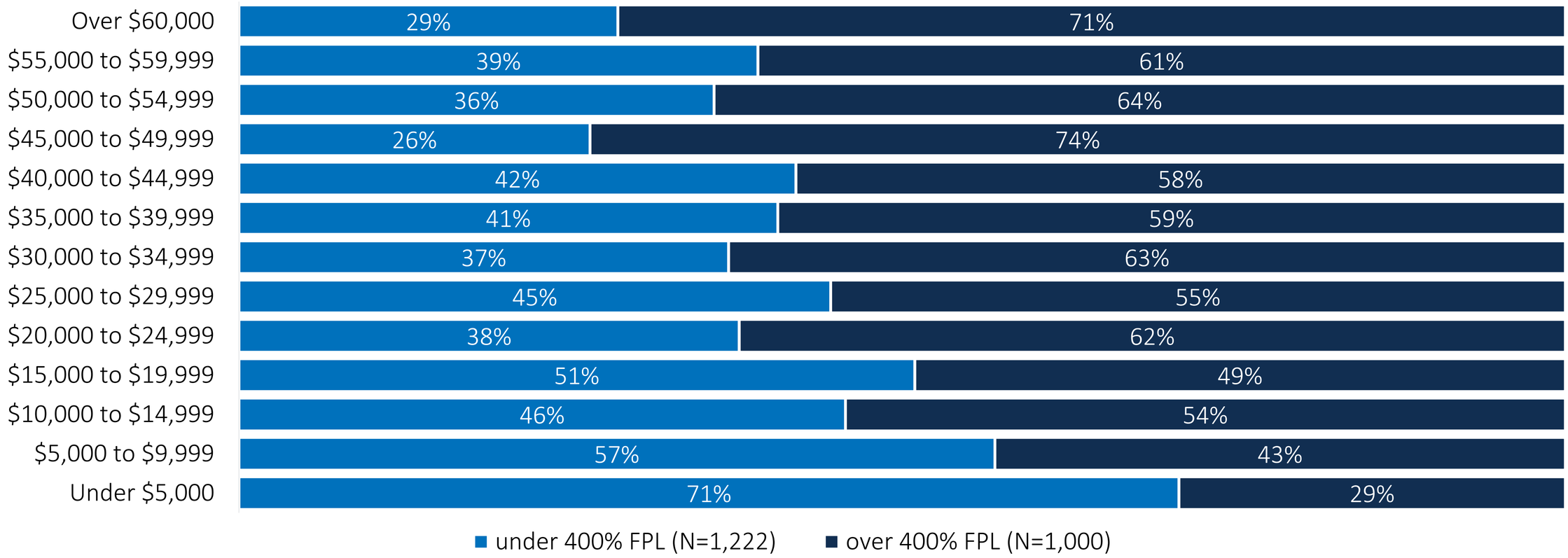
- **PHEV** is still preferred over BEV for both **LMI and non-LMI**



**Blank responses are excluded.*

Maximum Down Payment for Next Vehicle

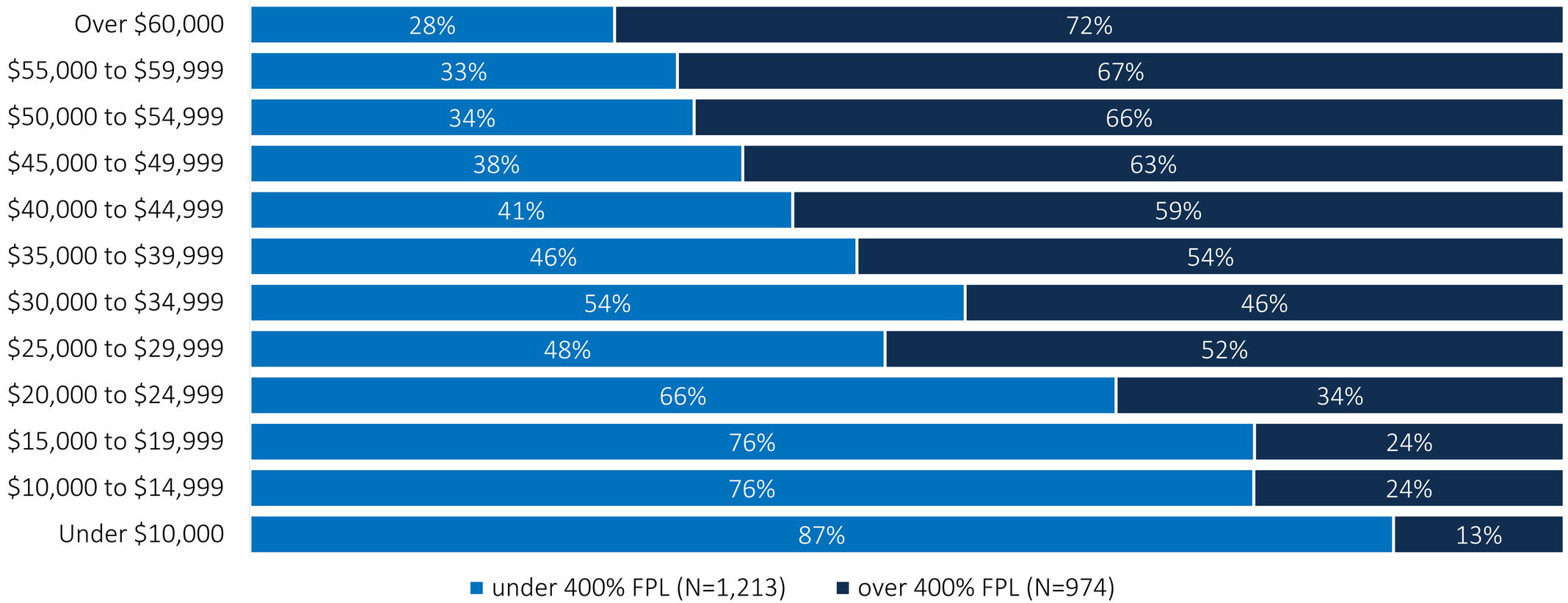
- **33%** of **LMI** respondents selected "**Under $5,000**" as their maximum down payment
- **18%** of **LMI** respondents are willing to put **"$5,000 to $9,999"** as their maximum down payment
- **20%** of **LMI** respondents would **not** place a down payment for their next vehicle



**Blank responses are excluded.*

Maximum Vehicle Purchase Price for Next Vehicle

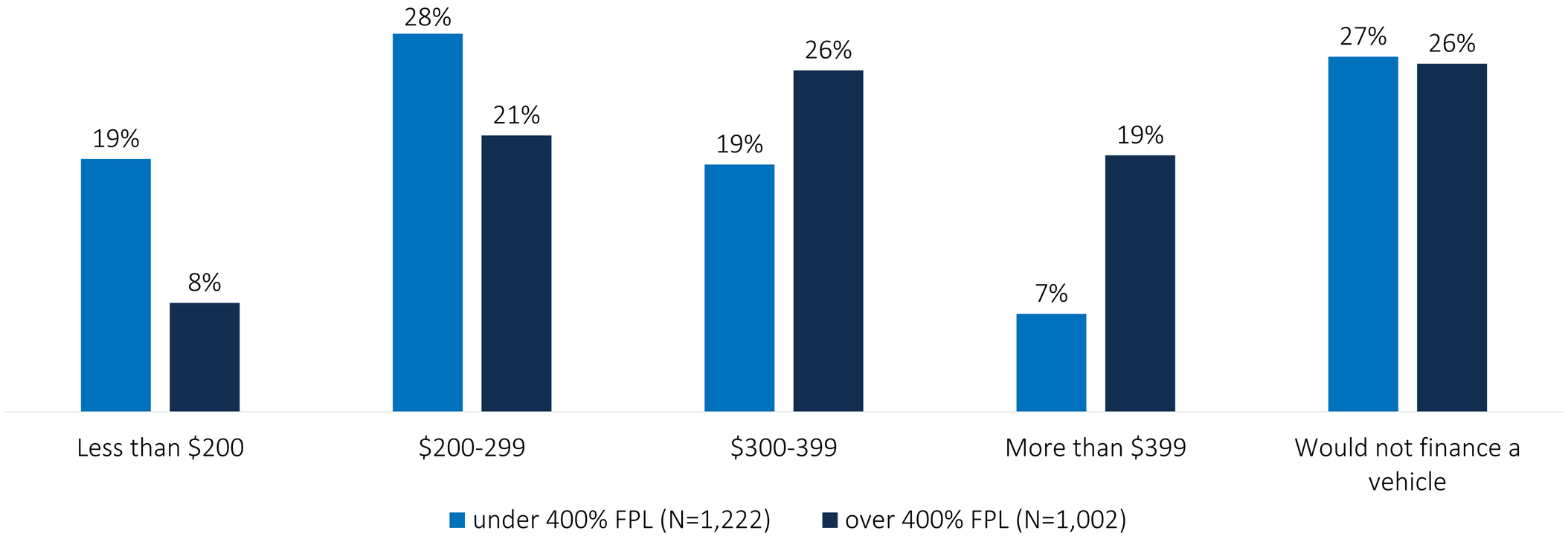
- **56%** of **LMI** respondents will **not** purchase a vehicle **over $30,000**



**Blank responses are excluded.*

Maximum Monthly Payment for Vehicle Financing

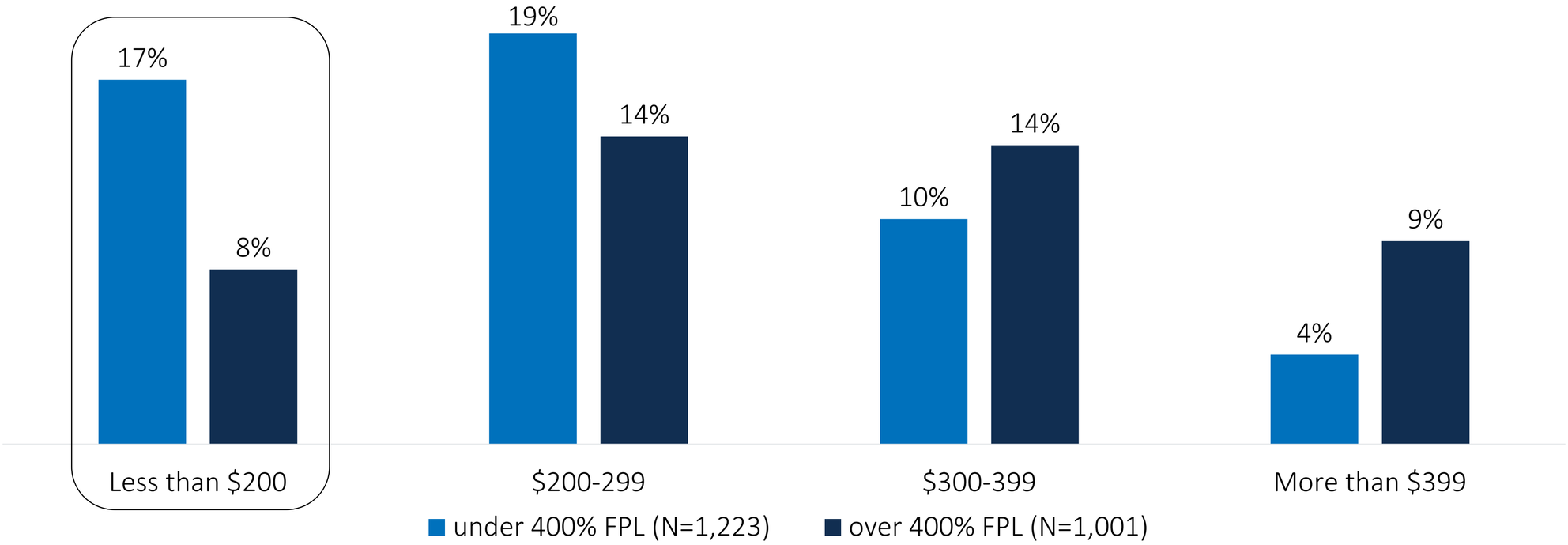
- **47% of LMI** respondents said they preferred to spend **less than $299 monthly**
- **71% of non LMI** respondents expected to pay **more than $300** monthly



**Blank responses are excluded.*

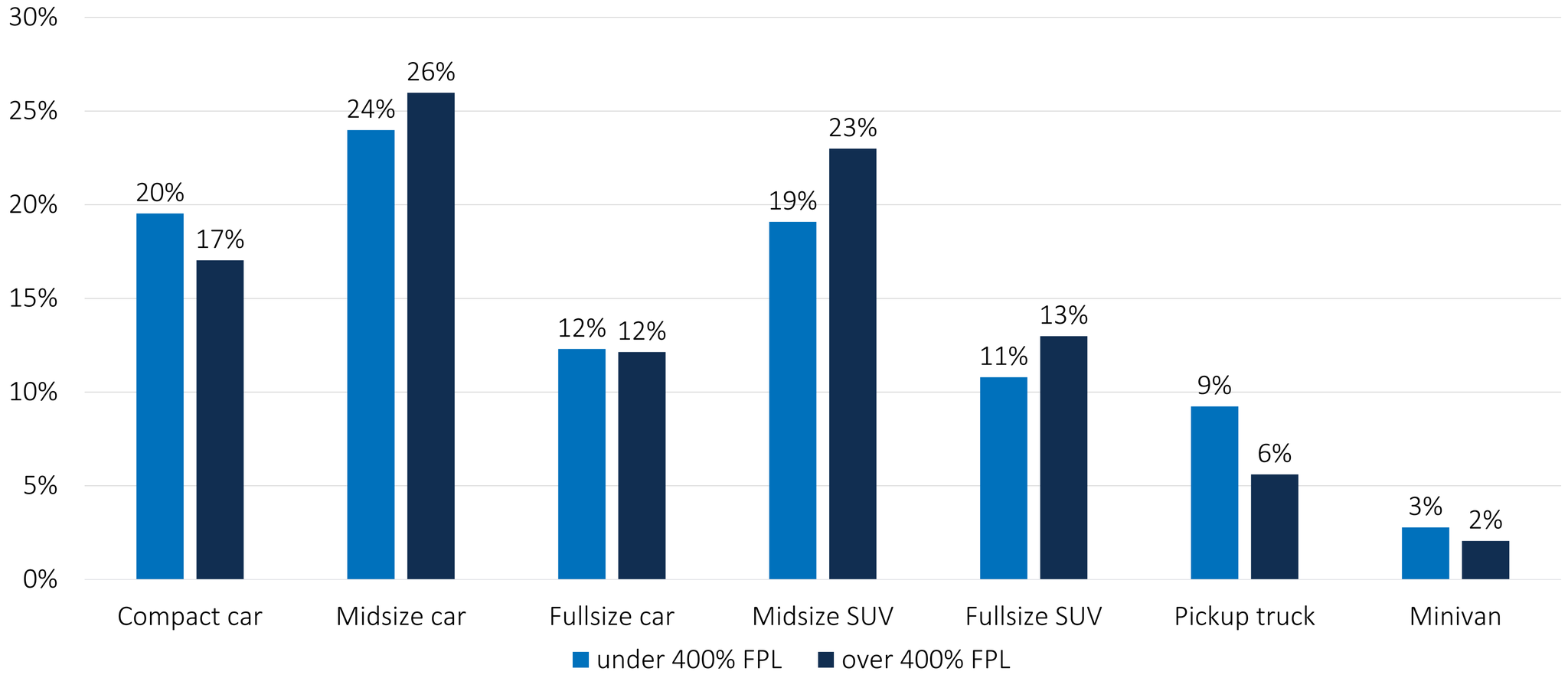
Maximum Monthly Payment for Vehicle Leasing

- **50%** of **LMI** respondents and **55%** of **non-LMI** would prefer not to lease a vehicle
- Between **"$200-299**" is the most popular lease payment for all **LMI** respondents
- Between "**$200-399**" is the most popular lease payment for all **non-LMI** respondents



"Would not lease a vehicle" option is excluded form the chart. Blank responses are excluded.

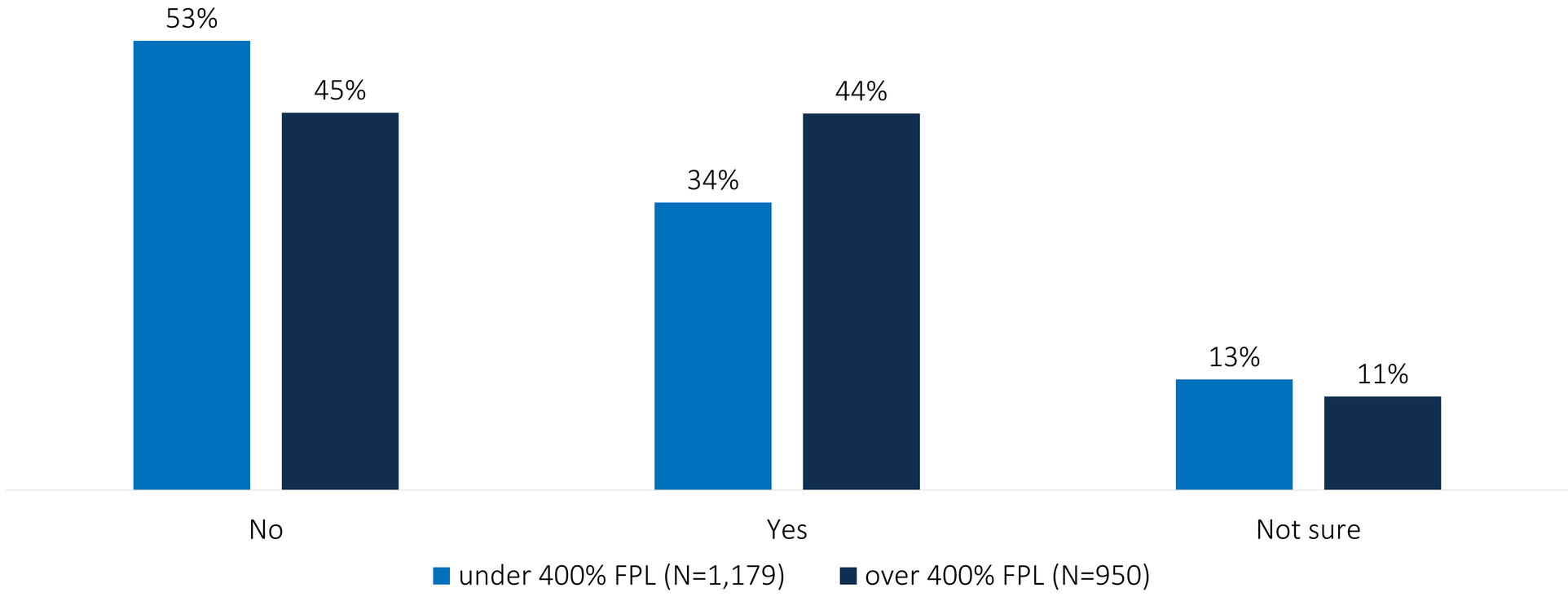
Body Style Consideration for Next Vehicle



**Blank responses are excluded.*

Consideration of BEVs for Next Vehicle (Non-BEV owners)

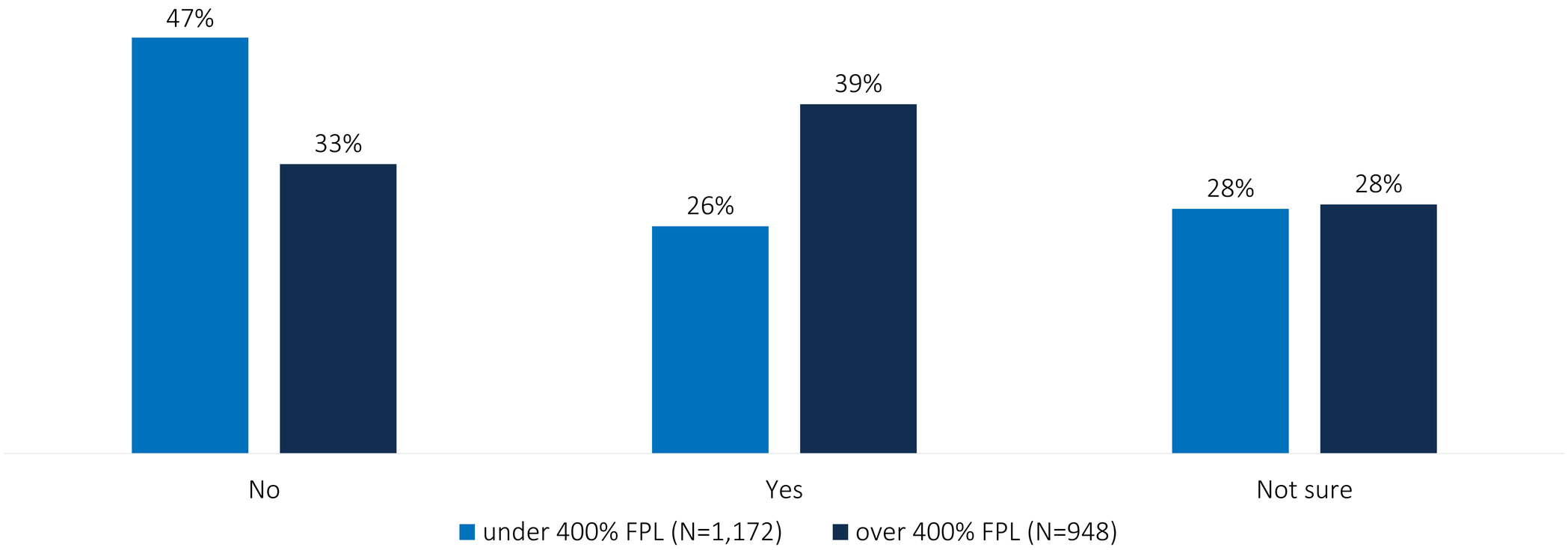
- **Majority** of **LMI** population responses said they were **not** going to consider BEV as their next vehicle purchase whereas **non-LMI** population were more likely to consider a BEV



**Blank responses are excluded.*

Affordability of Available BEVS (Non-BEV Owners)

- **Nearly half of LMI drivers** consider current **BEV options unaffordable**

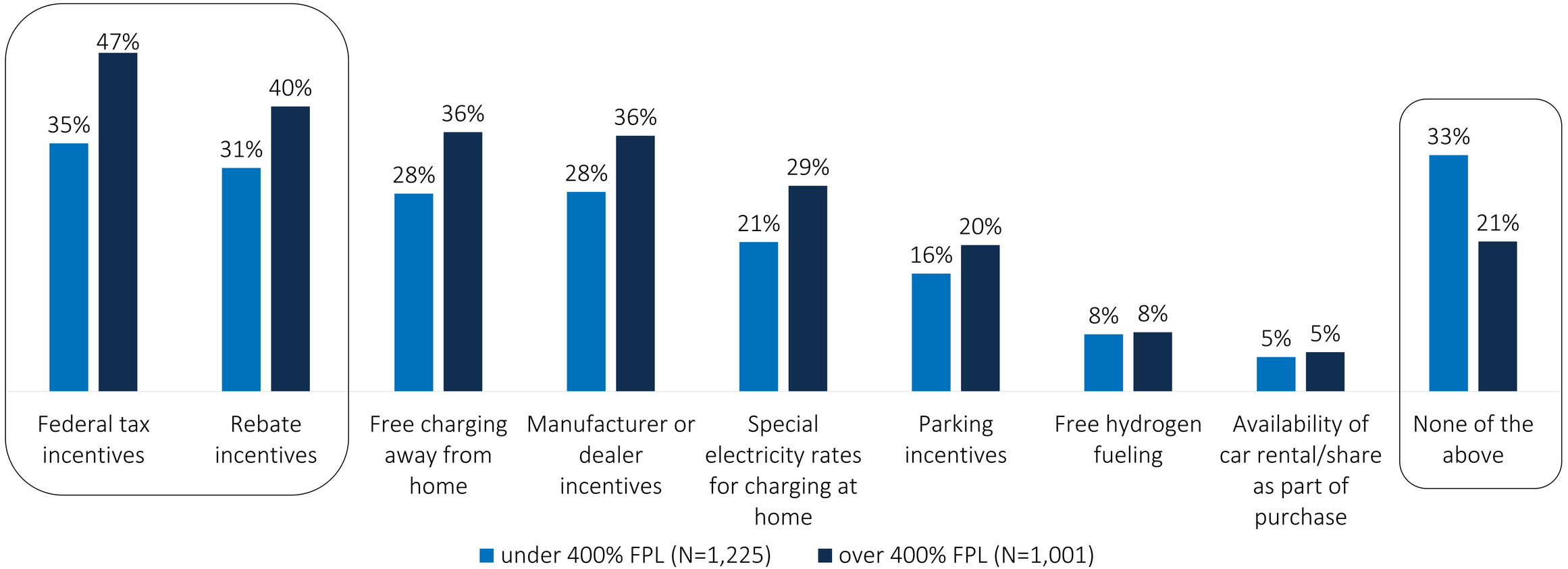


**Blank responses are excluded.*

Awareness of EV Incentives

EV Incentive Awareness

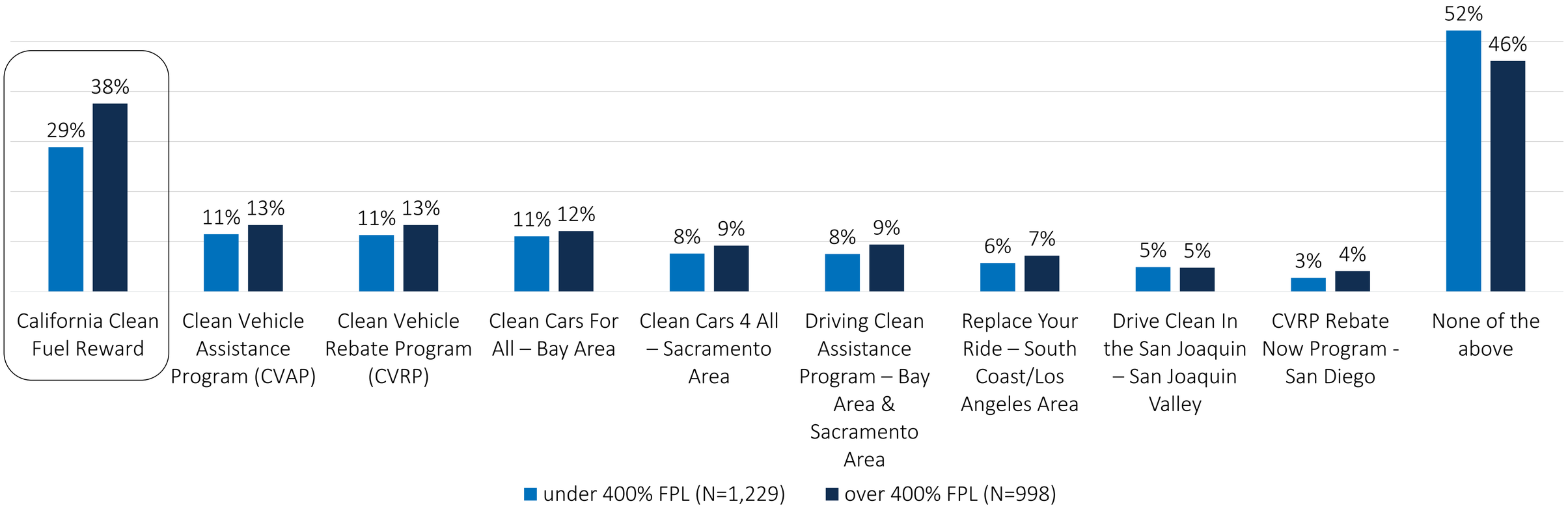
- **One-third** of **LMI** respondents are **not aware** of the available incentives for adopting EVs
- **Non-LMI** respondents **are more aware** of available incentives than **LMI** respondents



**Percentage indicates awareness of the incentive. Blank responses are excluded.*

EV Grant or Rebate Awareness

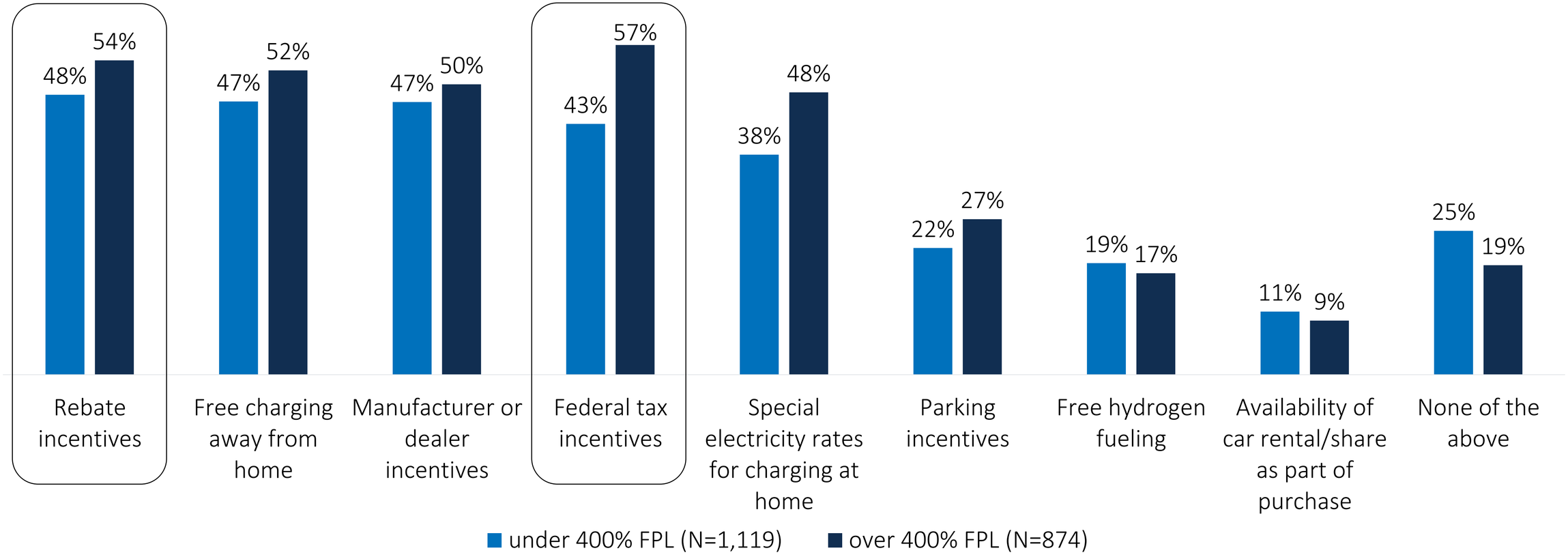
- Respondents are **more aware** of the **California Clean Fuel Reward** program compared to others on the list



**Blank responses are excluded. Percentages may not accurately represent the awareness throughout the entire state of CA as some programs are regionally specific.*

Incentives That Increase EV Attractiveness*

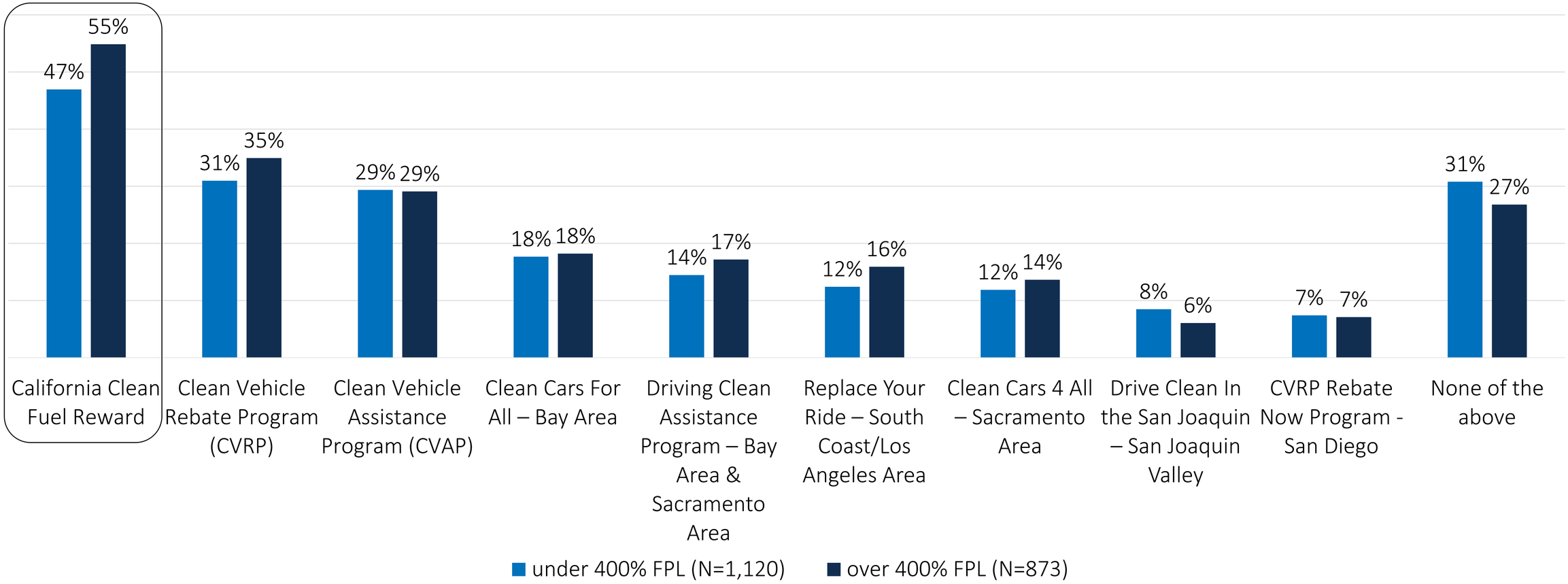
- Both **LMI and non-LMI** are **less interested** in parking incentives, free hydrogen fueling, and availability of car rental/share as part of purchase



**Blank responses are excluded. Non-EV owner responses only.*

Programs Increasing EV Interest*

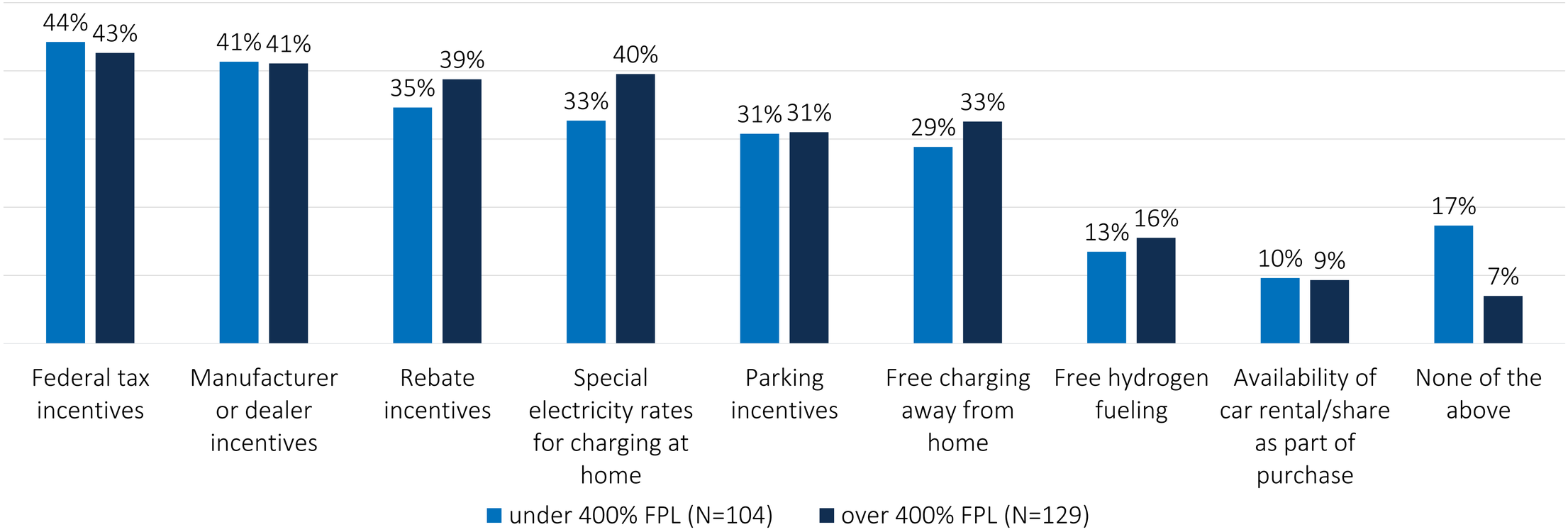
- **California Clean Fuel Reward** is the top program that would make both **LMI and non-LMI** respondents more interested in acquiring an EV



**Blank responses are excluded. Percentages may not accurately represent the awareness throughout the entire state of CA as some programs are regionally specific. Non-EV owner responses only.*

Incentives Influencing EV Purchase*

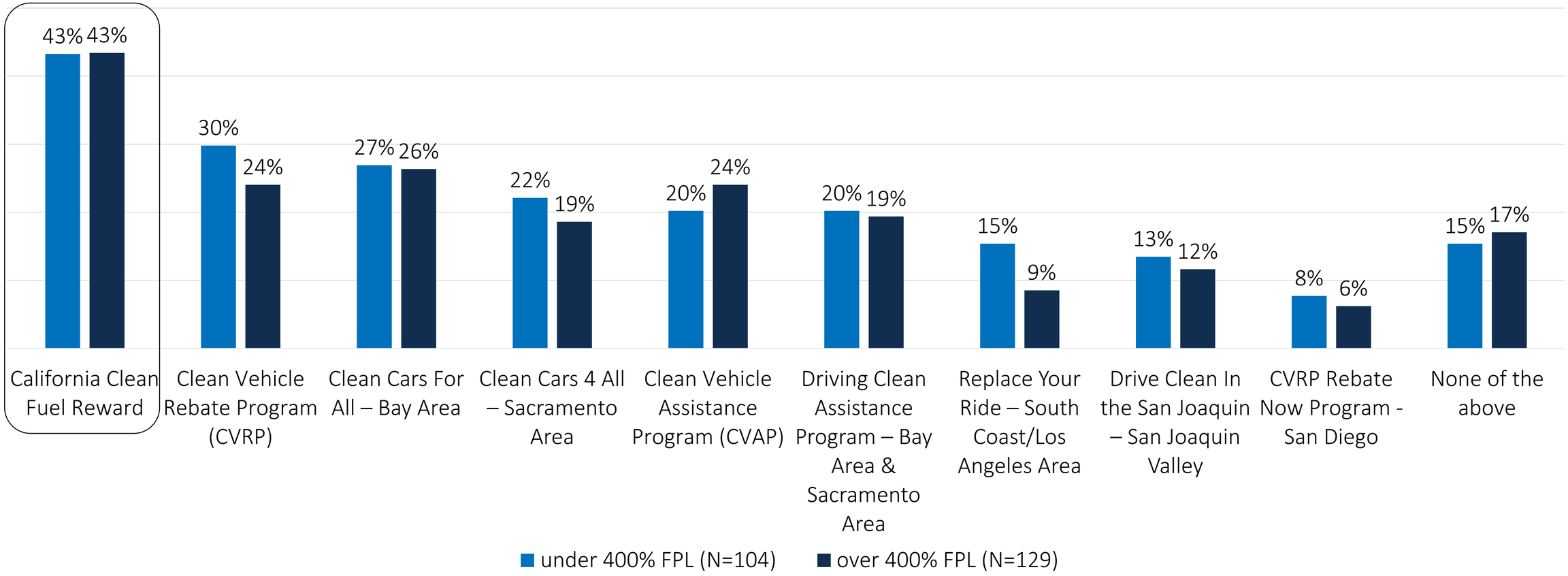
- **Federal tax incentives** and **manufacturer or dealer incentives** were the top influences for **LMI** respondents to acquire an EV
- **Rebate incentives** and **special electricity rates for charging at home** were additional influences for **non-LMI** respondents



**Blank responses are excluded. EV owner responses only.*

Programs That Influenced EV Purchases*

- **California Clean Fuel Reward** is the top program that influenced both **LMI and non-LMI** respondents to acquire an EV

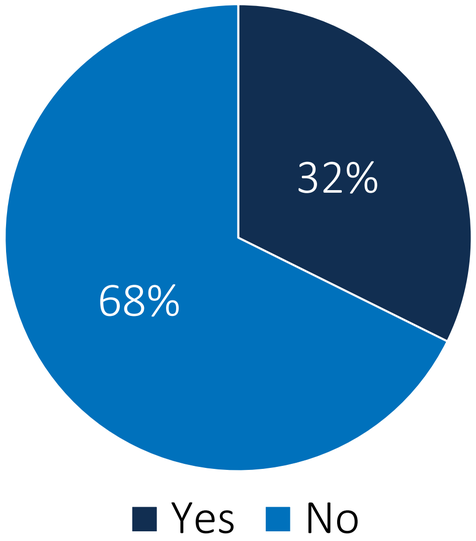


**Blank responses are excluded. Percentages may not accurately represent the awareness throughout the entire state of CA as some programs are regionally specific. EV owner responses only.*

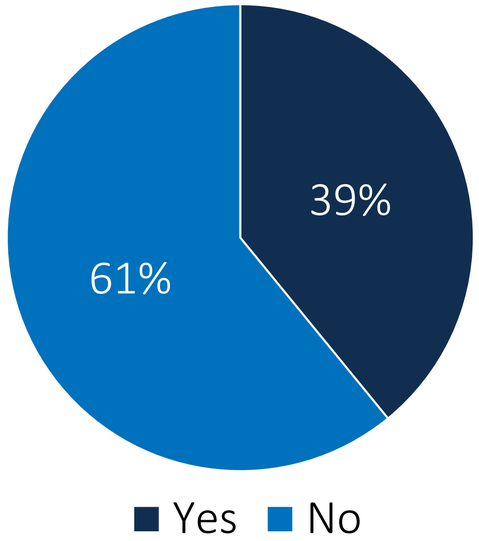
Knowledge of Potential to Combine Incentives

- **7% more non-LMI** respondents are aware of stackable incentives

LMI Respondents Knowledge of Stackable Incentives



Non-LMI Respondents Knowledge of Stackable Incentives

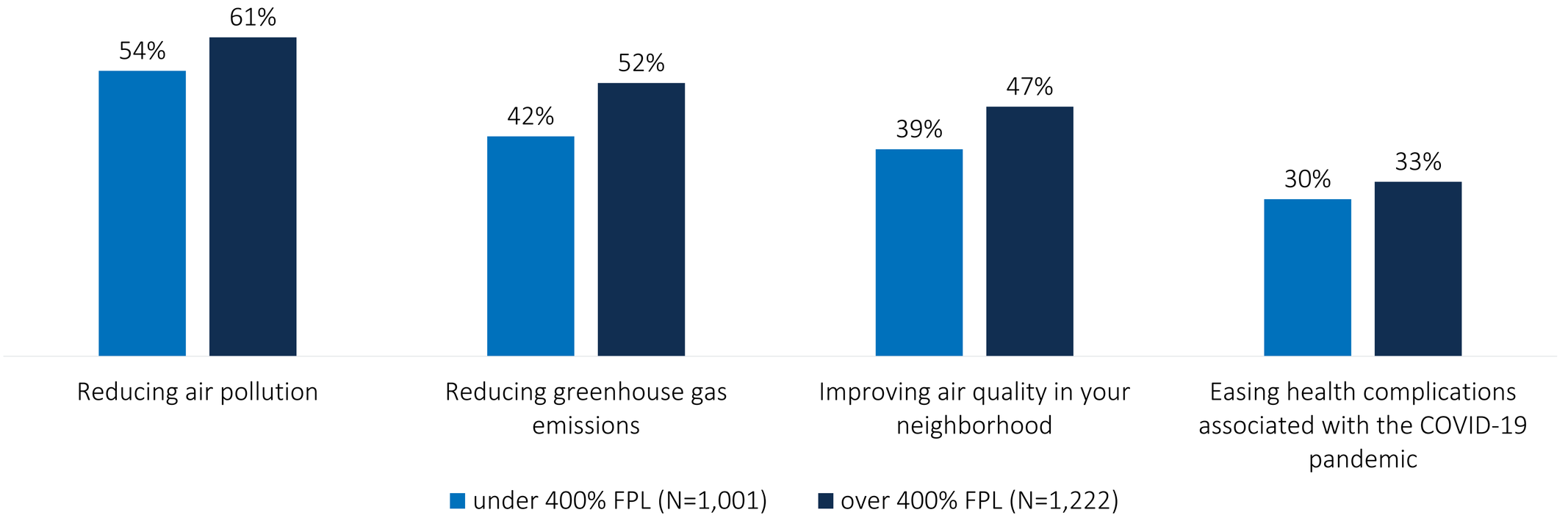


**LMI respondents, N=1,225. Non-LMI respondents, N=995. Blank responses are excluded.*

Environmental Concerns

Environmental Considerations: Vehicles

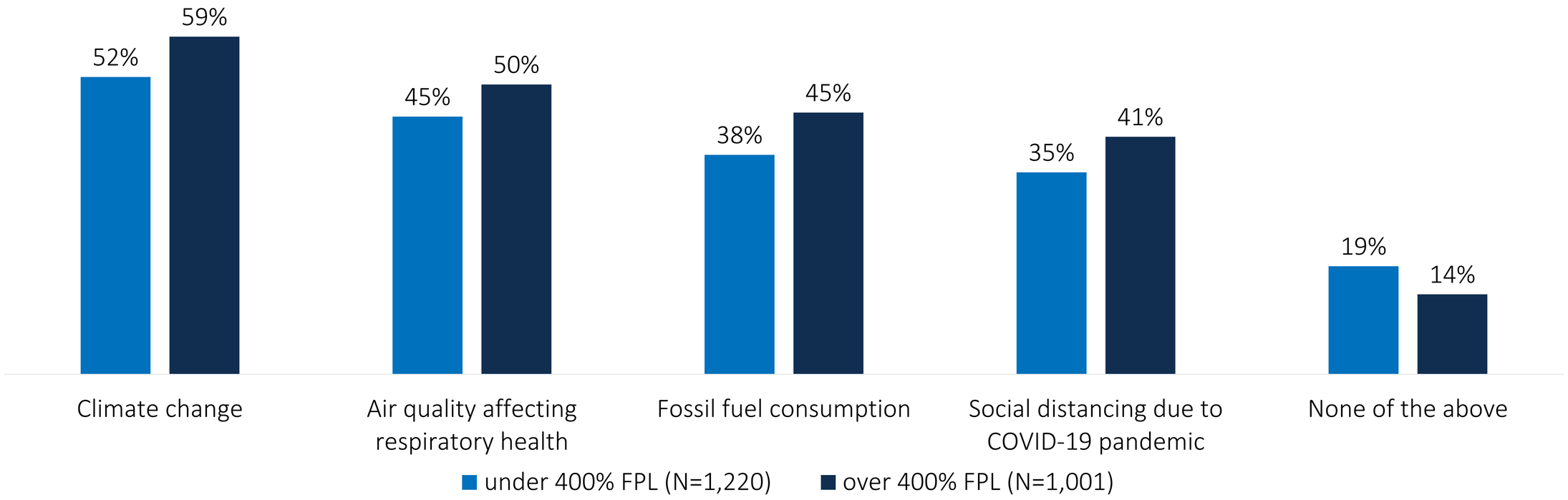
- **LMI and non-LMI** respondents consider **reducing air pollution** as an important factor when acquiring a vehicle followed by reducing greenhouse gas emissions



**"None of the above" and blank responses are excluded.*

Environmental Considerations: Transportation

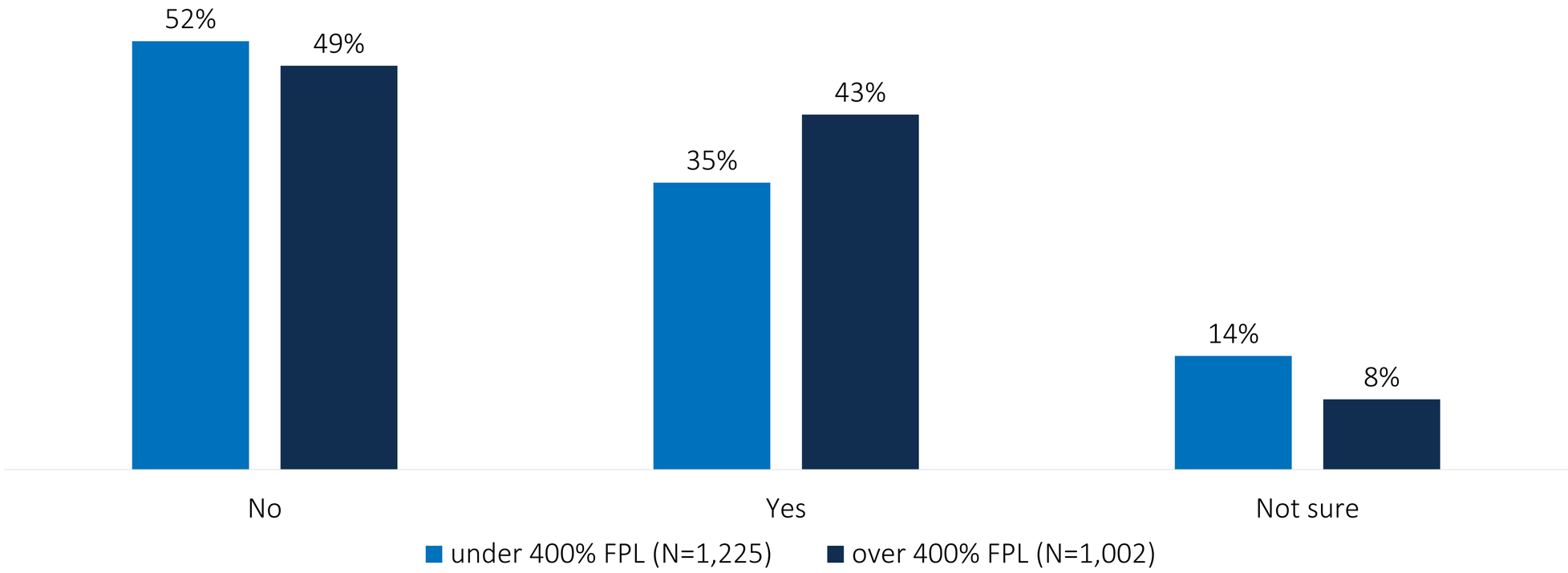
- **Climate change** and **air quality** are the top factors for both **LMI and non-LMI** respondents



**Blank responses are excluded.*

Interest in Taking Action to Improve Air Quality

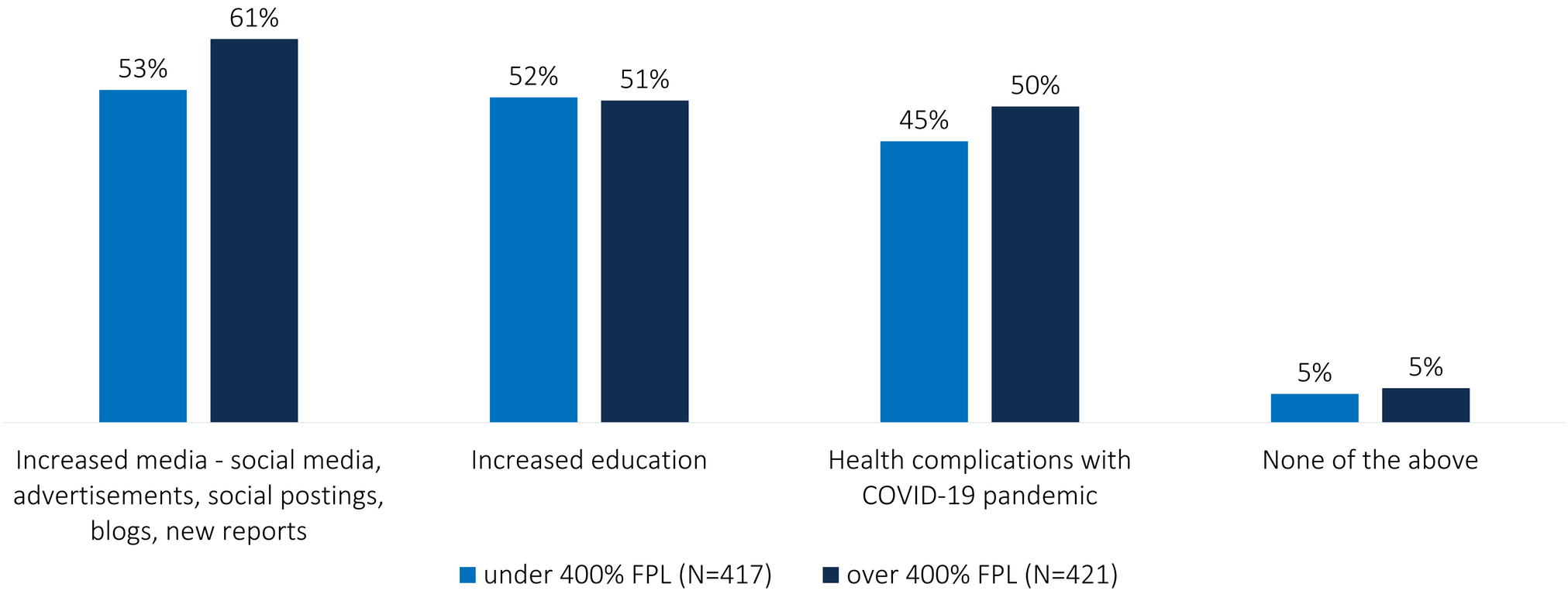
- Over **400% FPL** group had **higher interest** in taking personal action in improving air quality with transportation choices



**Blank responses are excluded..*

Influence on Personal Action

- **Increased media** is top influence for respondents in taking personal action to reduce air pollution and improve air quality with their transportation choices



**Blank responses are excluded.*

Conclusions

- COVID reduced travel, commuting to work, and air travel, while increasing the use of personal vehicles
  - Decreasing the need for commuting vehicle contrasts with increasing the use of personal vehicle for other travel
- COVID delayed many vehicle purchases which contributed to pent up demand and early 2021 sales surge
- Incentives continue to influence EV purchases
  - Nearly half of the LMI drivers consider current BEV options unaffordable
- Higher income individuals were more likely to consider air quality in transportation choices

Survey Participant Characteristics: Household Demographics

Demographic Characteristic of Survey Respondents* by FPL

Gender	Under 400% FPL (N=1,224)	Over 400% FPL (N=1,004)
Male	44%	55%
Female	54%	44%

Ethnicity	Under 400% FPL (N=1,212)	Over 400% FPL (N=999)
Non-Hispanic/Latino	81%	92%
Hispanic/Latino	19%	8%

Age	Under 400% FPL (N=1,223)	Over 400% FPL (N=1,004)
Under 50 years old	55%	52%
Over 50 years old	45%	48%

Education Level	Under 400% FPL (N=1,222)	Over 400% FPL (N=1,004)
Associate degree or lower	57%	23%
Bachelors' degree or higher	43%	77%

**"Prefer not to answer" responses are excluded.*

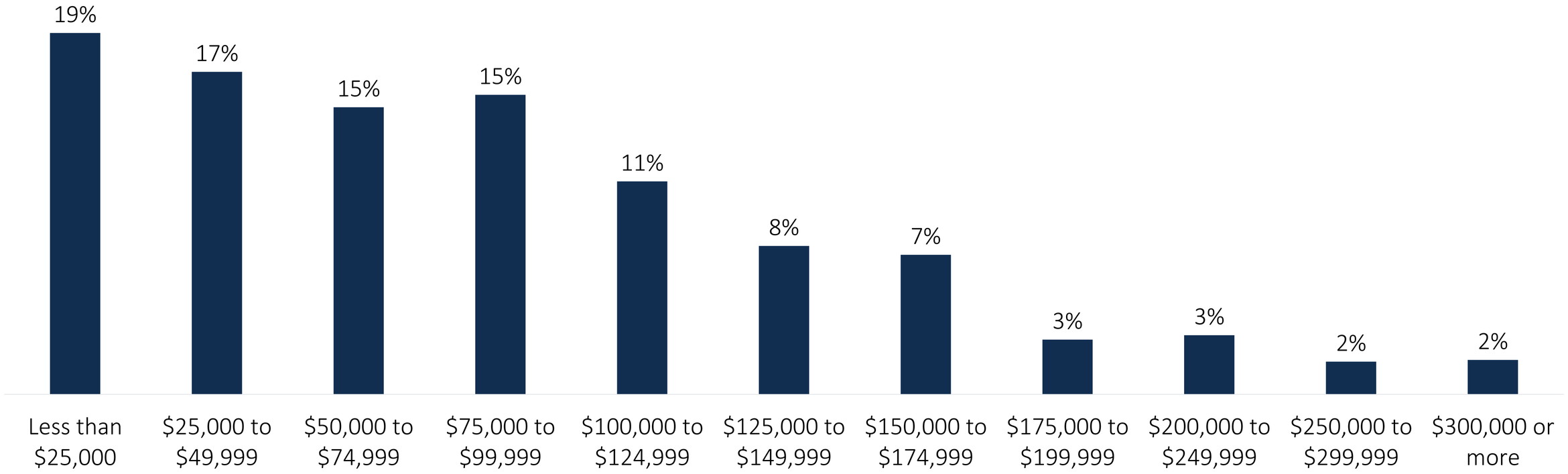
Race Characteristic of Survey Respondents* by FPL

Race	Under 400% FPL (N=1,198)	Over 400% FPL (N=1,000)
White or Caucasian	**74%**	**84%**
Black or African American	9%	4%
East Asian	5%	6%
Other	4%	1%
Two or more race	4%	2%
Middle Eastern or North African	1%	0%
Native American or Alaska Native	1%	0%
Native Hawaiian or other Pacific Islander	1%	0%
South Asian	1%	1%
Southeast Asian	1%	2%

**"Prefer not to answer" responses are excluded.*

Household Income

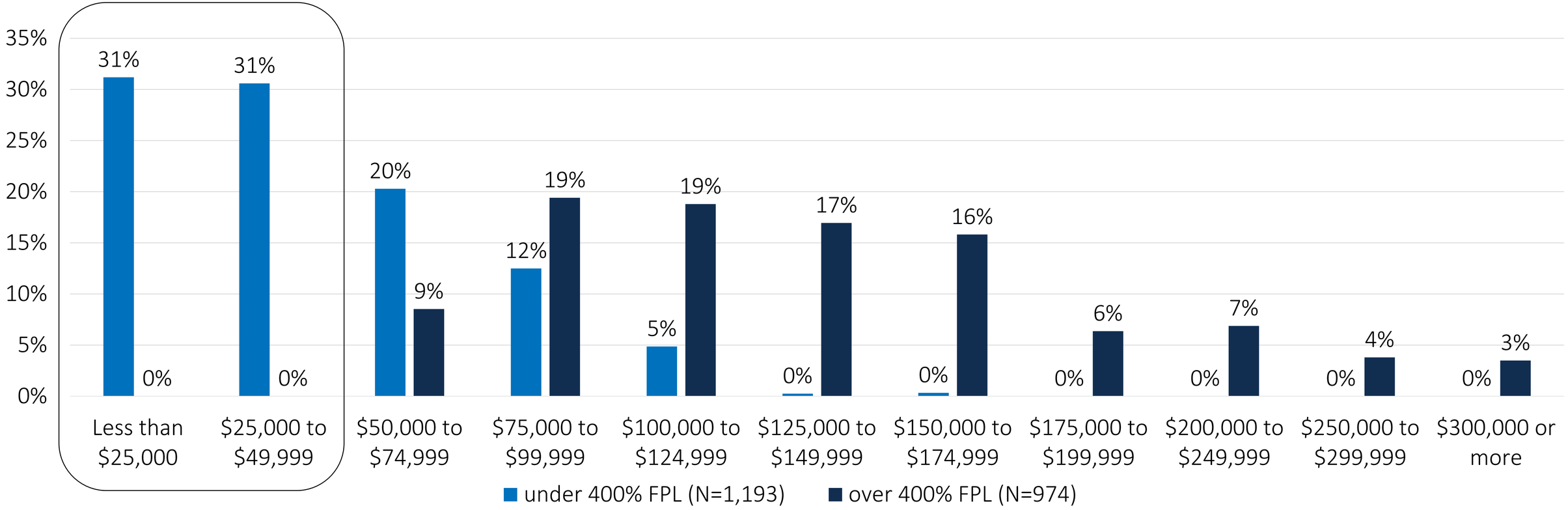
- **55%** of respondent's household income puts them **under 400% FPL** based on household size and self-reported income



**N=2,210. Blank responses and responses with household income over $1 million are excluded.*

Household Income by FPL

- **62%** of the **LMI** population earn **less than $50,000 per year**

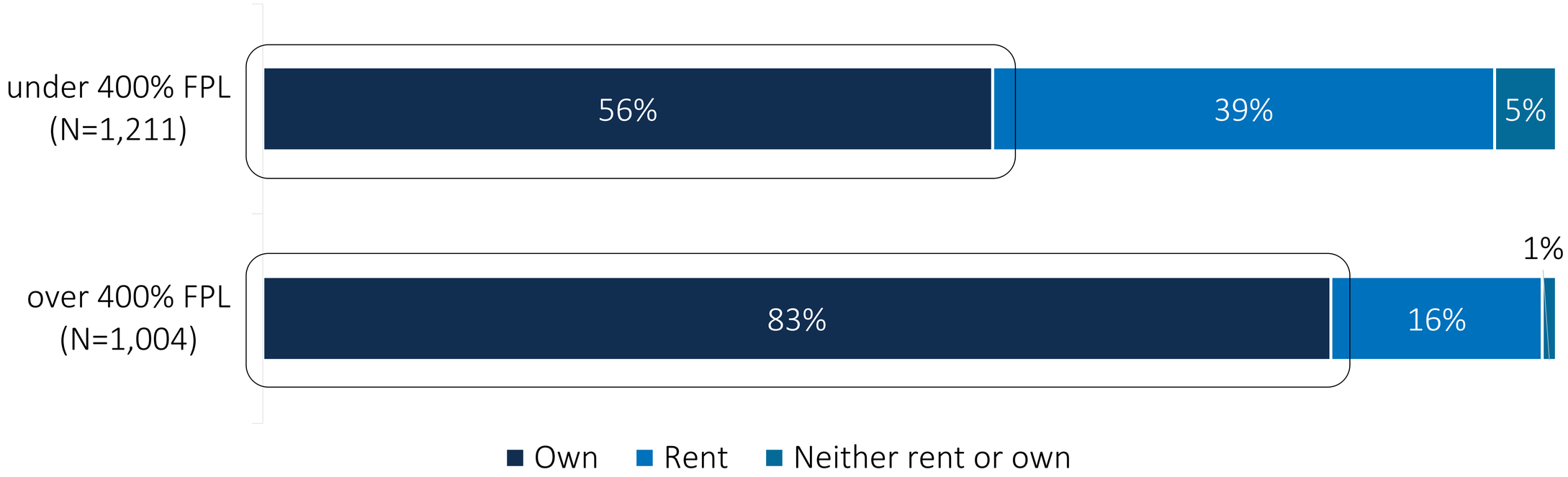


**Blank responses and responses with household income over $1 million are excluded.*

Survey Participant Characteristics: Residence

Home Own/Rent by FPL

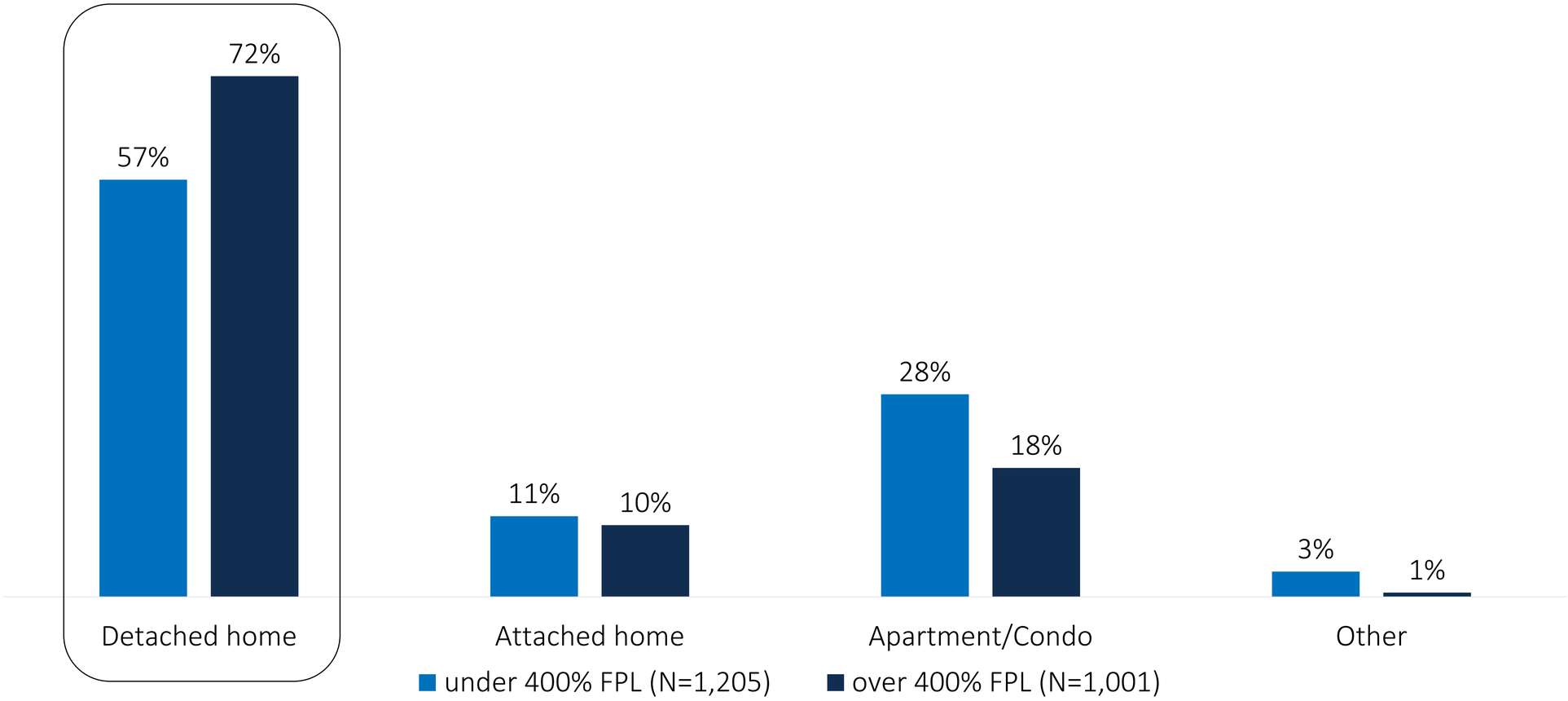
- **56%** of **LMI** respondents **own** a home
  - 49% of this group are age 50 and older
- **27%** more of **non-LMI** respondents **own** a home



*"Prefer not to answer" responses are excluded.

Resident Type by FPL

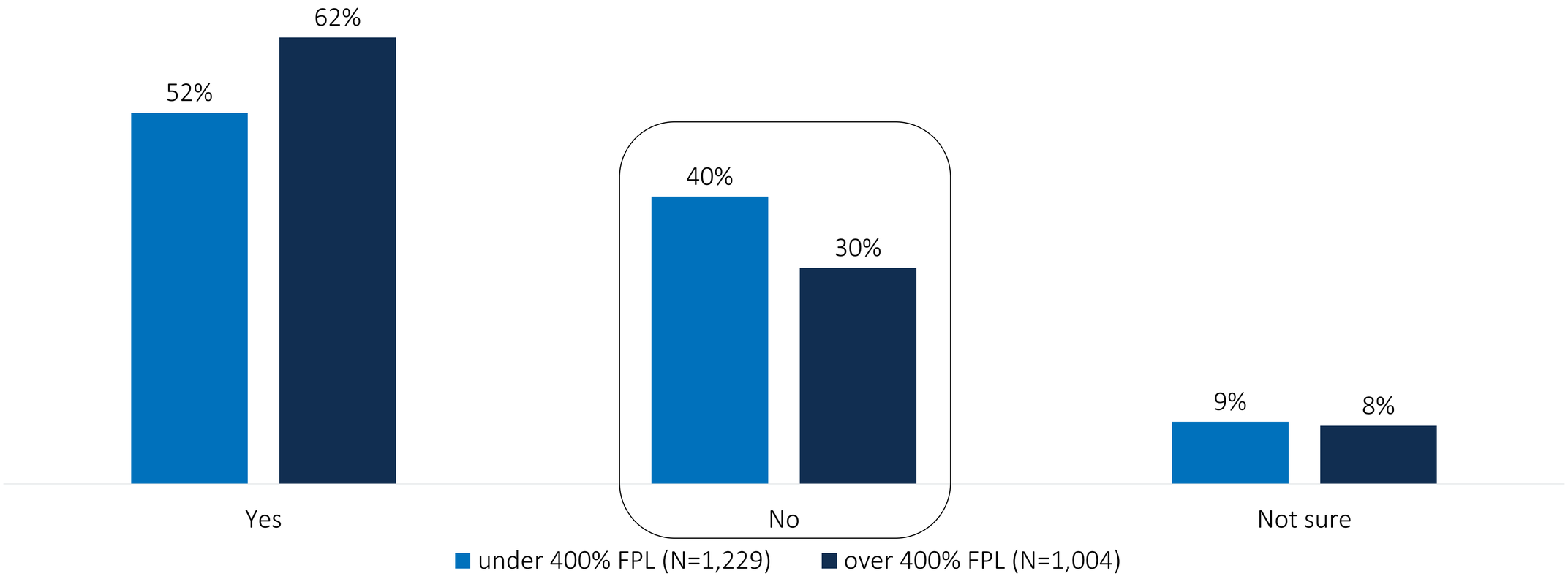
- Compared to **non-LMI** respondents, only **57%** of **LMI** respondents live in **detached homes**



**"Prefer not to answer" responses are excluded.*

Residence Has Dedicated Parking Space with Access to Electricity Within 20 feet

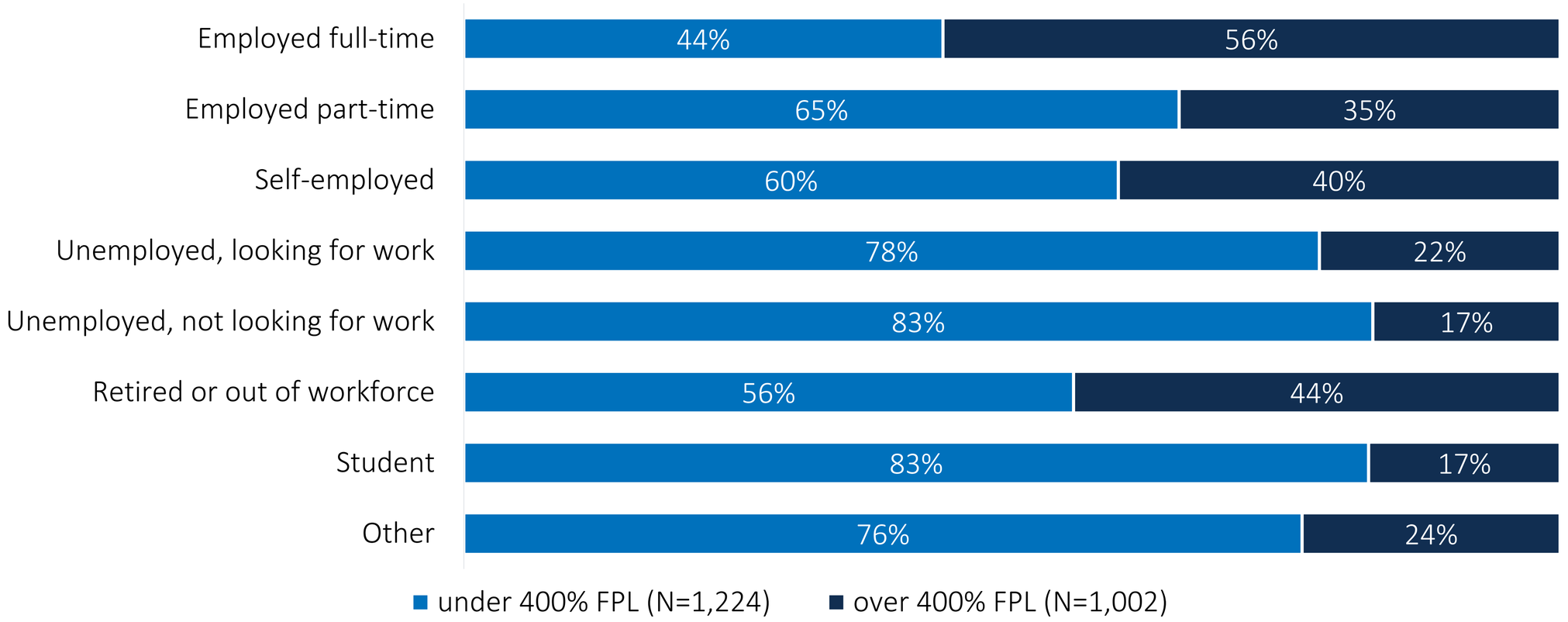
- **40%** of **LMI** respondents said they had **no access to electricity within 20 feet from residence**



Survey Participant Characteristics: Employment

Primary Employment Status

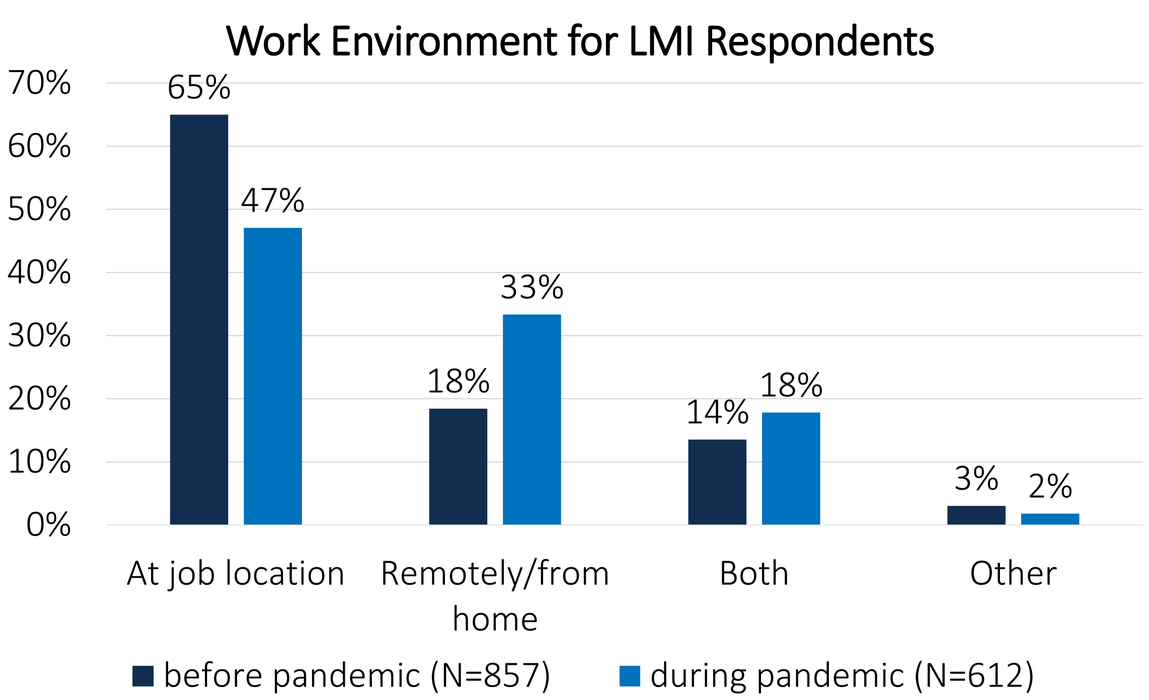
- Survey respondents had a variety of occupations, thus inconclusive

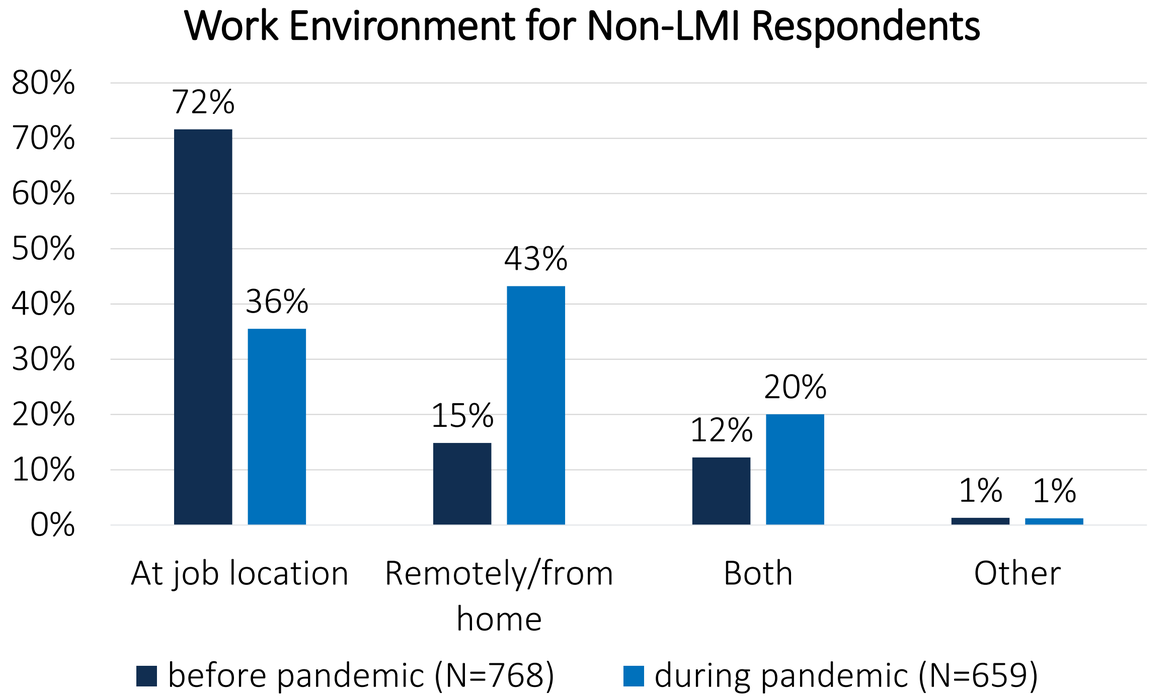


**Blank responses are excluded.*

Physical Work Environment Before and During the Pandemic

- **47%** of **LMI** respondents **worked at their job location** during the pandemic as compared to **36%** of **non-LMI**



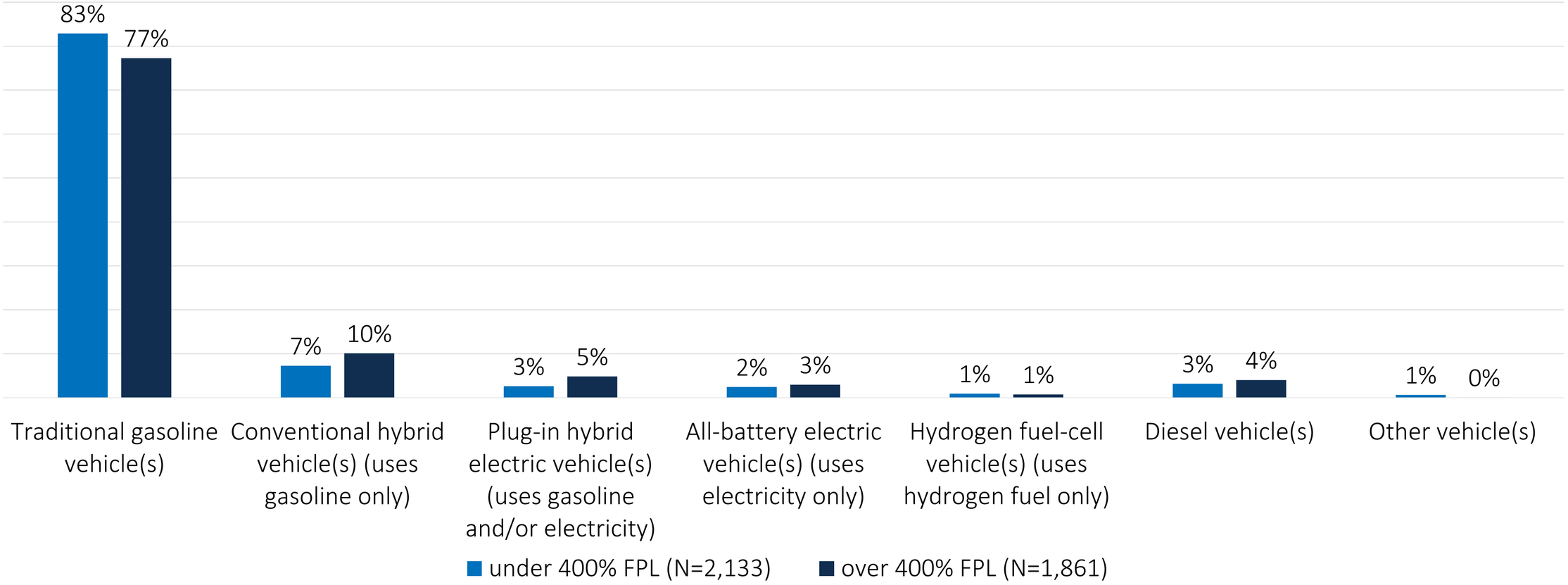


**Blank responses are excluded.*

Survey Participant Characteristics: Vehicle Ownership

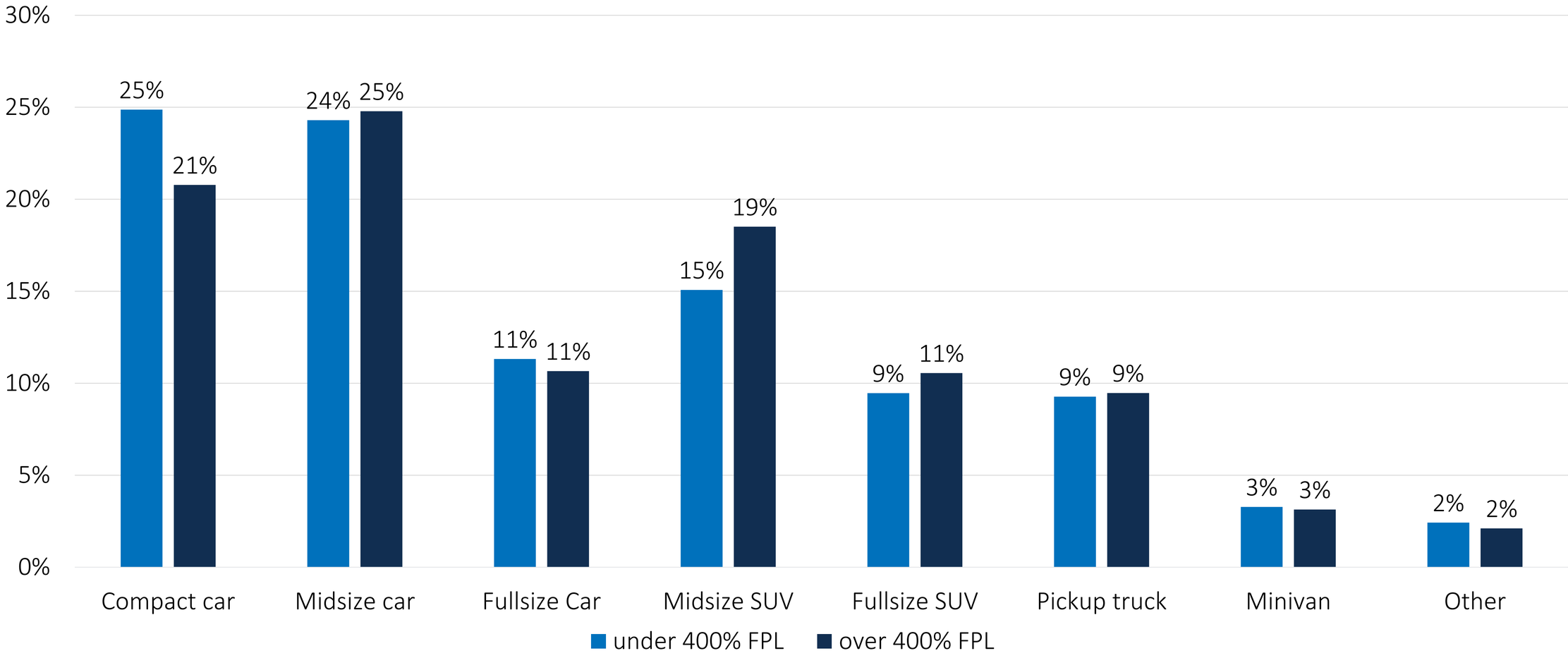
Vehicle Owned Powertrain Distribution

- Majority of the vehicles owned by respondents are gasoline powered*



**Sum of the number of vehicles owned by a household by FPL level. Blank responses are excluded.*

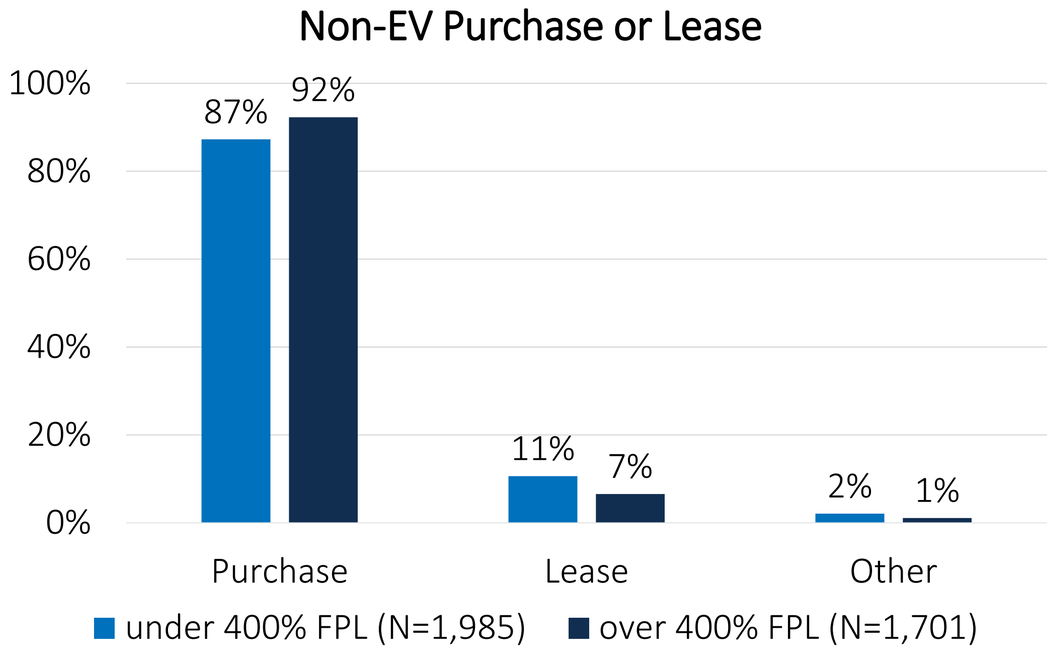
Vehicle Body Style Owned

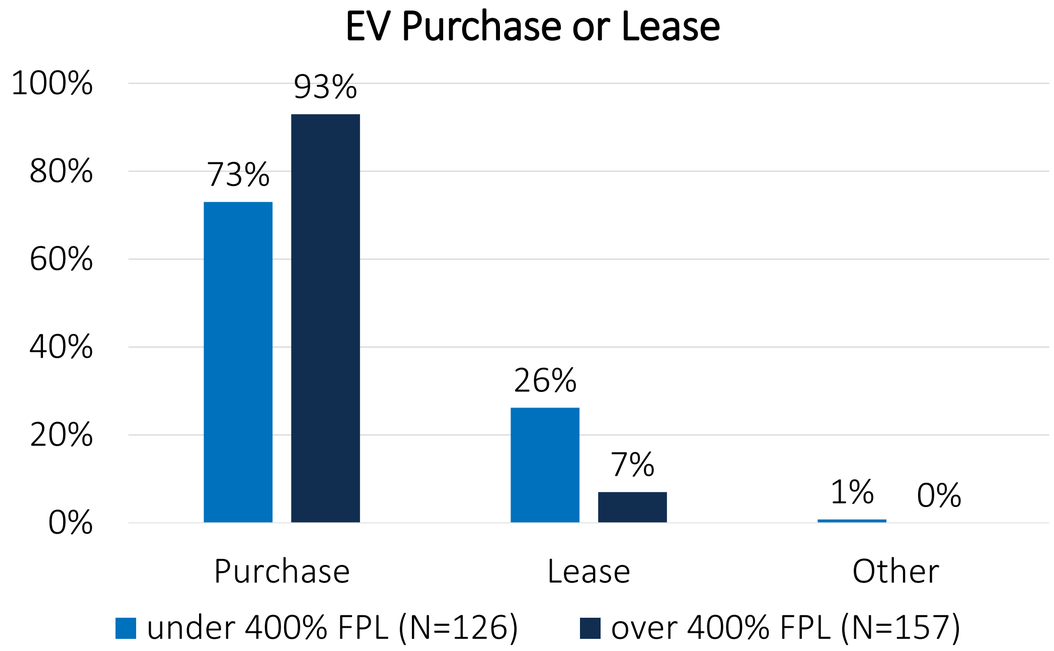


**Blank responses are excluded.*

Vehicle Purchase or Lease

- Majority of vehicles, both EV and Non-EV were **purchased**
- Approximately a quarter of all EVs owned by **LMI** respondents are leased

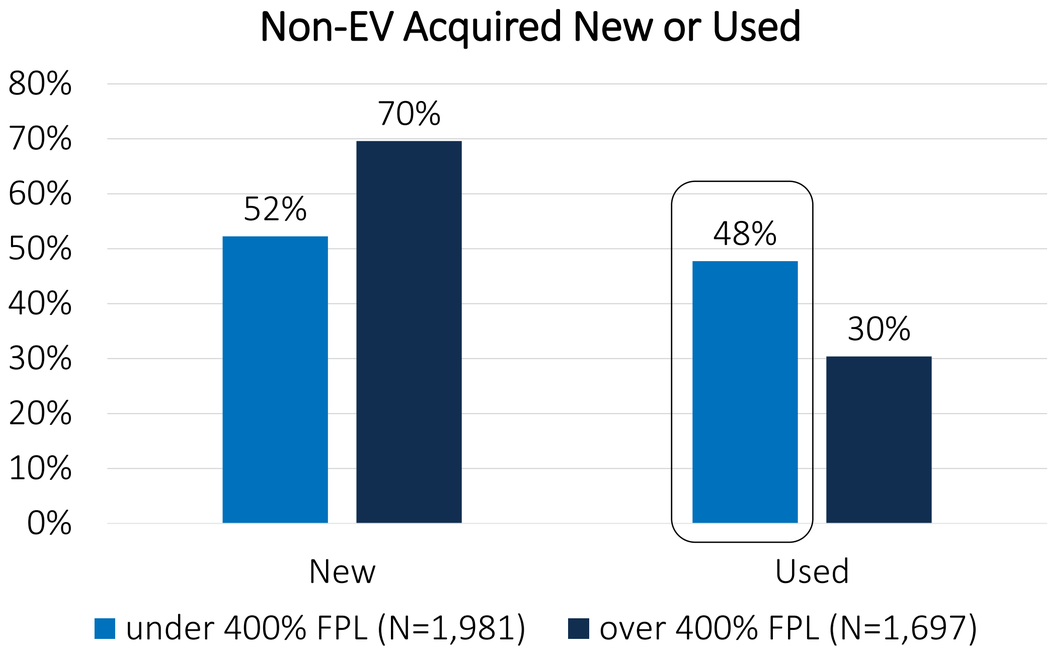


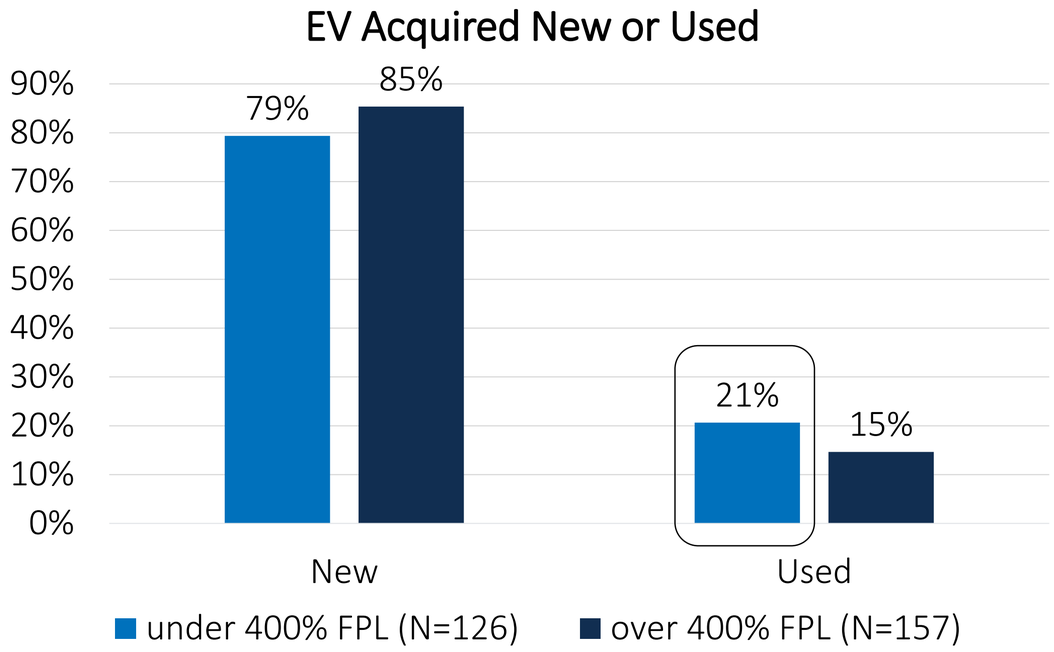


**One response of leasing 616 vehicles and blank responses are excluded.*

Vehicle Acquired New or Used

- **LMI** respondents acquired **more used vehicles** than **non-LMI**
- Majority of EVs, for both **LMI and non-LMI** were acquired **new**





**Once response of 616 acquired new vehicles and blank responses are excluded.*

Center for Sustainable Energy®

One simple mission — DECARBONIZE.®

The Center for Sustainable Energy® (CSE) is a nonprofit offering clean energy program administration and technical advisory services. With the experience and streamlined efficiency of a for-profit operation, CSE leads with the passion and heart of a nonprofit. We work nationwide with energy policymakers, regulators, public agencies, businesses and others as an expert implementation partner and trusted resource.