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Advancing Deployment of Electric Vehicles in Disadvantaged Communities in the Southern California Edison (SCE) Service Territory

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PLUG-IN HYBRID & ELECTRIC VEHICLE RESEARCH CENTER

of the Institute of Transportation Studies

Advancing deployment of electric vehicles in disadvantaged communities in the Southern California Edison (SCE) service territory

By

KATHLEEN YIP

ABSTRACT

Widespread adoption of plug-in electric vehicles (PEVs), which includes both electric vehicles and plug-in hybrid vehicles, can help clean the air, but the high up-front cost of passenger electric vehicles, limited charging infrastructure, and low consumer awareness have slowed the adoption of these vehicles in the communities that need them most. People of color and people experiencing poverty are disproportionately impacted by the burdens of transportation systems, and do not receive an equal share of the benefits of clean transportation technologies. This study examines how Southern California Edison (SCE) can advance deployment of electric vehicles in disadvantaged and low-income communities in a way that optimizes monetary investment and community benefit. To inform this study, several researchers and I conducted interviews at community events in the San Joaquin Valley Air District and in San Bernardino County. We interviewed community members about their transportation habits, needs, and challenges. For SCE to increase EV deployment in disadvantaged communities, it is important to talk with people in the community to understand their mobility needs and who they trust. Based on these interviews and further engagement with community members, targeted outreach plans should be developed. Finally, reworking and expanding funding and finance programs to meet the needs of low-income communities is essential.

ACKNOWLEDGEMENTS

I would like to express my gratitude to the following individuals and people from the following organizations for their guidance, coordination, and invaluable assistance as I developed this document. The time and insights they contributed have made this project possible.

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The opinions expressed herein do not necessarily reflect those of the University of California Davis or the individuals and organizations that contributed to it. Kathleen Yip bears sole responsibility for the report's contents.

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INTRODUCTION

"Electric vehicles? Like the Tesla? Those things are so expensive. No one out here would ever be able to afford one."

"I don't take Ubers or Lyfts or whatever. I just don't."

The backpack giveaway was set to start at 9 AM. We arrived at 7 AM, and there was already a line wrapped around the building and down the block. We heard that people had been in line since 6 AM. The backpack giveaway is an annual event put on by community groups Youth Visionaries and Youth Action Project (YAP) to help ensure that kids in the San Bernardino area have the school supplies they need for the year. Each kid receives one backpack at the entrance of the event and goes through the community center to pick up other school supplies – pencils, notebooks, coloring pencils. The event we attended was held at the community center on a hot August day. The thermometer read 102 degrees and people were standing in line in the sun. Event volunteers walked around with umbrellas, apples, and water while people waited in line for over 4 hours to get essential school supplies.

Over in San Joaquin Valley, the smog repairs start at 8 AM, but the lines start way before then. We drove by hundreds of cars as we searched for the entrance gates to the fairgrounds. The cars in line were already being tagged with different colored pieces of paper. Inside the tents, there were workers already busy setting up cones, making sure clipboards were full of forms, and running through logistics for the day. As the sun started to rise, I noticed that there were also tents with hot dogs and coffee for event participants, the local radio station was playing music, and local smog shops were setting up their booths – laying out books, ready to take appointments. At 8 AM, the first cars started to drive in, circling around the large grassy

area, following the direction of the people waving orange flags, queuing up in rows of ten. Many people own multiple cars, but most of the cars cannot pass a smog test. This event provides an opportunity for Valley residents to receive vouchers to repair or replace the vehicles that fail the smog test. ValleyCAN partners with a community-based organization to host an event in a different city each month. Event workers walked up and down the rows of cars collecting information from participants. Then, the first few lines of parked cars lit up their engines and started to move up to the smog check tent.

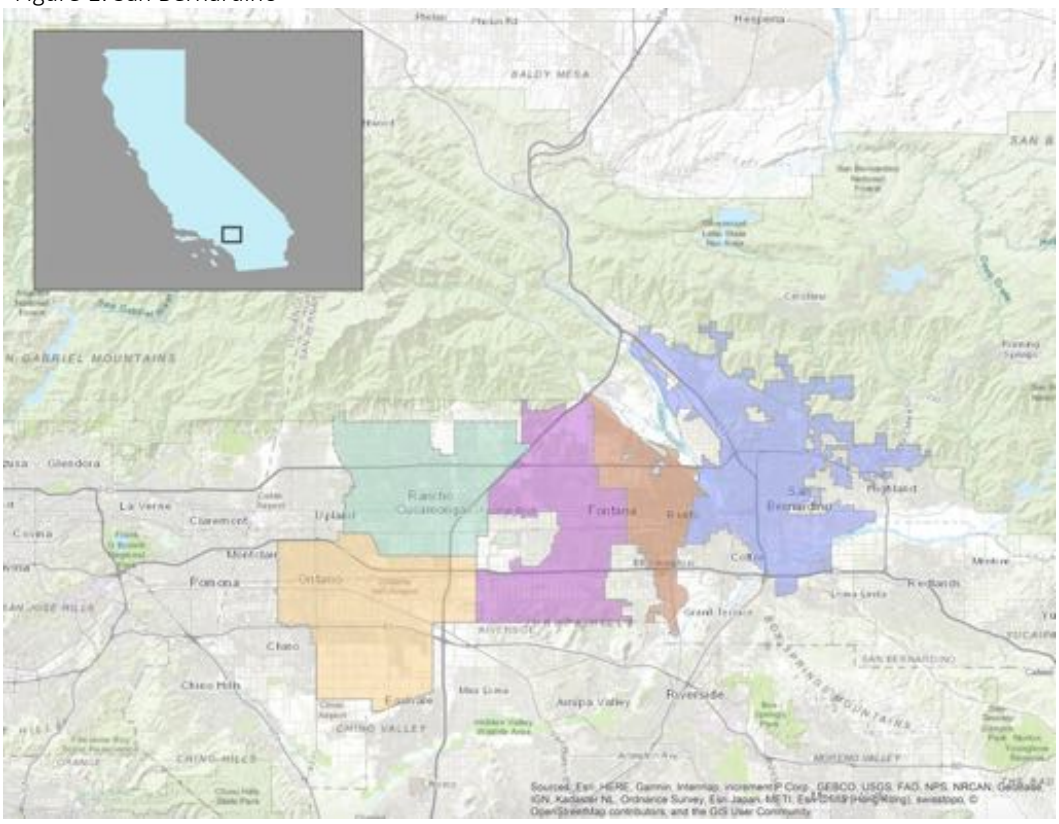
There is a striking sense of survival in the communities we entered. Waiting in line for hours in 100 plus degree heat for a $15 backpack, sleeping in a car overnight to get a smog check – the people in these communities, the people whom this project aims to serve, are less than 200 percent above the poverty level. They are often struggling to meet their basic needs for food and shelter. Electric vehicles are not something that residents of San Bernardino and the Valley think about.

Widespread adoption of plug-in electric vehicles (PEVs), which includes both electric vehicles and plug-in hybrid vehicles, can help reduce greenhouse gas emissions, clean the air, and save money over the lifetime of the vehicle. Though their high up-front cost, limited charging infrastructure, and low consumer awareness have slowed the adoption of these vehicles in the communities that need them the most. People of color and people experiencing poverty are disproportionately impacted by the burdens of our transportation system, and do not receive an equal share of the benefits of clean transportation technologies.

Defining the Community in this Paper

The first community we surveyed were cities within San Bernardino County – specifically people from the cities San Bernardino, Rialto, Fontana, Rancho Cucamonga, and Ontario (Figure 1). We conducted surveys and interviews in Rialto city, with survey respondents coming to the community event from surrounding cities. This report references these 4 areas, and broadly refers to them as San Bernardino.

Figure 1: San Bernardino



The other community we look at are the counties that make up the San Joaquin Valley Air Control District – made of up San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern counties (Figure 2). Survey responses were collected in Madera and Porterville cities, from residents of all counties. This report refers to this area as the Valley.

Figure 2: San Joaquin Valley

We surveyed proportionately more females in San Bernardino than in the Valley (88 percent female in San Bernardino versus 50 percent female in the Valley). The average age of respondents was similar – 37 years in San Bernardino, 39 years in the Valley. Valley respondents were 62 percent Latino, 33 percent Caucasian. San Bernardino respondents were 67 percent Latino and 22 percent African American. The most notable differences between the two survey populations was in home ownership and commute times. San Bernardino respondents reported commute times that averaged around 2 to 3 hours. Commute times in the Valley were more varied, with many commuting under an hour, but some traveling more than 6 hours per day. Respondents that were traveling significant hours reported having seasonal agricultural jobs, and were not traveling far distances every day, but 2 to 3 days a week. 42 percent of respondents in the Valley report owning their home, while 21 percent own in San Bernardino. However, both

communities show high proportions of renters – 69 percent renting in San Bernardino and 49 percent renting in the Valley. Median household income for the majority of respondents falls below $40,000 a year. Even with the differences in demographics, survey responses were very similar across the 2 communities. As such, I will discuss the survey respondents as one type of group in this paper – low-income, disadvantaged communities of color.

BACKGROUND

Karner et al. define transportation equity as just processes and just outcomes.[1] Just processes is defined as the "meaningful involvement of those historically burdened by transportation infrastructure – people of color and low-income people, and just outcomes referring to the "fair distribution of benefits and burdens of transportation plans and programs across space and demographic groups."[2] Aimen and Morris describe meaningful involvement as requiring "potentially affected community stakeholders and residents [to] have an opportunity to participate in decisions about a proposed activity that will affect their environment, safety, or health. It means that affected communities have an opening to influence government decisions and that all involved participants will be considered in the decision-making process."[3] Meaningful involvement is critical, since without input and involvement by those who will be directly

[1] Karner, A., Golub, A., Martens, K., & Robinson, G. (2018) Transportation and environmental justice: History and emerging practice. In R. Holifield, J. Chakraborty, & G. Walker (Eds.), *The Routledge handbook of environmental justice* (400-411). New York, NY: Routledge
[2] Ibid
[3] Aimen, D., & Morris, A. (2012). *Practical approaches for involving traditionally underserved populations in transportation decisionmaking.* Washington, DC: National Cooperative Highway Research Program

affected by a policy, building, or development. The "outcomes will simply reflect the desires of the public officials who created it."[4]

It is imperative to solicit input and feedback from the communities that will be affected from any decision in a genuine way, and it needs to be done early and often. Traditional methods of public involvement often fail to produce meaningful results. Innes and Booher write that legally required methods of public involvement processes are not effective because they "do not achieve genuine participation in planning or other decisions; they do not satisfy members of the public that they are being heard; they seldom can be said to improve the decisions that agencies and public officials make; and they do not incorporate a broad spectrum of the public."[5] They suggest that public-government involvement needs to be a truly collaborative relationship, one where both sides are listening to and helping each other – a collaborative model of participation – one that "encompass[es] genuine dialogue across a group of participants representative of all potential stakeholders, early involvement prior to key decision points, and the cogeneration of knowledge."[6]

Karner and Marcantonio suggest a 3-step model for inclusion of all stakeholders in the decision-making process.[7] The first step is learning about the current transportation needs and equity gaps of the community, from the members of the community. The second is to set aside a fair share of funds to address the needs of the community. Putting forth a real effort to help the

[4] Connelly, S. (2006). Looking inside public involvement: How is it made so ineffective and can we change this? *Community Development Journal, 41*, 13-24
[5] Innes, J., & Booher, D. (2004). Reframing public participation: Strategies for the 21st century. *Planning Theory & Practice, 5,* 419-436
[6] Ibid
[7] Karner, A., Marcantonio, R. (2018) Achieving transportation equity: meaningful public involvement to meet the needs of underserved communities. *Public Works Management & Policy, 23,* 105-126. Retrieved from http://journals.sagepub.com/doi/pdf/10.1177/1087724X17738792. June 2018.

community results in more salient and relevant community engagement. The third step is to set strong metrics for evaluation – setting quantifiable benchmarks for changes the community would like to see as a way to evaluate the program's success.[8]

Greenlining Institute's *Mobility Equity Framework* emphasizes the need of going to the people at events in their community, rather than asking them to come to you. The Framework emphasizes that identifying community mobility needs should be the first step of any community transportation plan, so that projects will provide the most benefit and the least amount of harm.[9] Greenlining points out that metropolitan planning organizations (MPOs) hold decision-making power as to which transportation projects get approved, and as such, which communities ultimately benefit.[10] However, MPOs do not reflect the demographics of a community, as they typically underrepresent low-income communities. The Framework offers the idea of reforming the voting structure of MPOs to ensure that all communities are fairly represented in the transportation planning process – redistributing power among residents so that they are proportionately represented.

A University of California Los Angeles' Luskin School of Public Affairs study (Luskin study) suggests conducting smog repair type events as a way to complement other ongoing efforts to increase air quality in areas where building out the transit system is currently not cost-effective; or, in places where a quick transition to zero-emission vehicles is challenging because of

[8] Ibid
[9] Creger, H., Espino, J., & Sanchez, A. (2018). *Mobility Equity Framework: How to make transportation work for people.* The Greenlining Institute. Retrieved from http://greenlining.org/publications/2018/mobility-equity-framework/. April 2018.
[10] Ibid

financing and other issues.[11] The Luskin study found that ValleyCAN saw participation from 97 percent of the census tracts in the Central Valley during the period of study (2012-2017). The study found that the ValleyCAN model distributed $12 million in voucher benefits to Valley residents over the 5-year study period. The Luskin report recommends using this model as in intermediary between the current incentive structure and other current ARB efforts. I find that the smog repair type events are a good complementary solution for other efforts, but not a substitute for conducting outreach and reworking the incentive structure to work for low-income communities in the near term. Raising public awareness needs to happen concurrently with advancing programs.

The California Air Resources Board's *Low-Income Barriers Study Part B: Overcoming Barriers to Clean Transportation Access for Low-Income Residents* suggest that there is no "singular solution to addressing barriers and numerous actions will be necessary to increase clean transportation access for low-income residents and residents of disadvantaged communities." Additionally, that "there are specific barriers which are common amongst all of the communities CARB visited as part of [their] effort, including the need to secure permanent, long-term funding, increase education, outreach, and residents' awareness on clean transportation and mobility options, access to workforce training and good quality jobs, and affordability of transportation, clean technologies, or other alternative options."[12] The Barriers Study will be referenced throughout the report of this study.

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[11] Pierce, G., & Connolly, R. (2018). *Can smog repairs create social justice? The Tune In & Tune Up smog repair program in the San Joaquin Valley.* UCLA Luskin School of Public Affairs.

[12] *Low-income barriers study, Part B: Overcoming barriers to clean transportation access for low-income residents, Final guidance document.* California Air Resources Board (2018). Retrieved from https://www.arb.ca.gov/msprog/transoptions/sb350_final_guidance_document_022118.pdf. February 2018.

METHODS

To inform this study, SCE, UC Davis researchers, and I met with academics and practitioners in the field to gather information about existing programs, prior research, and lessons learned. Following these meetings, we investigated the different types of disadvantaged communities in California, aiming to choose 1 to 3 communities to survey in detail. The original intent was to select three different types of communities – urban, rural, and suburban. After thoroughly searching for community-based organizations (CBOs) to work with and analyzing various community demographics, we ultimately selected the Valley (rural) and San Bernardino County (suburban) for this work. These communities are situated within the SCE service territory, they have high CalEnviroscreen[13] scores, and there was an opportunity to partner with a strong CBO. We were unable to find a community-based organization in an urban area within the SCE territory (East Los Angeles) that had the capacity to partner with us, so we could not conduct an urban area survey. The communities that we studied are heavily car dependent. Future research needs to be done to create a survey designed for urban areas, as they are likely to use more alternate modes of transportation than the communities in this study.

For each of the communities, we met with local leaders in the area to give us foundational knowledge of the community dynamics and needs. This information helped structure the survey portion of the project. Through surveys and interviews, we gathered information about the transportation habits, needs, and challenges of community residents. The

[13] CalEnviroScreen is an index created by the Office of Environmental Health Hazard Assessment (OEHHA). The CalEnviroScreen considers socioeconomic indicators, air quality and pollution factors. It combines many data points into an overall score for every census tract in California. The top, most at risk, census tract zones are in the 96th to 100th percentile.

survey had 16 questions that tested the pulse of the community to adopt clean transportation options. The questions were modelled after surveys that the UC Davis Plug-In Hybrid and Electric Vehicle center has done in the past to test consumer attitudes toward clean vehicles.[14] There were questions that asked about their opinions and usage of vehicles, transportation network companies (TNCs), ride sharing, car sharing, and transit.

Sample questions from the survey in Figure 3 below:

Figure 3: San Bernardino survey

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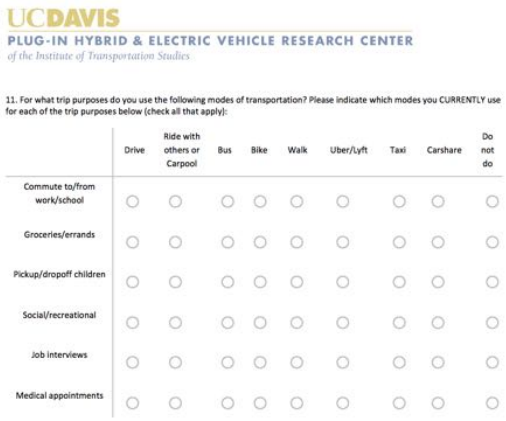
We are conducting a survey to learn about how you get around San Bernardino. We want to know what your transportation needs are and how clean transportation options, like electric vehicles can fit into your life. The survey takes about 5 minutes to complete, and your responses will be used as valuable input to make sure clean transportation programs coming to San Bernardino County work for all San Bernardino County residents.

1. How often do you have access to a car when you need one?

- All of the time
- Most of the time
- Some of the time
- Every once in a while
- Rarely
- Never

2. Do you have a car? If yes, tell us about it. If no, do you want one?



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11. For what trip purposes do you use the following modes of transportation? Please indicate which modes you CURRENTLY use for each of the trip purposes below (check all that apply):

	Drive	Ride with others or Carpool	Bus	Bike	Walk	Uber/Lyft	Taxi	Carshare	Do not do
Commute to/from work/school	○	○	○	○	○	○	○	○	○
Groceries/errands	○	○	○	○	○	○	○	○	○
Pickup/dropoff children	○	○	○	○	○	○	○	○	○
Social/recreational	○	○	○	○	○	○	○	○	○
Job interviews	○	○	○	○	○	○	○	○	○
Medical appointments	○	○	○	○	○	○	○	○	○

The scripted survey took about 5 minutes for respondents to complete. We randomly surveyed people that were waiting in line, and filled out the survey for all respondents, asking them the questions that were written on paper. We selected this method of transcribing responses to ensure that there was someone who could answer questions about the survey in real time. Long wait times at both events allowed us to move beyond the scripted survey and talk more freely with survey respondents who were more talkative. We did not record any personal information on the survey to protect the confidentiality of all survey respondents. Anecdotes and what we learned are detailed in the results and discussion section.

[14] Kurani, Ken. July 2017. In-person interview.

San Bernardino County

From our discussions, it was suggested that Youth Action Project (YAP) was an excellent community-based partner with a bounty of local knowledge. We partnered with community-based organizations Youth Action Project (YAP) and Youth Visionaries in San Bernardino to conduct interviews and surveys at their backpack giveaway. The median household income of most of those surveyed falls below $40,000 a year. The backpack giveaway was a school supply event for kids and parents, and we ended up surveying many more women in San Bernardino than men. Even though the San Bernardino sample was skewed, the event was a great place to interview people of the target demographic that this work pertains.

Above left: Youth Action Project volunteer handing out raffle tickets and clean energy information at San Bernardino backpack giveaway event
Above right: Youth Action Project volunteers, Terrance Stone (Youth Visionaries founder), Deborah Stone (City of Rialto Department of Community Services), Andrew Dugowson (Southern California Edison)

About 500 people from San Bernardino city and the surrounding areas go to the community center in Rialto, a neighboring city and line up for a free backpack and school supplies. Due to fire code restrictions, about 10 people could go through the community center at a time, meaning that many people were waiting around 5 hours, in 102 degree heat, to get into the event. With folks waiting for such a long time with nothing to do, the backpack giveaway was an opportune time for us to talk with them, asking questions about their transportation habits, challenges, and needs. We talked with 86 people at the event and were able to talk with many of the residents for a significant amount of time, hearing their stories and understanding how they interact with their vehicles and how they feel about other transportation modes.

San Joaquin Valley Air District

> *"I camped out last night starting at 6PM. I wanted to make sure my car got seen. I've heard they have to turn cars away."*
>
> *"I've been here since last night. My car has failed smog 4 times."*

We partnered with Valley Clean Air Now (ValleyCAN) in the San Joaquin Valley to conduct interviews and surveys at 2 of the organization's 'Tune In & Tune Up' events – 1 in Porterville and 1 in Madera. The Tune In & Tune Up events are free smog repair events for residents in the Valley. Some customers camp out overnight for the event, which provided a great opportunity to talk with people about their cars, get a sense of how they feel about electric vehicles, and understand their willingness to consider taking other transportation options. We spoke with 21 people at the event.

Above: Cars driving up to the line at ValleyCAN's Tune In and Tune Up smog repair event in Porterville

Above: Cars waiting to be smogged at ValleyCAN's Tune In and Tune Up smog repair event

DISCUSSION

Lessons from Pilot Programs

Successful programs in the past, such as scrap and replace programs, have used a hands-on approach, run by people with deep roots in the community. They knock on doors, flyer at the grocery store, and go to community events and talk to people face-to-face. These people know the media outlets to reach their target audience, the right messengers, and the best locations to hold events.

An example of how 2 different communities deployed the same program is the South Coast Air Quality Management District (SCAQMD) and the San Joaquin Valley Air Pollution Control District deployed the EFMP Plus Up programs. Efforts in the Valley were conducted in a grassroots type of way – boots on the ground and in-person. News of the program spread through word of mouth. The Valley program was deployed through existing programs, such as ValleyCAN's smog repair program. More than 500 vehicles show up every weekend to the events where ValleyCAN workers help attendees understand what the types of incentives they qualify for, fill out paperwork, look for available used cars, set up financing, and schedule appointments. Auto dealerships were having a hard time getting the number of vehicles they needed for the program, so they started using CarMax. Now most of the cars are moved through CarMax. Financing for ValleyCAN event participants is also managed through CarMax. The ValleyCAN events are a "one-stop shop" for people, providing a cradle-to-grave type of experience, so that no people are lost in the follow-up process.

SCAQMD administered the program in-house, including a website and television ads to publicize the program. SCAQMD's outreach efforts were effective, as there is significantly more

demand than the program has capacity to fulfill, and it has been difficult to keep up. There have not been any additional actions from the SCAQMD administered program. Learning from the SCAQMD experience, it may be helpful to partner with a local CBO, as the San Joaquin Valley Air Control District partnered with ValleyCAN, to administer future programs. As will be discussed below, trust is important, and local CBOs have strong relationships in the community. Additionally, the CBOs may be able to integrate new incentives and rebates into existing programs, just as ValleyCAN has done.

Issues Around Charging

Charging is currently a major issue at multi-unit dwellings. In 2014, California Assembly Bill 2565 was passed allowing renters to request that landlords allow installation of EV charging stations in parking spaces. However, rental properties with fewer than five parking spaces and subject to rent control are exempt from the law.[15] This is a problem for disadvantaged communities, as many of the rental properties in the area meet these criteria. In 2015, California Building Codes were modified to mandate that electrical infrastructure at new buildings and parking lots have enough capacity to support charging stations.[16] The rules specify that one- and two-family dwellings have a service panel with the capacity to install a 40-amp circuit, enough to support a 32-amp charging station and conduit that can support the wiring for an 80-amp

[15] Assembly Bill No. 2565 Chapter 529: An act to add Sections 1947.6 and 1952.7 to the Civil Code, relating to tenancy. (2014). California Legislative Information. Retrieved from https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB2565. June 2018.
[16] AB-1239 Building Standards: electric vehicle charging infrastructure. (2017). California Legislative Information. Retrieved from https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB1239. June 2018.

circuit.[17] The 2015 building code will cover all new builds, though disadvantaged communities may not experience the benefits of this bill for many years down the road.

Trust

The night before the backpack giveaway, I walked around town. I observed the cars on the road, searched for chargers (I did see one in front of the Carl's Jr of all places), and noticed where people were hanging out at night. I walked by an apartment complex as a car was being broken in to. The owner of the vehicle was standing 100 feet away. I asked the girl if she wanted me to call the police. She said "No, why would you call them? They're not going to do anything." So, we both stood in her doorway and watched her get robbed. Distrust in San Bernardino is palpable.

There is a link between high-crime neighborhoods, fear, and distrust, particularly in low-income communities of color. The national crime rate is 3.86 violent crimes per 1,000 people.[18] The crime rate in San Bernardino and in the Valley is almost double the national rate, about 7 violent crimes per 1,000 people (Figure 4). In the maps below, we see higher violent crime rates in the counties in this study, compared to neighboring counties (highlighted in Figure 4). It is important to note that violent crime in the San Bernardino area is skewed on the map when analyzing crime by county. San Bernardino County, being the largest county in the United States,[19] includes a mix of cities and protected land that alter the statistics of the county. This

[17] Edelstein, S. "CA To Require New Buildings To Be Prepped For Electric-Car Charging Stations." (2014) *Green Car Reports.* Retrieved from https://www.greencarreports.com/news/1095076_ca-to-require-new-buildings-to-be-wired-for-electric-car-charging-stations. June 2018.

[18] "Table 4 Crime in the United States by Region, Geographic Division, and State, 2013-2014." (2014). FBI: UCR. Retrieved from https://ucr.fbi.gov/crime-in-the-u.s/2014/crime-in-the-u.s.-2014/tables/table-4. July 2018.

[19] QuickFacts: United States – San Bernardino. (2010). United States Census Bureau. Retrieved from https://www.census.gov/quickfacts/fact/table/US/PST120217?. August 2018.

study looks at the San Bernardino area in the map in Figure 5, which reflects very high crime rates (darkest red).

Figure 4: Crime rates in the San Joaquin Valley and San Bernardino County

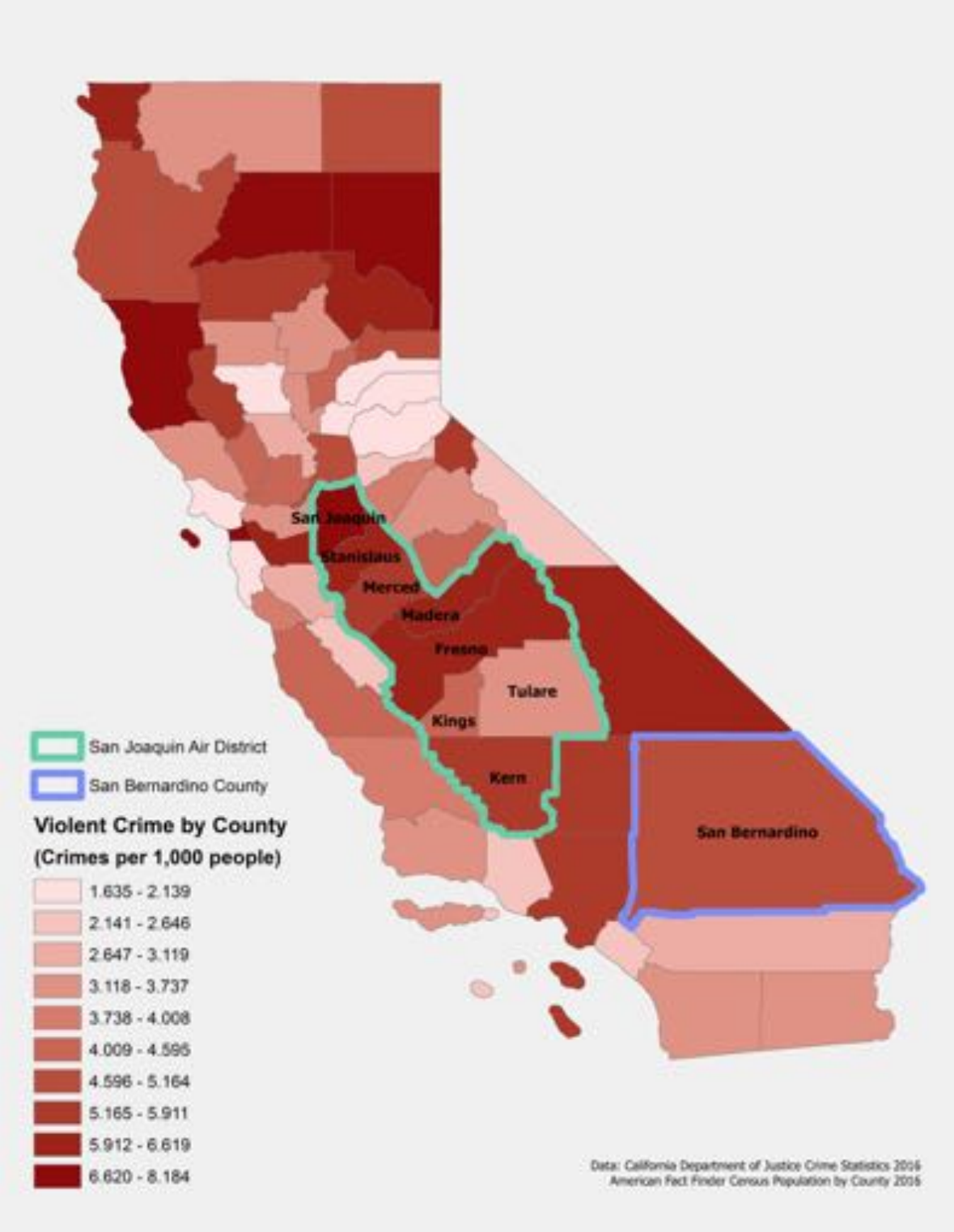
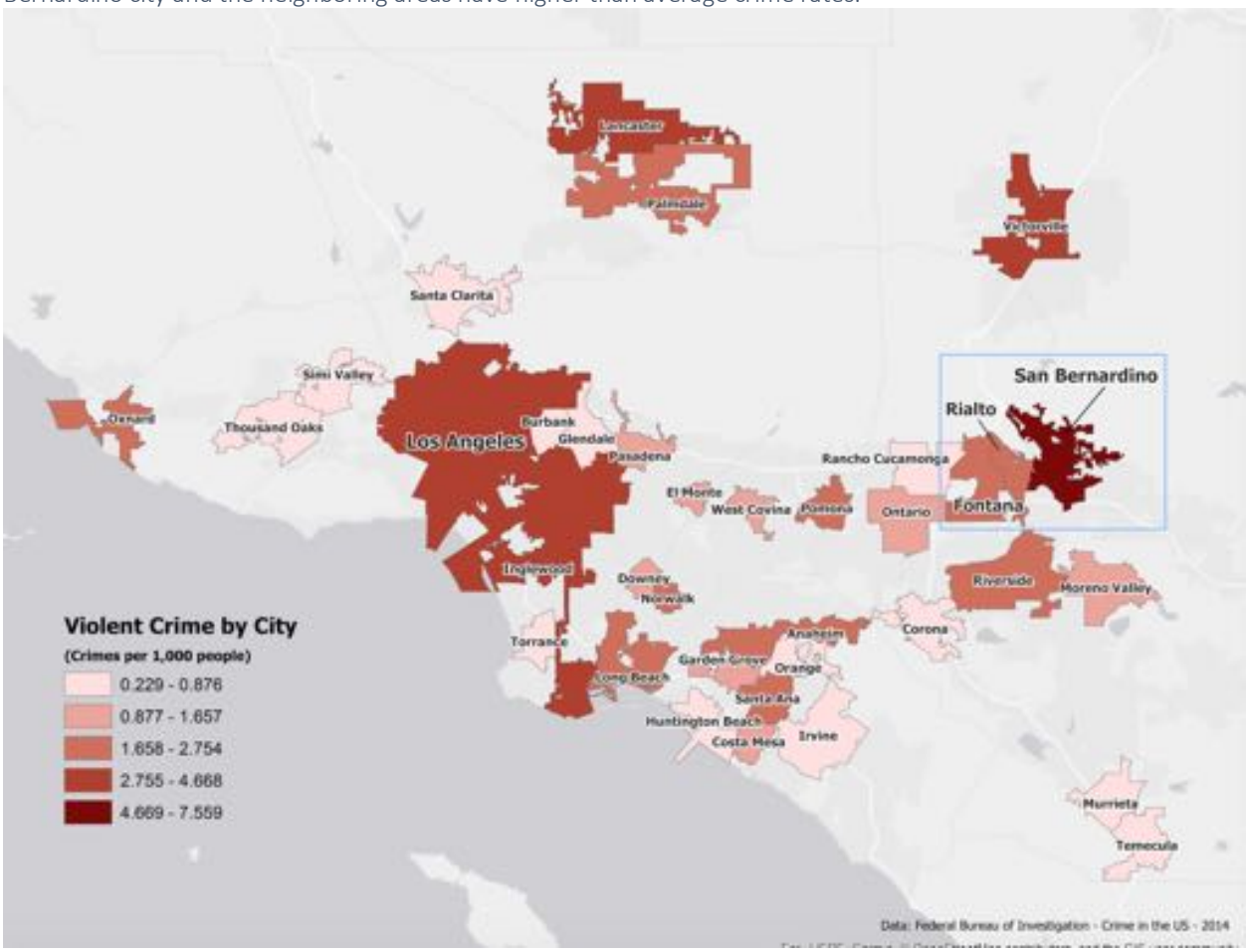


Figure 5: San Bernardino county is large and includes a lot of different cities that skew the crime rate numbers. San Bernardino city and the neighboring areas have higher than average crime rates.



High crime rates, as seen in Figure 4 are a major reason why there is such strong distrust in disadvantaged communities. These communities in this study have some of the highest crime rates in the state. The CARB barriers study reports that "fear of crime, injury, and personal safety are overarching accessibility concerns and deterrents to using active transportation and public transportation."[20] The fear of crime, injury, and personal safety are also significant concerns

[20] *Low-income barriers study, Part B: Overcoming barriers to clean transportation access for low-income residents, Final guidance document*. (2018). California Air Resources Board. Retrieved from https://www.arb.ca.gov/msprog/transoptions/sb350_final_guidance_document_022118.pdf. February 2018.

when it comes to the reluctance to purchase advanced technology vehicles. Lack of awareness and knowledge about the technology and new vehicles plays a role in this distrust.

FINDINGS

"I probably fill up my tank up half way each time. No more."

Commute Times and Vehicle Ownership

Many survey respondents in San Bernardino report traveling to downtown Los Angeles for work. Commute times near Los Angeles are more dependent on traffic than distance. The majority of respondents report traveling between 2 to 3 hours a day (see Figure 7). Survey respondents in the Valley report commuting between 40 to 80 minutes on average. As we can see in

Figure *6*, there were several outliers in the Valley, with a subset of respondents traveling 3 hours a day to get to work. These respondents were primarily agricultural workers. A Harvard study found that a person's commute time is the most significant factor in their chances of escaping poverty.[21] This means that people with longer commute times tend to have a higher chance of being in poverty. On average, Americans spend 52 minutes commuting a day. 52 minutes is significantly less than residents of San Bernardino, but relatively similar to Valley residents. 8.7 percent of Americans have a commute of over 60 minutes.[22]

[21] Chetty R. & Hendren N. (2015). The Impacts of Neighborhoods on Intergenerational Mobility. Harvard University. Retrieved from http://www.equality-of-opportunity.org/images/nbhds_exec_summary.pdf. January 2018.
[22] "Commuting Characteristics by Sex, 2016 American Community Survey 1-Year Estimates." (2016). United States Census Bureau, American Fact Finder. Retrieved from https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_1YR_S0801&prodType=table. August 2018.

Figure 6: San Joaquin Valley Commute Times

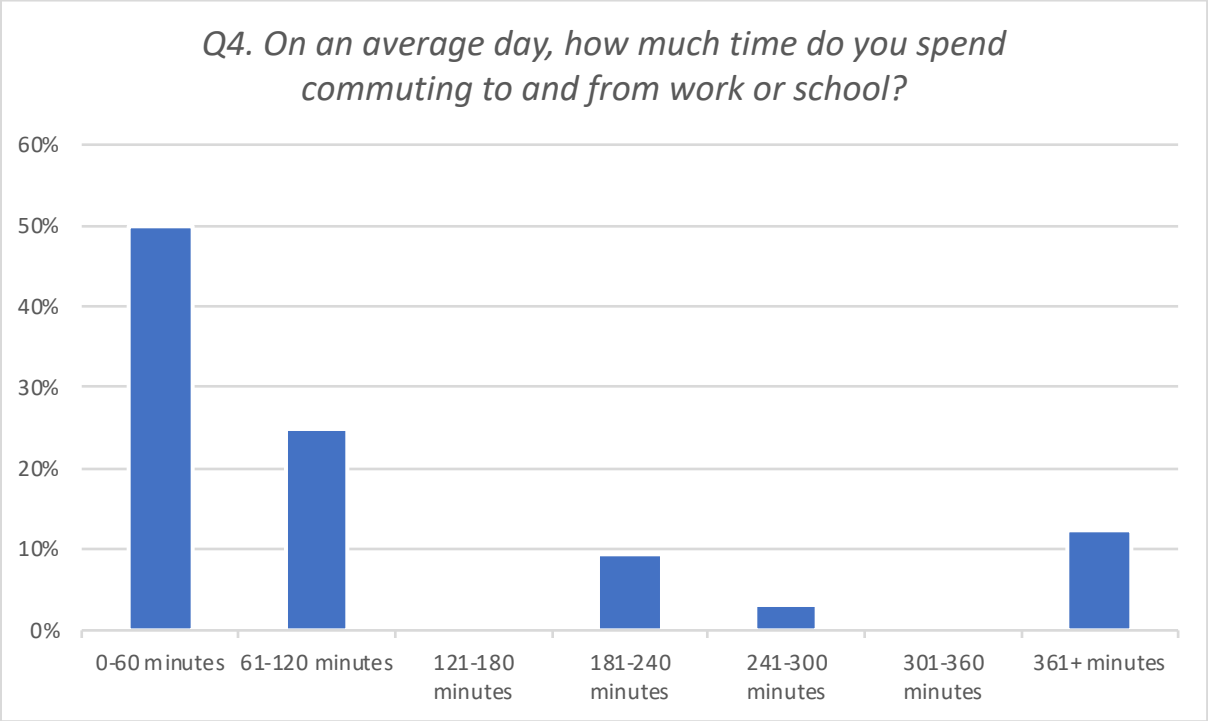
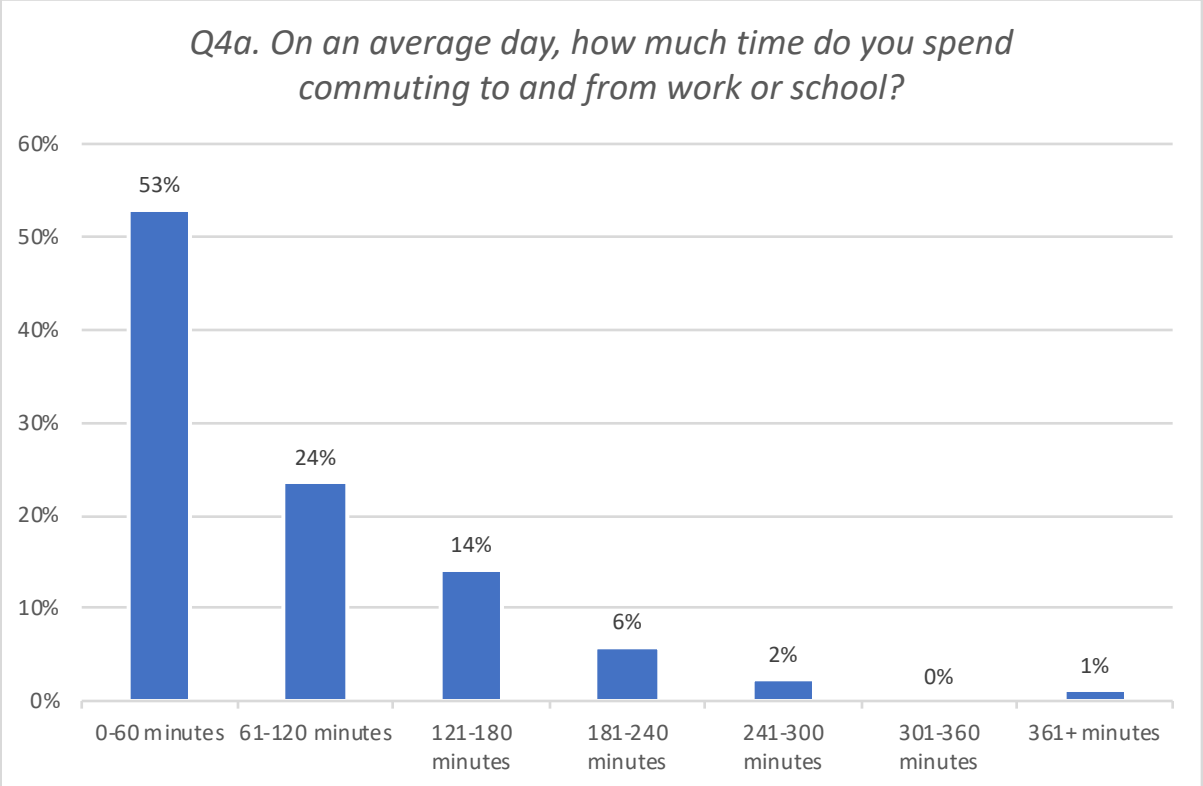


Figure 7: San Bernardino Commute Times



The CARB Barriers Study found that, compared to the population average, vehicle ownership rates were lower in low-income areas and households had a shorter travel radius.[23] This study's results differ, finding that among the communities surveyed, vehicle ownership rates are similar to the national average,[24] with roughly 90 percent of respondents in the community reporting having a vehicle. The survey also found that travel radius, at least for commuting, was equal to or greater than the national average for the people surveyed. However, according to a California Budget Project report, transportation costs account for about 8 to 12 percent of the average household in the state.[25] The Budget Project report shows a 14 percent cost burden for the San Joaquin and San Bernardino counties.[26] [27] Community members communicated that major obstacles often relate to costs of ownership, like smog repairs, maintenance, and fuel. In low-income neighborhoods, basic transportation costs account for a greater proportion of the household budget.

Mode Choice

A small percent of people in the communities surveyed report using TNCs, 13 percent in San Bernardino and 7 percent in the Valley. This is below the national average of 15 percent of

[23] *Low-income barriers study, Part B: Overcoming barriers to clean transportation access for low-income residents, Final guidance document.* (2018). California Air Resources Board. Retrieved from https://www.arb.ca.gov/msprog/transoptions/sb350_final_guidance_document_022118.pdf. February 2018.
[24] The national average vehicle ownership rate is 90 percent (from Household Size by Vehicles Available. (2016) United States Census Bureau. Retrieved from https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_5YR_B08201&prodType=table. July 2018.)
[25] Kimberlin, S., & Rose, A. (2017). Making Ends Meet: How much does it cost to support a family in California?. California Budget & Policy Center. Retrieved from https://calbudgetcenter.org/resources/making-ends-meet-much-cost-support-family-california/. July 2018.
[26] No city specific data available
[27] Kimberlin, 2017

Americans using TNCs.[28] Survey respondents cited lack of trust with the service and lack of availability as the main reasons why they prefer to use other modes to get around. One interviewee said that they would "absolutely not take a ZipCar (type of service)" because of the risk of "someone leaving drugs or guns in the middle console." Another commented that they would not get in a TNC for fear of being "driven by a gang member." There were also comments about how TNCs and carshare "don't operate (there). (They) don't see them in the community."

> *"I've been taken on 3 drug deals. They get in my car and they end up taking me the drop off point. I will never drive for Uber again. I will continue to drive for Lyft. If it ever happens on Lyft, I'll stop driving for Lyft too."*

One TNC driver, an African American and San Bernardino city resident, responded that that he no longer drives for one of the TNC companies because he has been taken on three drug deals with customers. However, he has not had any problems on a different app, so will continue to drive using that application unless more problems arise. He was driving a hybrid vehicle and told me that he had originally been driving a battery electric vehicle but needed to get towed 2 times because of running out of charge. He then started driving a plug-in hybrid and said that the only thing he wished was different about the vehicle was the range. He said that he wishes there was more range, but that he would "never, never go back to driving a gas car again."

> *"No, I will never take an Uber. I don't know who the driver may be and where they might take me."*

Feelings of safety and trust are really important when it comes to willingness to move away from traveling via a personal vehicle. It will be important to overcome the trust barrier in

[28] Smith, A. (2016) 2. On-demand: Ride-hailing apps. Pew Research Center. Retrieved from http://www.pewinternet.org/2016/05/19/on-demand-ride-hailing-apps/. July 2018.

order to make members of low-income, disadvantaged communities feel safe taking alternate transportation modes or adopting a new type of vehicle technology.

Figure 8: San Joaquin Valley Mode Use

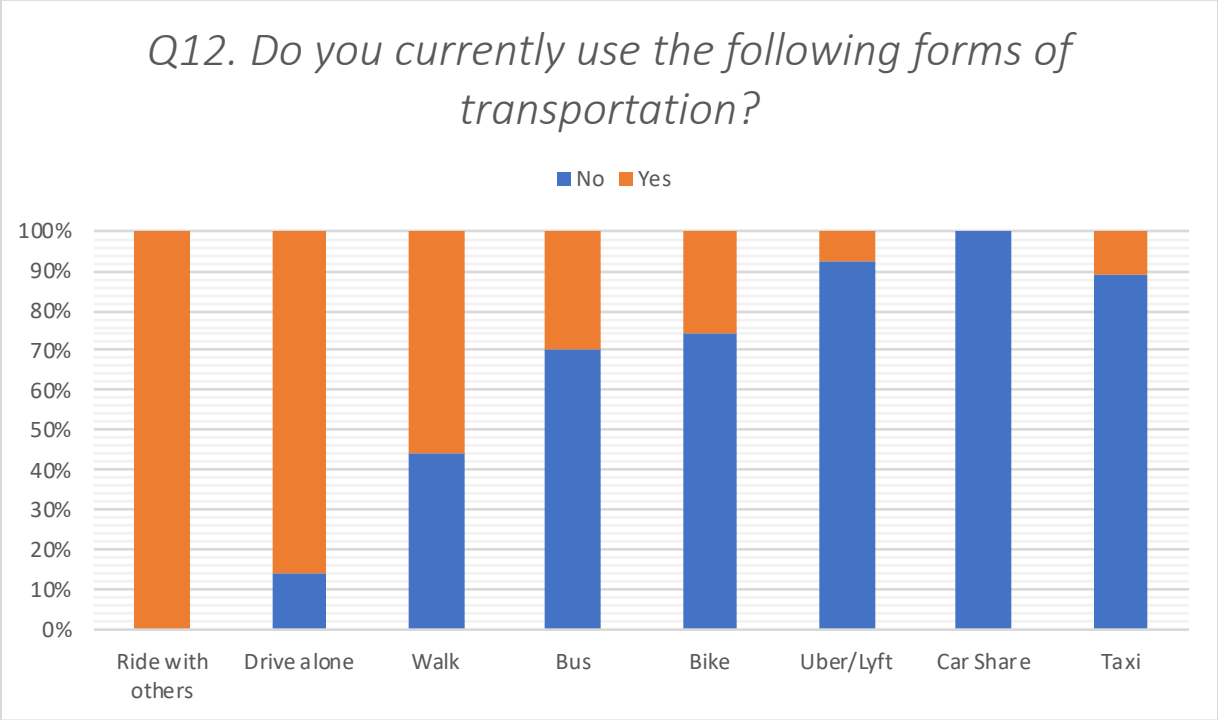
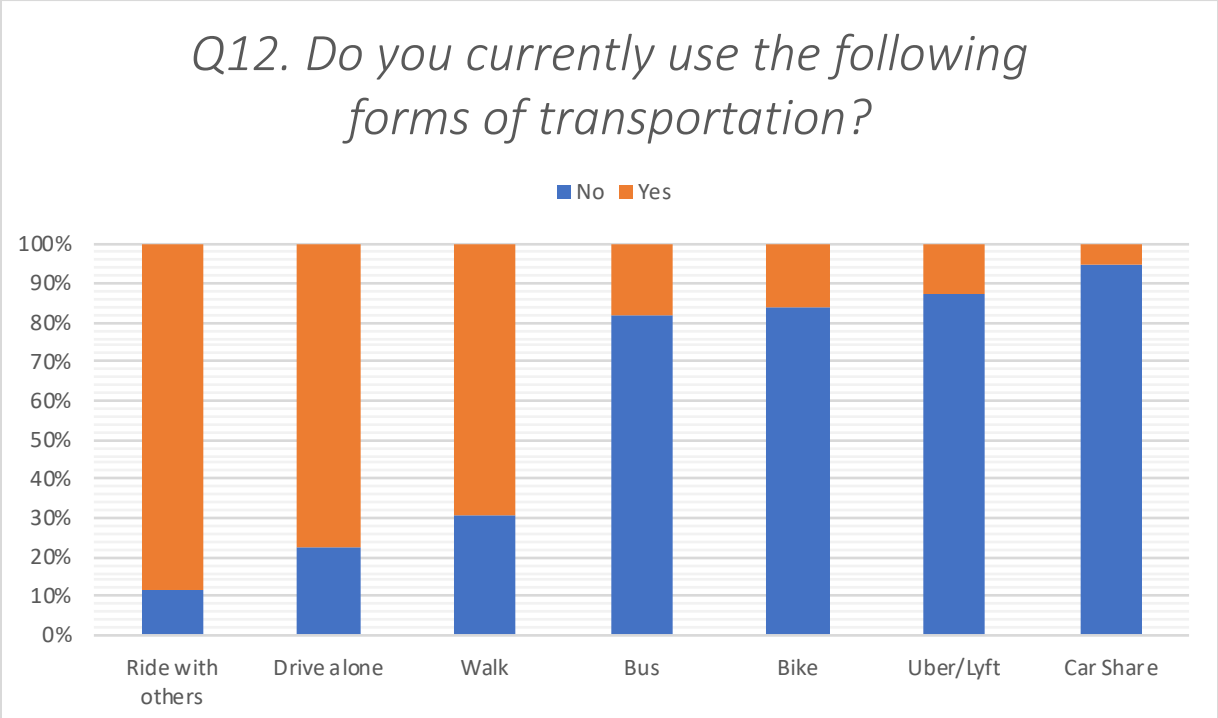


Figure 9: San Bernardino Mode Use



Trusted Sources of Information

From this event, I learned that the trusted sources for information dispersal are the CBOs we worked with (Youth Action Project and Youth Visionaries). The Founder of Youth Visionaries, Terrance Stone, grew up in San Bernardino and was a long-time gang member. When he got out of the gang, he started Youth Visionaries to help keep kids out of gangs. He told us that gangs provide the things that families traditionally provide – food, shelter, safety, love, and self-esteem. Joseph Williams, founder of Youth Action Project, told us that many kids in San Bernardino are missing at least one of those things, and as a result, many of them end up in gangs.[29] Terrance Stone is a trusted person in the community not only because he is from the community, but also because he knows the struggles in which many of the people in the community face. Many people in San Bernardino said that the Women's Center and the Community Center are trusted places to learn and share information. Also, that Facebook was a trusted place to get information, because things tend to be posted by friends or friends of friends. In San Bernardino, the Community Center would be a good place to install chargers as it is a place where people already spend lots of time and a place where they feel safe.

Many folks at the events in the Valley stated that they had learned about the event via a radio ad. It may be old school, but radio may be an effective way to reach low-income communities. Internet service may not be available to everyone, and survey respondents reported spending a lot of time in their cars. Churches and community centers were cited as good places for disseminating information in the communities. Facebook was cited as a trust place to get information in the Valley as well. In the Valley, people cited Walmart and the

[29] Williams, Joseph. 2017 August. Personal interview.

community park as places they already spend a lot of time and would be a good place to conduct outreach events, and also to place charging infrastructure.

RECOMMENDATIONS

Talking with People in the Community

To successfully deploy electric vehicles in a disadvantaged community, it is important to first talk with residents to understand the nuanced dynamics of the community. This includes talking with CBOs, government officials, local employers, schools, and other people that have worked in the community and know the community well. Ask community members and neighborhood advocates for their opinion on what the issues are and for the possible solutions. This really is the critical step in developing a sustainable plan that meets the specific needs of a community. Accessible and convenient locations to place chargers can only be found through the information gathering phase and survey of the community. These locations vary by community and can only be discovered by learning what locations are familiar to residents and where they already spend time.

From these discussions, you can design a possible solution that is appropriate for the community. The plan must acknowledge community opinions, helps narrow identified gaps, and also fits the funding allotted for the project. The solution should be as simple as possible, allowing room for adjustments. There should be thought that addresses how any implemented programs will continue when funding has been depleted. Once the plan is developed, it is important to get feedback from community members and advocates. This can identify issues in the plan, and promote stakeholder buy-in. It is essential for the community to be involved and

support the project as much as possible. Without community support, the project is likely to be ineffective.

Incentives and Subsidies

As we have learned from the ValleyCAN experience, local trust is essential to getting community buy in. Then, following the "one-stop shop" organization structure, clean vehicle adoption rates can increase. The CARB Barriers Study foreshadows plans to develop a web-based application that will be a "one-stop shop" for low-income customers that will provide information and assistance about the incentives and vehicles they qualify for. This makes the application process simpler and clearer.[30] Before the release of this web tool, community-based events that offer in-person assistance of the same nature will continue to be helpful. Events will provide an opportunity for residents to get assistance in understanding what incentives they qualify for and help with processing paperwork.

One of the options in the Scrap and Replace program is to get transit dollars. It would be worth trying to amplify the appeal of the transit dollar option, by offering additional funds that can be used for ride-sharing applications. Many low-income residents lack credit cards and bank accounts, so they are currently unable to try alternative transportation options. A program where incentives and subsidies are disseminated through a transit card that works like a credit card at some retailers is a way to disseminate rebate dollars so that low-income residents can access services that require a credit card. The Ventra card in Chicago is a well-known successful

[30] *Low-income barriers study, Part B: Overcoming barriers to clean transportation access for low-income residents, Final guidance document*. (2018). California Air Resources Board. Retrieved from https://www.arb.ca.gov/msprog/transoptions/sb350_final_guidance_document_022118.pdf. February 2018.

example of this type of system.[31] Rebate dollars can be loaded onto a Ventra-type card and used like a credit card for ride-hailing applications and other alternative transportation options. This type of program can provide access to app-based transportation platforms for low-income residents.

Another hurdle that the current incentive system faces is that many people in disadvantaged communities are not buying vehicles at dealerships, and many are not buying new vehicles. There is a distrust around dealerships and bank lenders, and many people in the community feel like dealers will inflate prices on advanced vehicles.[32] From our survey, we learned that people buy their vehicles from CarMax, Craigslist, or their friends. It will be difficult to shift behavior away from cash economy type purchases (such as buying through Craigslist or friends) and establishing a trusted relationship with a transactional-type of experience will be slow. But as more used electric and hybrid vehicles show up on the market, SCE can place resources into making point of sale rebates work at CarMax. This may build some trust in the transactional experience of purchasing from a dealer-type establishment. Shifting behavior to the purchase of new car will be challenging, but feasible once the trust is established.

Outreach

> *"No. I've never heard of any rebates. They obviously haven't been trying to come talk to us so that we know about those things."*

Zero people that we talked with had heard about the incentives available to them for clean transportation options. Paired with some of the distrust around new technologies, there

[31] Ventra Chicago. Retrieved from https://www.ventrachicago.com/howitworks/. March 2018.
[32] *Low-income barriers study, Part B: Overcoming barriers to clean transportation access for low-income residents, Final guidance document*. (2018). California Air Resources Board. Retrieved from https://www.arb.ca.gov/msprog/transoptions/sb350_final_guidance_document_022118.pdf. February 2018.

are many barriers for the community members we talked with in purchasing a clean vehicle. When people do not have a baseline awareness of EVs, they have a huge misconception in terms of the capabilities and requirements of an EV. Growing education and outreach around EVs will be necessary for people to start to entertain the idea of owning an EV.

"If people knew how much these cars save them, they'd never ever go back to a gas car."

It is important that outreach in low-income communities emphasizes the value of alternative transportation options. Targeted messages should be stress matters that are important to the community, and in the dominant language of the community. Messages emphasizing saving money and increased reliability will be more effective than messages about environmentalism and reducing fossil fuel consumption. "Residents want to ensure information is disseminated in a relatable format they can understand. [Additionally,] residents would benefit from repeated outreach and visits to ensure a more consistent presence in the community, to build trust, and ensure community-based organizations have the tools and resources they need to pass along information to their residents."[33] Reinforced outreach that builds understanding over time is important for success.

Spreading awareness and education is a cumulative effort. Reg Javier, Deputy Executive Office of Workforce and Economic Development at the San Bernardino County Economic Development likened this thought to teaching soft skills in a 2-hour training. It doesn't work. Education around EVs will take time. In a distressed community, a vehicle purchase is typically a decision made out of need (i.e. a car breaks down). Therefore, vehicle purchases are made

[33] *Low-income barriers study, Part B: Overcoming barriers to clean transportation access for low-income residents, Final guidance document*. (2018). California Air Resources Board. Retrieved from https://www.arb.ca.gov/msprog/transoptions/sb350_final_guidance_document_022118.pdf. February 2018.

quickly. For a family living in a town like San Bernardino or Porterville, it is important to build the base of knowledge around EVs. Then, when the time comes to buy a vehicle, the knowledge is already present, so electric vehicles can be considered in the purchasing options.

Building Foundational Knowledge

Awareness of these issues is an underpinning of understanding. School districts are changing their models around applied and contextualized learning. Adding clean transportation to the education curriculum for kids is something that is starting to be introduced. This is a way to build a foundational understanding of core pieces of electric vehicles, charging, and the other aspects of operating an electric vehicle.[34] [35] Community colleges and vocational schools can provide apprenticeship type programs to increase opportunities to learn about vehicle and infrastructure production and maintenance. They can also help provide educational opportunities and on the job training for young people, as well as job opportunities in a new, secure, and stable field.[36]

Increasing Visibility

Finally, one of the main drivers of electric vehicle purchases is peer example. Peer example of EV purchases is probably non-existent in many low-income communities. Survey respondents mentioned that they do not see electric vehicles or chargers in their community. It will be important to increase visibility of the vehicles and infrastructure, not only so that people start to become aware of them, but more importantly so that people can envision themselves in

[34] Brown, Gracie. 2018 April. Phone interview.
[35] The State of Florida is looking into ways to introduce clean transportation curriculum and use EVs in driver's education programs offered at public schools
[36] Williams, Joseph. 2017 August. Personal interview.

a clean vehicle. The CARB Barriers Study found that clean vehicles are considered less convenient than gas or diesel vehicles because of low range, lack of charging infrastructure, and limitations in carrying multiple passengers and heavy equipment.[37] To increase some of the visibility, government fleets could include more electric or hybrid vehicles, so that people in the community can see the vehicles around town. The chargers that the government fleets use should be made available for public use, increasing the feeling of comfort around refueling for community members. Carrying heavy work equipment will be challenging before a viable electric truck option comes on the market but transitioning the passenger vehicle fleet can occur in the short term.

Government entities would be a good hub for carshare or TNC type vehicles as well. Money could be spent to purchase vehicles that are parked and charged at a government office. Drivers and passengers would be vetted through some sort of system set up by the government office and an entity the community trusts (i.e. churches or community centers). This is one way to start to build some feeling of comfort around carshare and rideshare. Additionally, if more shared vehicles are electrics or hybrids, people would start to build a sense of comfort and familiarity with advanced technology vehicles.

Government fleets are also great hosts for ride and drives in the community, as they can be sustained in the community itself and conducted on a regular basis. It would also be a good opportunity for community members to educate other residents about the vehicles, further reinforcing choice confirmation. Schools that have clean transportation curriculum can host

[37] *Low-income barriers study, Part B: Overcoming barriers to clean transportation access for low-income residents, Final guidance document*. (2018). California Air Resources Board. Retrieved from https://www.arb.ca.gov/msprog/transoptions/sb350_final_guidance_document_022118.pdf. February 2018.

tents at the ride and drive to disseminate information to residents. It is important to build an event that has all the relevant information and forms available, so people are not missed in the follow up stages.

It is key to place chargers in areas that are in disadvantaged communities themselves, and not just around the highway corridors. While chargers next to highways may be within the community borders, they will not promote awareness or be used by residents as much as chargers at locations of local significance.

Internet Access

Many community members mentioned that Facebook was a place that they trust to get information. Facebook replicates in-person choice confirmation ("look, my neighbor says this restaurant is good"; "my neighbor says this car will save me money"). In our discussions, we learned that access to smartphones is not a problem. At the events that we attended, smart phones appeared to be abundant. So, acquiring a smartphone is not the issue, the issue around getting internet service is the major barrier.

There are currently 23 free Wi-fi hotspots in San Bernardino city.[38] Most of these places are private businesses. Only the San Bernardino Public Library is a place where a purchase does not feel compulsory. In Porterville, there are 2 "free" Wi-fi spots – both are hotels.[39] There are

[38] "Free Wifi Hotspots in San Bernardino, CA." (2018). OpenWiFiSpots. Retrieved from http://www.openwifispots.com/Finder.aspx?City=San%20Bernardino&State=CA&Neighborhood=Rana#34.090261,-117.31383,13. August 2018.

[39] "Free Wifi Hotspots in Porterville, CA." (2018). OpenWiFiSpots. Retrieved from http://www.openwifispots.com/city_free_wifi_wireless_hotspot-Porterville_CA.aspx#36.0421648,-119.01756210000002,14. August 2018.

no free Wi-fi hotspots in Madera.[40] The only free Wi-fi in the San Joaquin Valley that I was able to find is at the public libraries.

One way to increase the accessibility and dissemination of information is to fund free internet service in low-income communities. In San Francisco, 3.1 miles of Market Street, the city's main thoroughfare, gained free Wi-fi in 2013. The city ended up paying $500,000 after donations of hardware and some internet access.[41] In 2014, Google donated $608,000 to the city to provide free Wi-fi in 32 of the city's parks and public spaces.[42] The San Francisco Department of Technology paid the remainder of the bill.[43] It will certainly be very costly to put city or region-wide internet in San Bernardino and the Valley, but the scale of investment could be much smaller and still have significant impact. By adding open and free internet service at places like the schools, community center, and churches in each town, the ability for people to receive and send information will be less of a barrier.

CONCLUSION

This report identifies barriers to EV deployment and offers some potential solutions. Trust plays a major role in why disadvantaged communities have been hesitant to adopt clean transportation options. Engaging with the community and with neighborhood advocates that

[40] "Free Wifi Hotspots in Madera, CA." (2018). OpenWiFiSpots. Retrieved from http://www.openwifispots.com/city_free_wifi_wireless_hotspot-Madera_CA.aspx#36.8585785,-119.99770330000001,14. August 2018.
[41] Cote, J. (2013). "S.F. rolls out 3 miles of free Wi-Fi along Market Street." *San Francisco Chronicle.* Retrieved from https://www.sfgate.com/bayarea/article/S-F-rolls-out-3-miles-of-free-Wi-Fi-along-Market-5067616.php. August 2018.
[42] Steinmetz, K. (2014). "Google gives San Francisco free Wi-Fi in public places." *TIME*. Retrieved from http://time.com/3453871/google-gives-san-francisco-free-wi-fi-in-public-places/. August 2018.
[43] "#SFWIFI FAQ's." (2014). City of San Francisco. Retrieved from https://sfgov.org/sfc/sites/default/files/San%20Francisco%20WiFi/sf-wifi-faq-1oct14.pdf. August 2018.

have local knowledge is the key to understanding the challenges and mobility needs of the community. The people in the community will identify locations of local significance, and the entities they trust to get information.

This study offers recommendations for ways to address some of the barriers identified by the community and the survey. The recommendations are specific to San Bernardino and the Valley, but adaptable to low-income communities in other geographic areas. A future survey needs to be done to test the potential for EV deployment and adoption of alternate modes of transportation in urban areas. While more research is needed, SCE and I will work to pursue opportunities to put some of the recommendations from this paper and others in place.

APPENDIX

Survey Questions

(Survey conducted in San Joaquin Valley replaced “San Bernardino” with “San Joaquin Valley”)

We are conducting a survey to learn about how you get around San Bernardino. We want to know what your transportation needs are and how clean transportation options, like electric vehicles can fit into your life. The survey takes about 5 minutes to complete, and your responses will be used as valuable input to make sure clean transportation programs coming to San Bernardino County work for all San Bernardino County residents.

1. How often do you have access to a car when you need one?

- ○ All of the time
- ○ Most of the time
- ○ Some of the time
- ○ Every once in a while
- ○ Rarely
- ○ Never

---

2. Do you have a car? If yes, tell us about it. If no, do you want one?

---

3. Do you have a license?

---

4. On an average day, how much time do you spend commuting to and from work or school? (minutes)

---

5. What kind of home do you live in?

- ○ Own
- ○ Rent a house
- ○ Rent an apartment
- ○ Own an apartment
- ○ Other _____

6. How much money do you think you spend on getting yourself around in a day?

7. How do you get around now and where do you go?

8. How far do you think an electric car can go in a single charge?

9. How much do you think it costs to charge an electric car? Is it cheaper or more expensive than a gasoline car?

10. How often do you use the following modes of transportation? Please indicate how frequently you CURRENTLY use the following modes:

	Never	Less than once a month	Once a month	Every other week	1 to 3 days per week	4 to 6 days per week	Once a day	More than once a day
Drive alone	○	○	○	○	○	○	○	○
Ride with others (with co-workers, family, friends, etc.)	○	○	○	○	○	○	○	○
Bus	○	○	○	○	○	○	○	○
Bike	○	○	○	○	○	○	○	○
Walk	○	○	○	○	○	○	○	○
Uber/Lyft	○	○	○	○	○	○	○	○
Taxi	○	○	○	○	○	○	○	○
Car share (ex: Zipcar)	○	○	○	○	○	○	○	○

11. For what trip purposes do you use the following modes of transportation? Please indicate which modes you CURRENTLY use for each of the trip purposes below (check all that apply):

	Drive	Ride with others or Carpool	Bus	Bike	Walk	Uber/Lyft	Taxi	Carshare	Do not do
Commute to/from work/school	○	○	○	○	○	○	○	○	○
Groceries/errands	○	○	○	○	○	○	○	○	○
Pickup/dropoff children	○	○	○	○	○	○	○	○	○
Social/recreational	○	○	○	○	○	○	○	○	○
Job interviews	○	○	○	○	○	○	○	○	○
Medical appointments	○	○	○	○	○	○	○	○	○

Information about you. Personal demographic information helps us to understand how to make transportation options better for the community. Though, this section is completely optional.

12. What is your age? (years)

13. I identify my gender as:

14. What is the average annual income of your household?

- ○ Less than $10,000
- ○ $10,000 - $19,999
- ○ $20,000 - $29,999
- ○ $30,000 - $39,999
- ○ $40,000 - $49,999
- ○ $50,000 - $59,999
- ○ $60,000 - $69,999
- ○ $70,000 - $79,999
- ○ $80,000 - $89,999
- ○ $90,000 - $99,999
- ○ $100,000 - $149,999
- ○ More than $150,000

---

15. What is your zipcode?

---

16. How would you describe your race/ethnicity? (check all that apply):

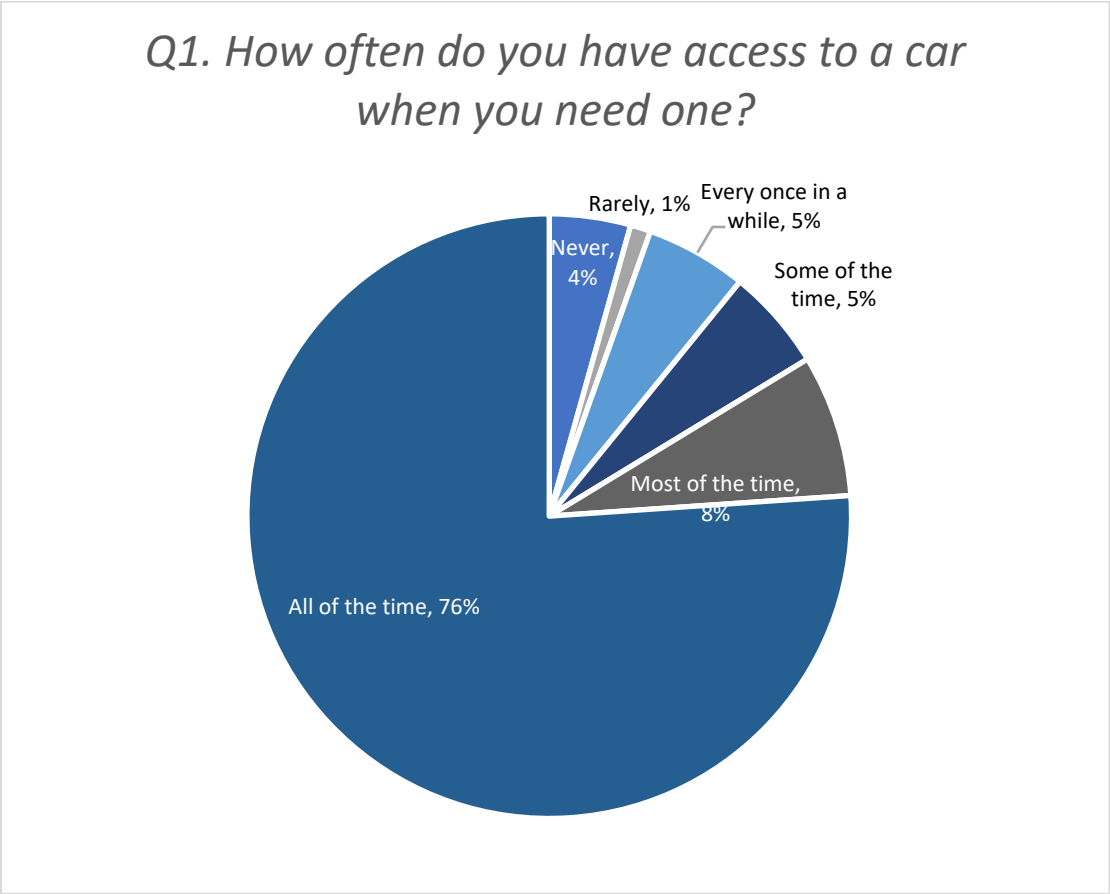
- ○ Black or African American
- ○ Hispanic or Latino
- ○ Asian
- ○ American Indian or Alaskan Native
- ○ Caucasian/White
- ○ Middle Eastern
- ○ Native Hawaiian or Pacific Islander
- ○ South Asian (i.e. Indian, Pakistani, etc.)
- ○ Other _____

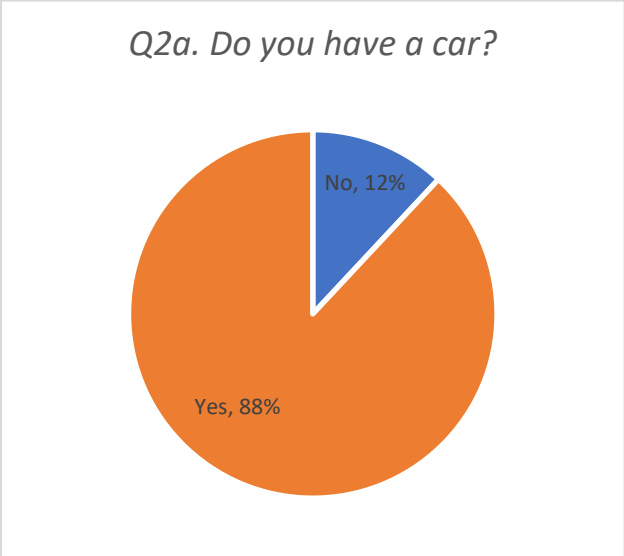
Thank you!

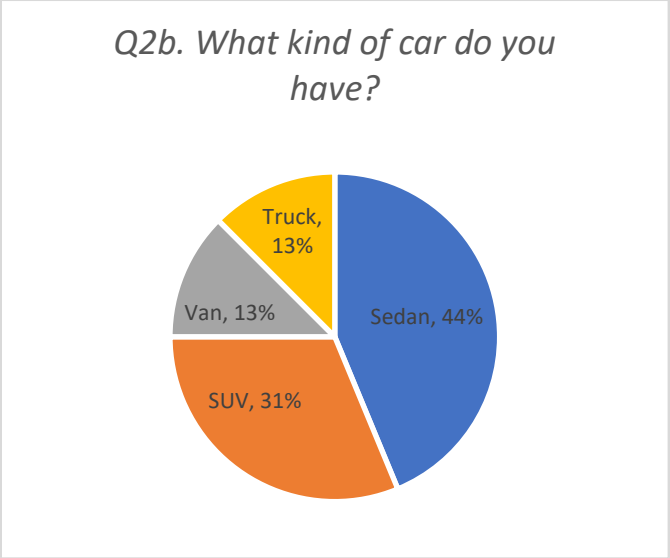
Survey Results

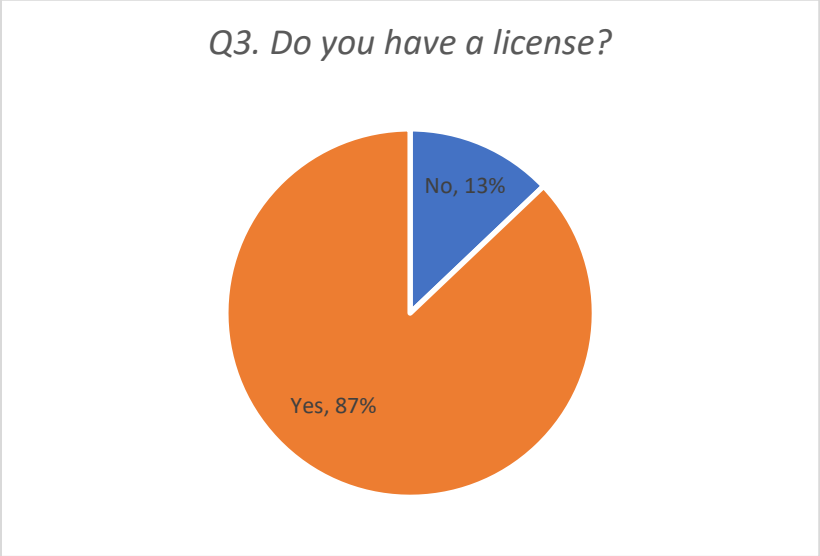
(made by Maia Moran)

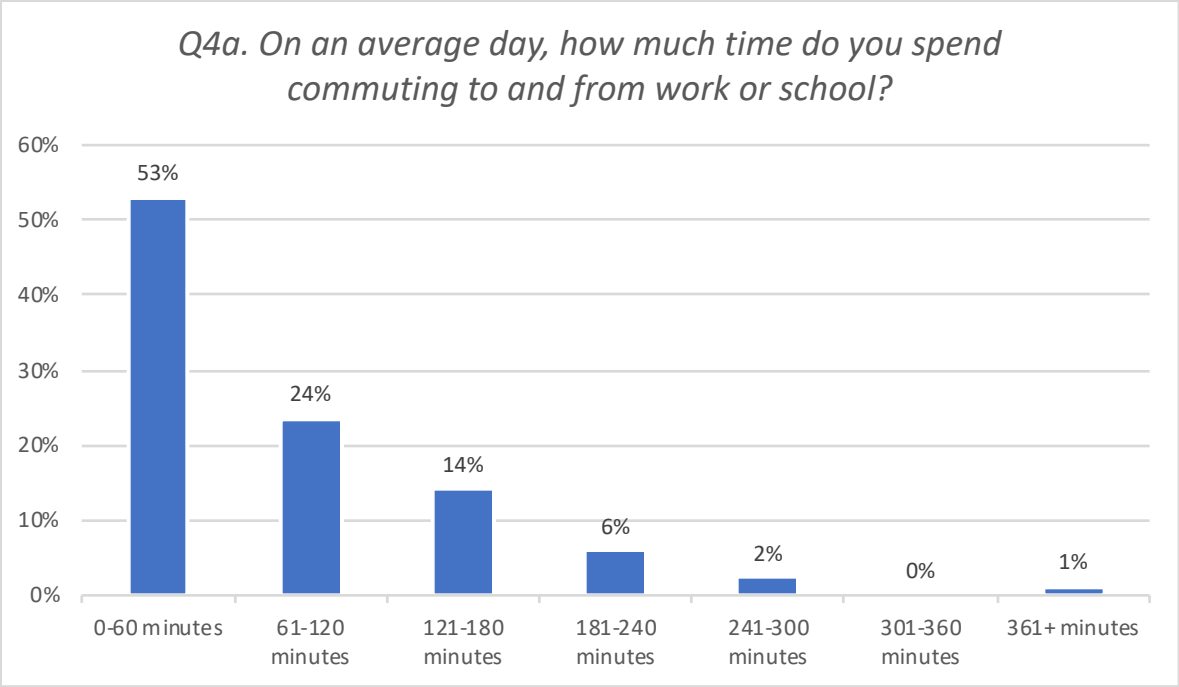
San Bernardino

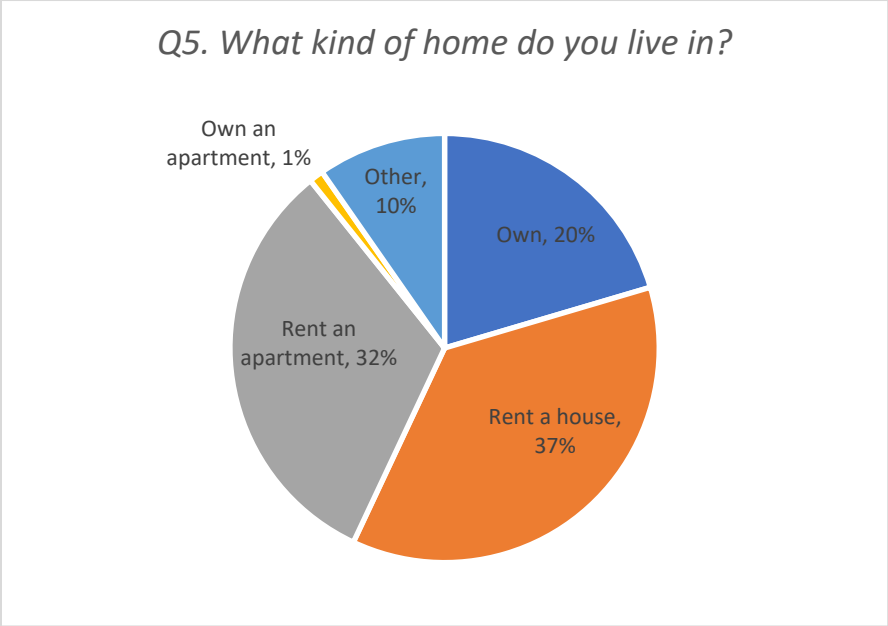


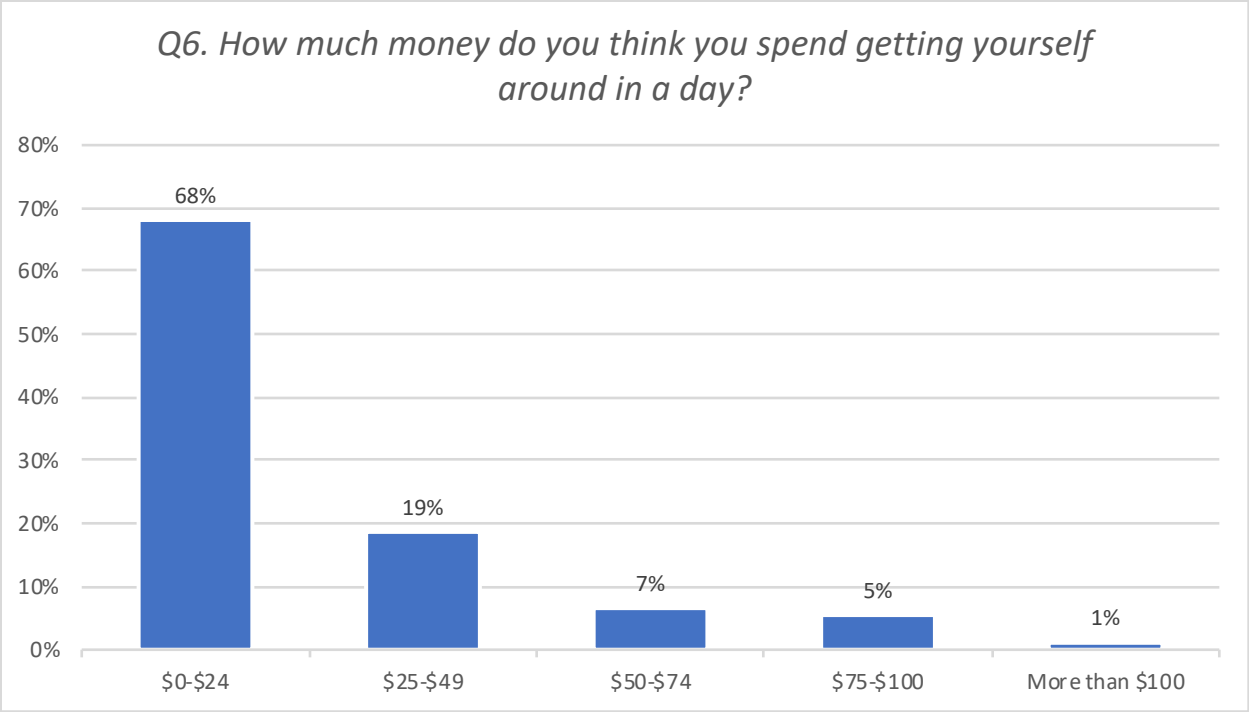


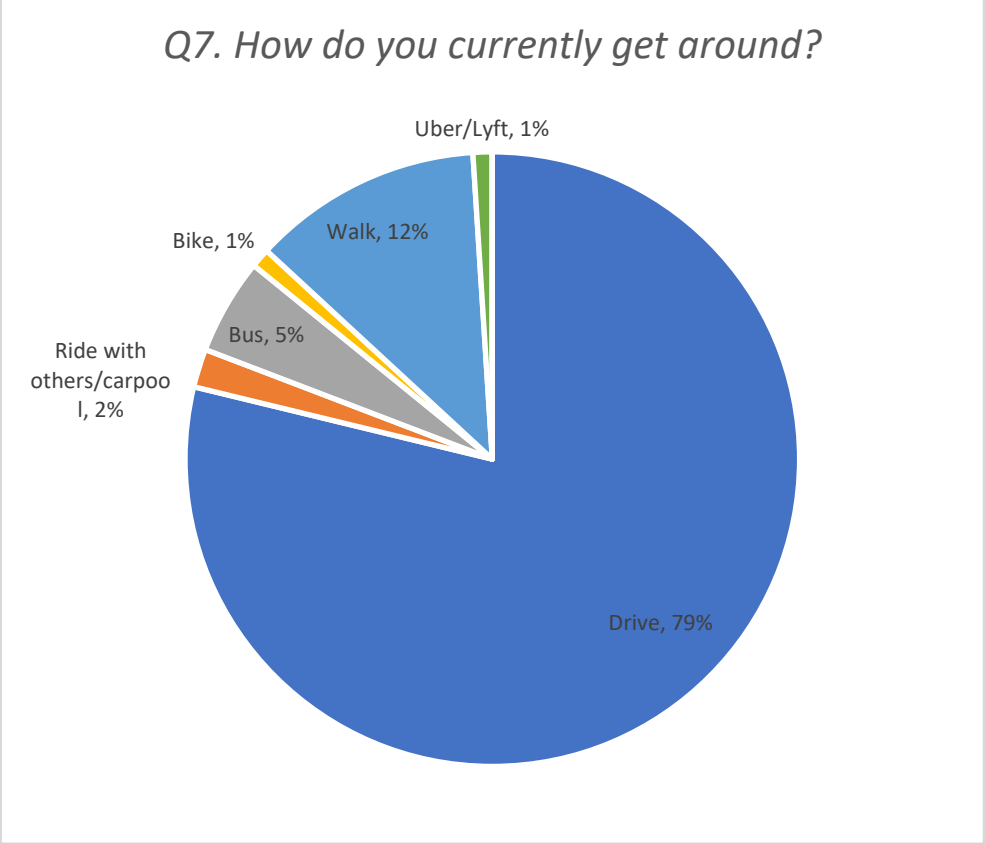

Q2b. What kind of car do you have?
Truck, 13%
Van, 13%
Sedan, 44%
SUV, 31%

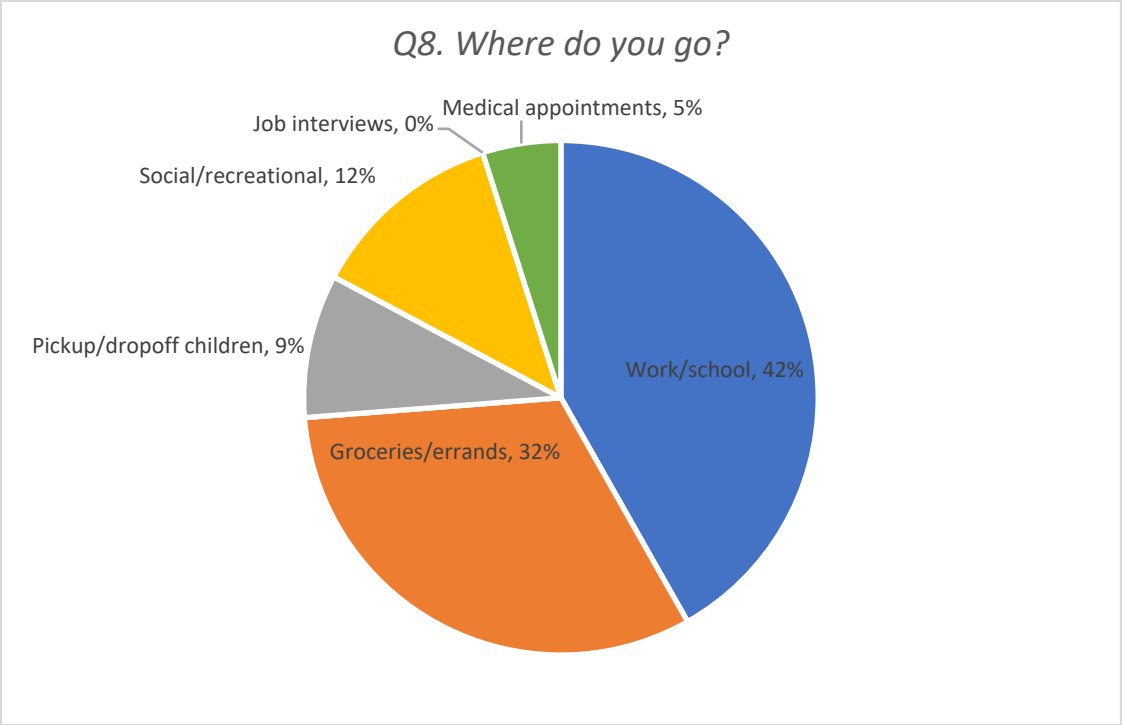

Q3. Do you have a license?
No, 13%
Yes, 87%

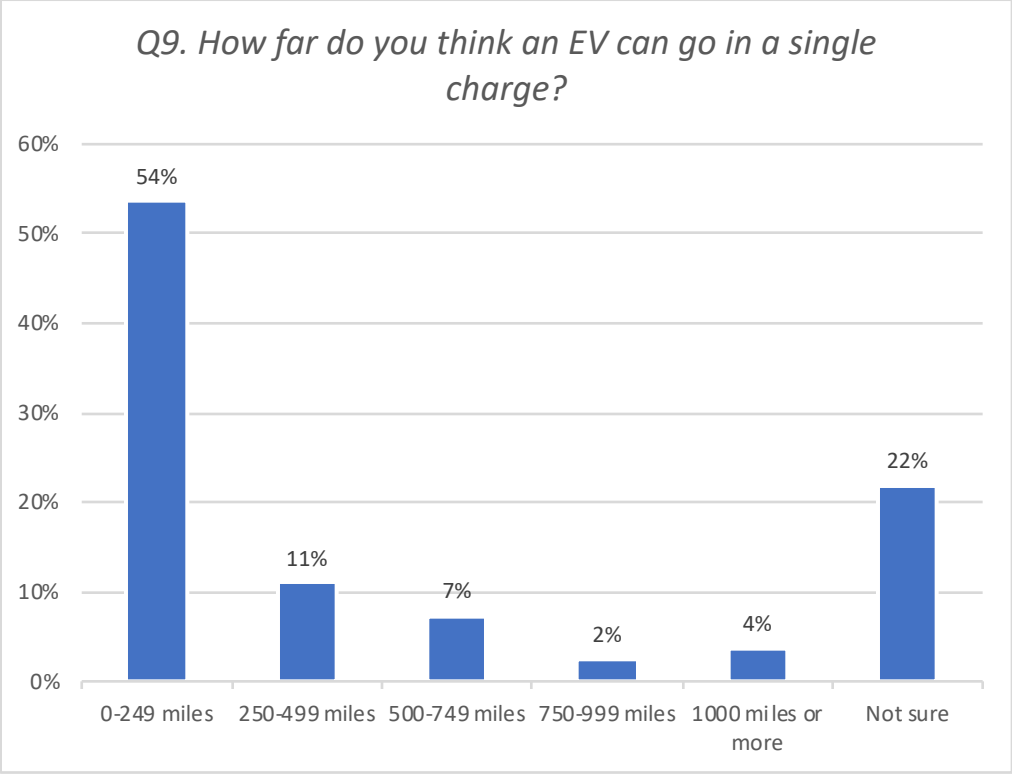

Q4a. On an average day, how much time do you spend commuting to and from work or school?
60%
50%
40%
30%
20%
10%
0%
53%
24%
14%
6%
2%
0%
1%
0-60 minutes
61-120 minutes
121-180 minutes
181-240 minutes
241-300 minutes
301-360 minutes
361+ minutes


Q5. What kind of home do you live in?
Own an apartment, 1%
Other, 10%
Own, 20%
Rent an apartment, 32%
Rent a house, 37%

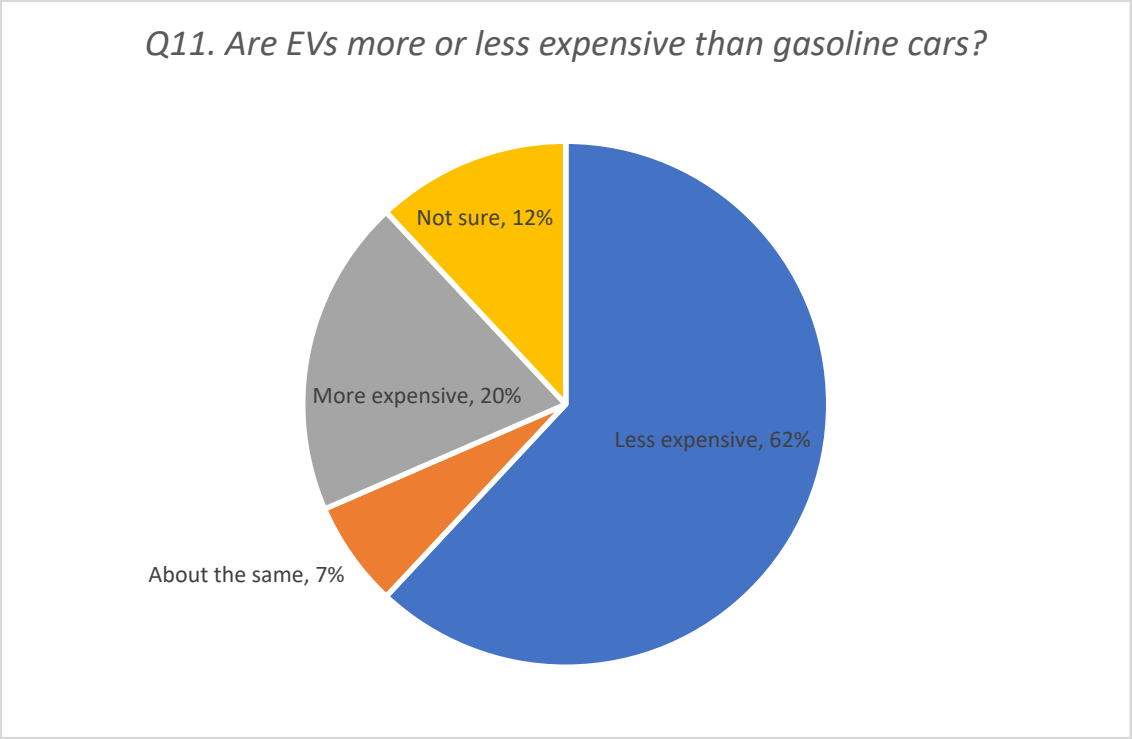

Q6. How much money do you think you spend getting yourself around in a day?
80%
70%
60%
50%
40%
30%
20%
10%
0%
68%
19%
7%
5%
1%
$0-$24
$25-$49
$50-$74
$75-$100
More than $100

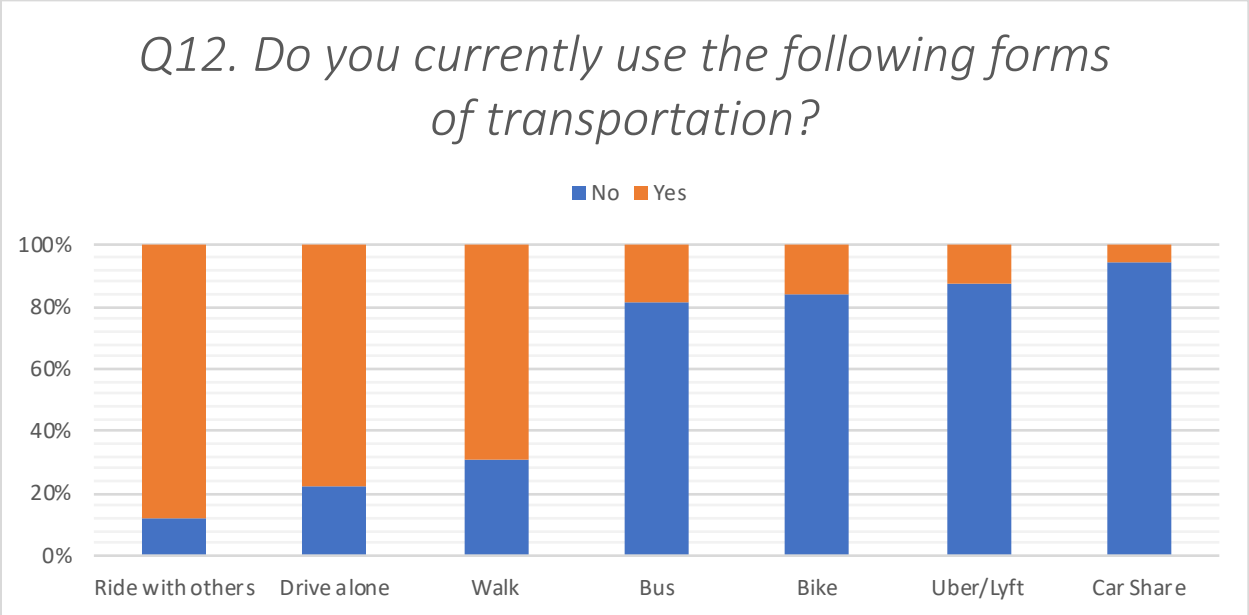

Q7. How do you currently get around?
Uber/Lyft, 1%
Walk, 12%
Bike, 1%
Bus, 5%
Ride with others/carpool, 2%
Drive, 79%

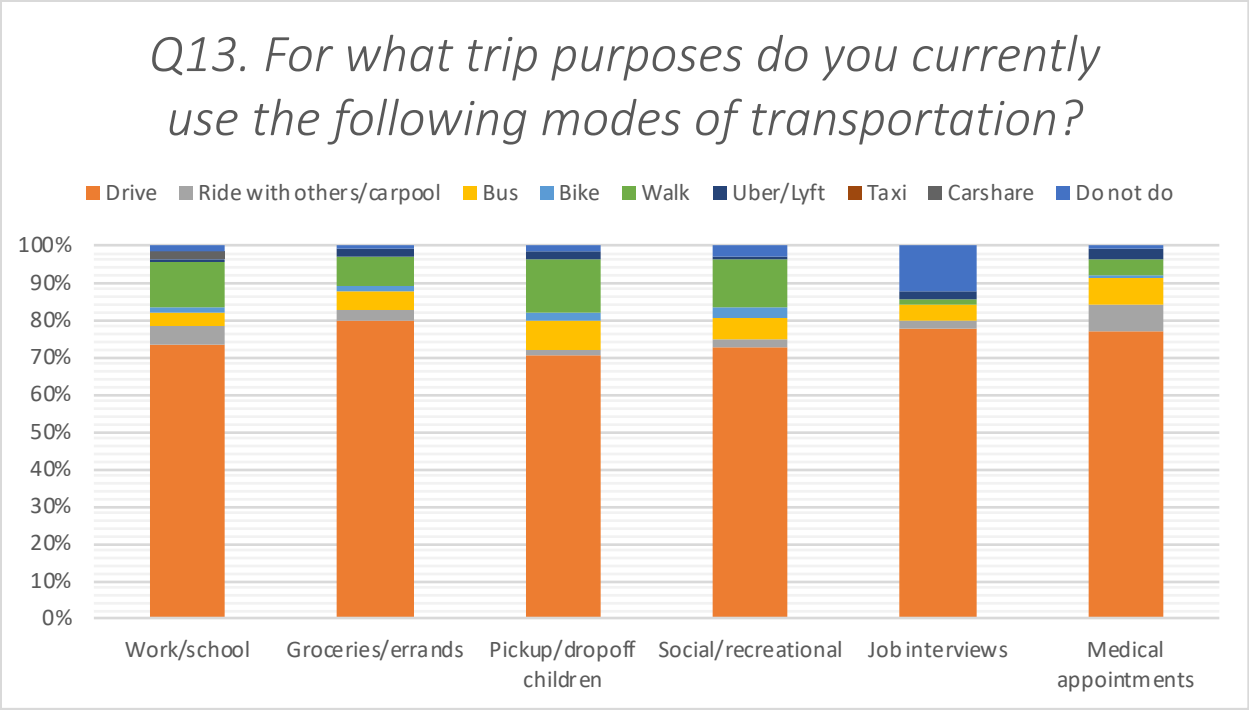


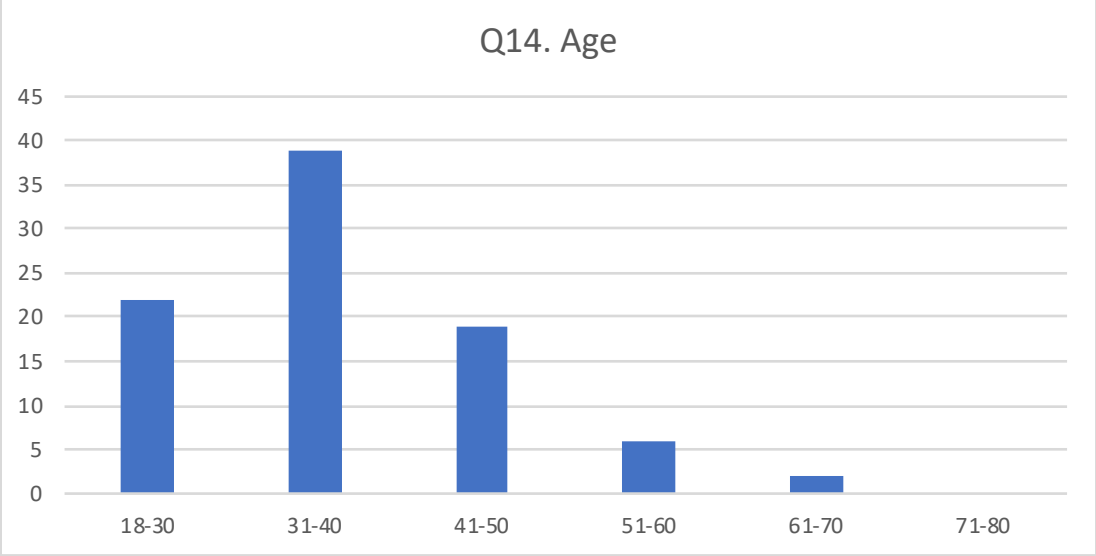


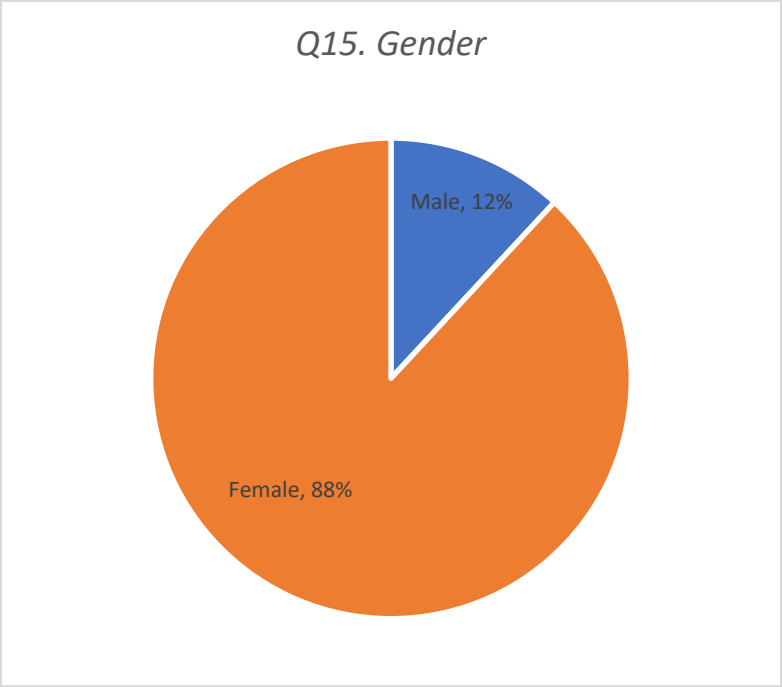
*Did not make a visual for Q10; similar question to Q9

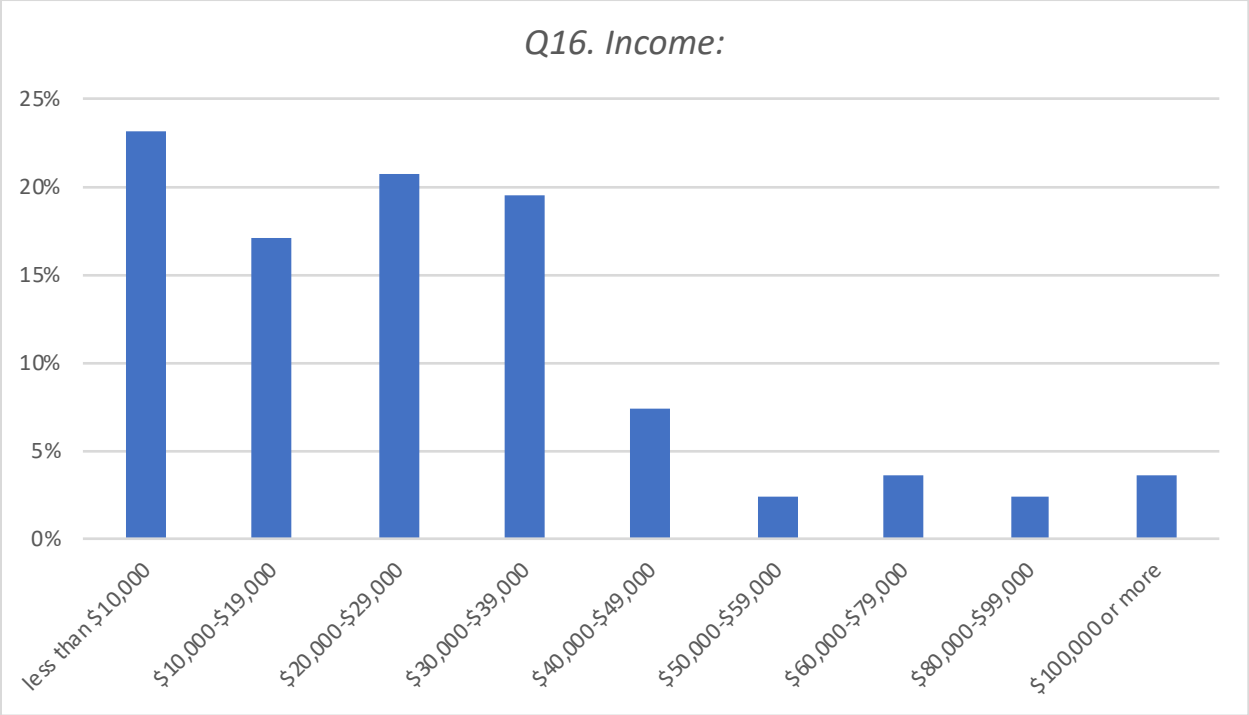

Q11. Are EVs more or less expensive than gasoline cars?
Not sure, 12%
More expensive, 20%
Less expensive, 62%
About the same, 7%


Q12. Do you currently use the following forms of transportation?
No
Yes
100%
80%
60%
40%
20%
0%
Ride with others
Drive alone
Walk
Bus
Bike
Uber/Lyft
Car Share

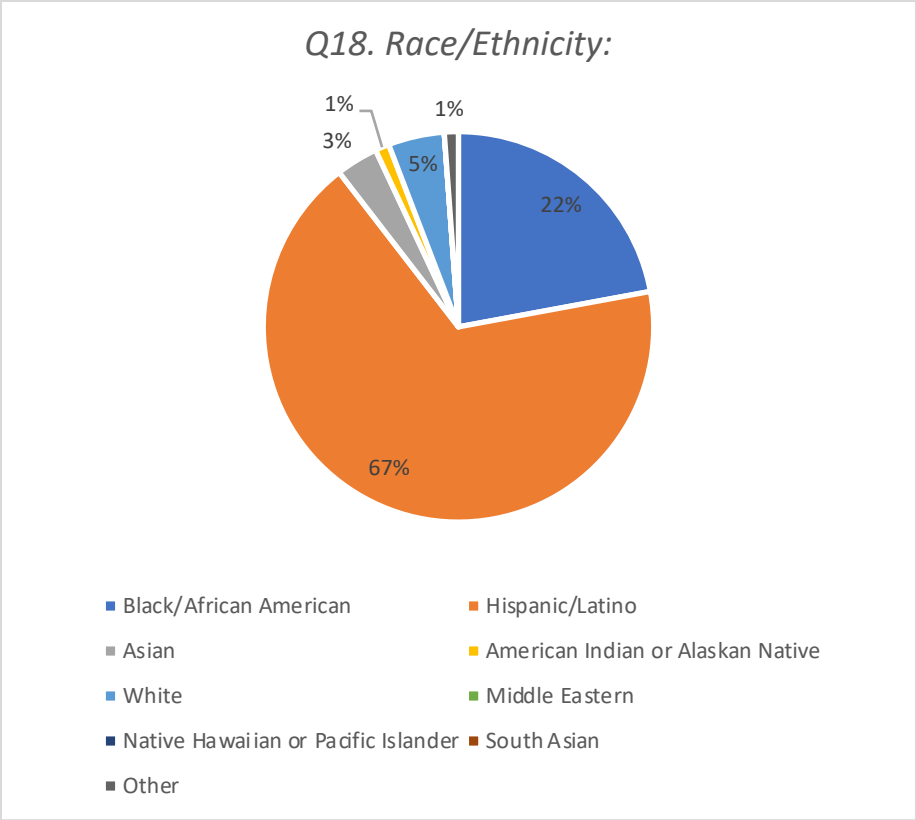

Q13. For what trip purposes do you currently use the following modes of transportation?
Drive
Ride with others/carpool
Bus
Bike
Walk
Uber/Lyft
Taxi
Carshare
Do not do
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Work/school
Groceries/errands
Pickup/dropoff children
Social/recreational
Job interviews
Medical appointments


Q14. Age
45
40
35
30
25
20
15
10
5
0
18-30
31-40
41-50
51-60
61-70
71-80

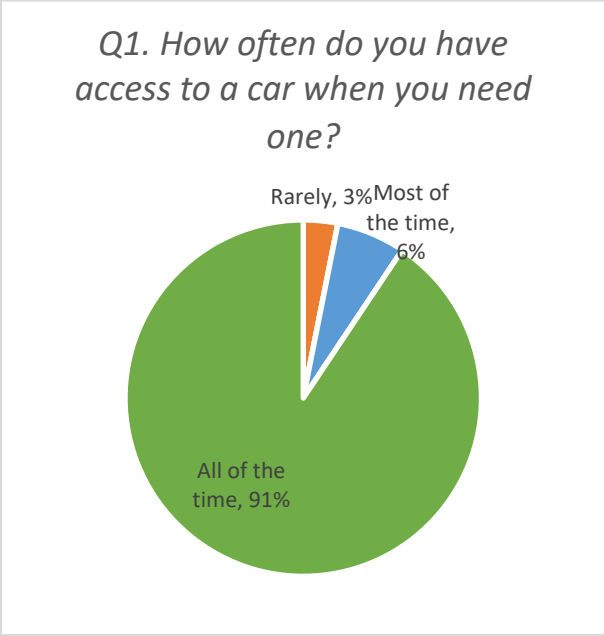


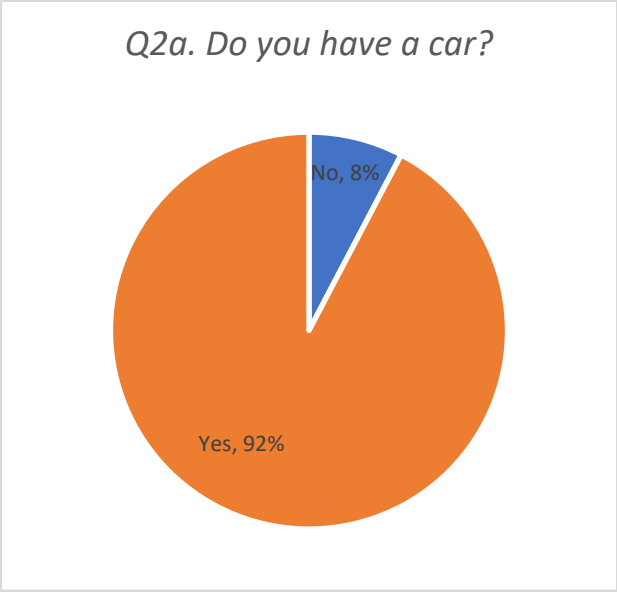


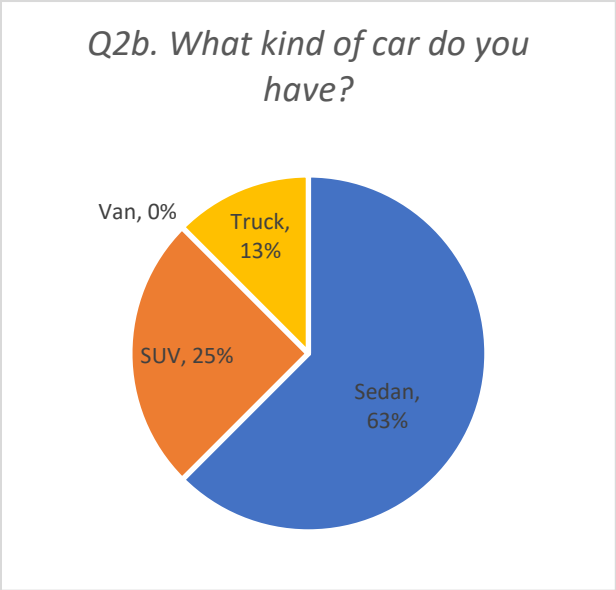
*Did not make visual for Q17, zip codes

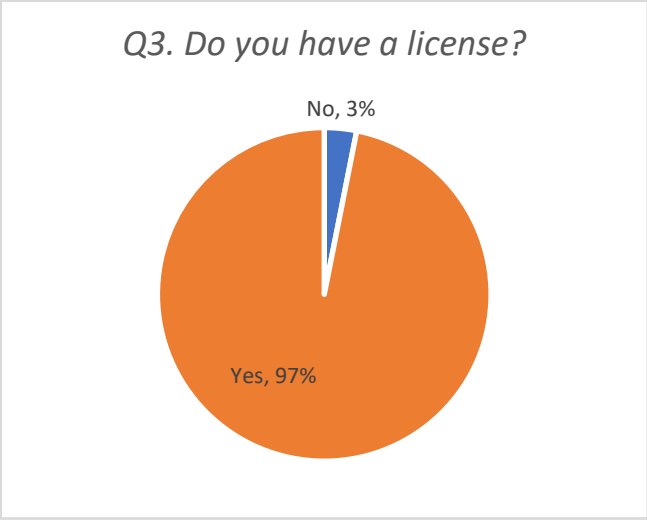


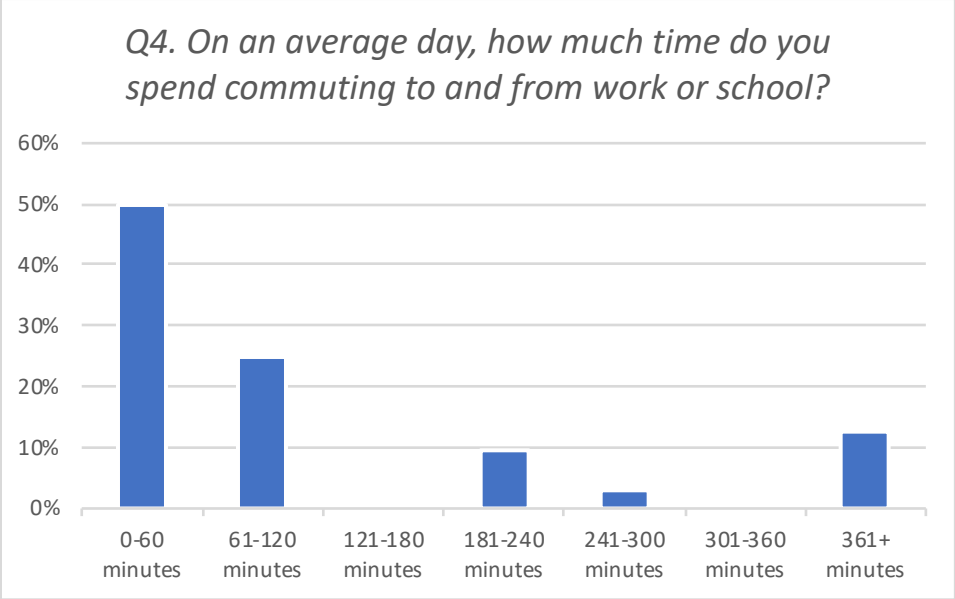
San Joaquin Valley

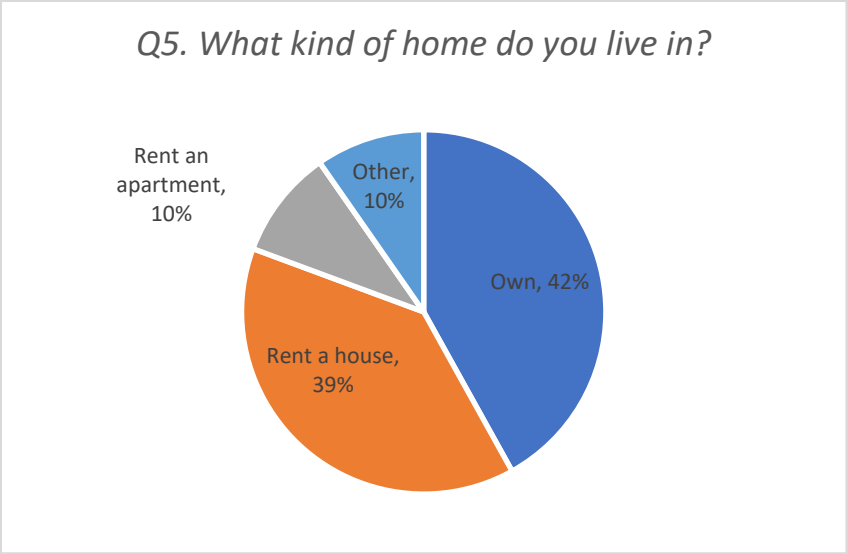


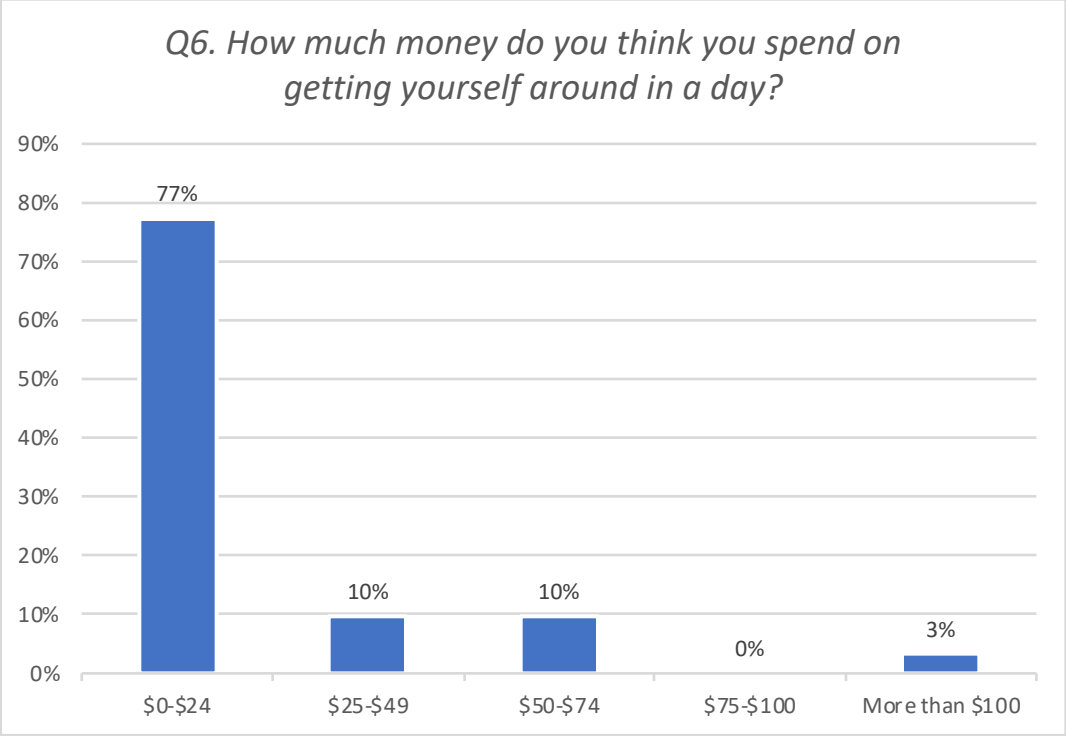

Q2a. Do you have a car?
No, 8%
Yes, 92%

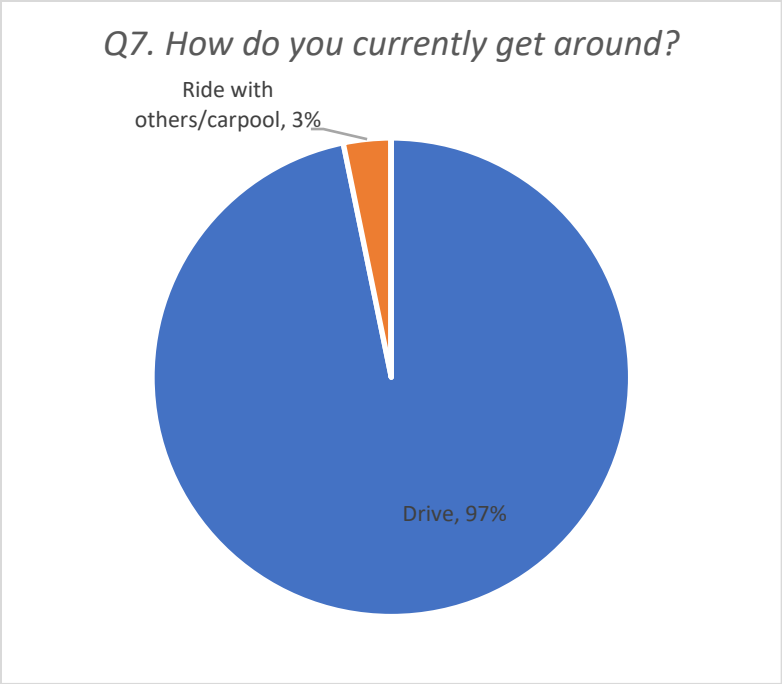

Q2b. What kind of car do you have?
Van, 0%
Truck, 13%
SUV, 25%
Sedan, 63%

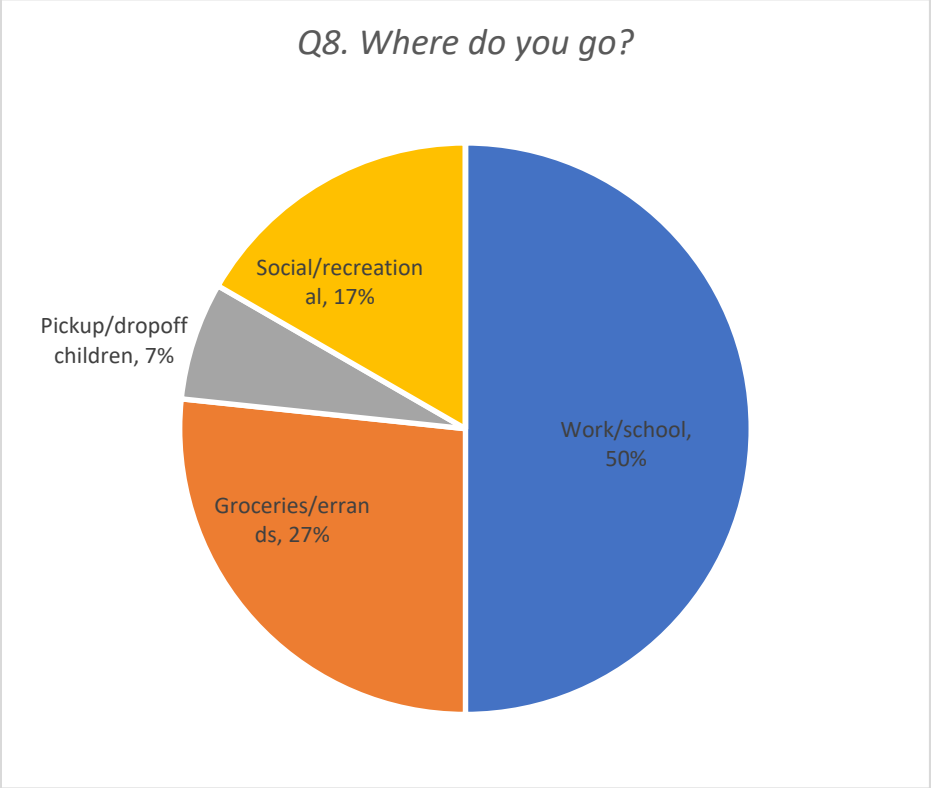

Q3. Do you have a license?
No, 3%
Yes, 97%

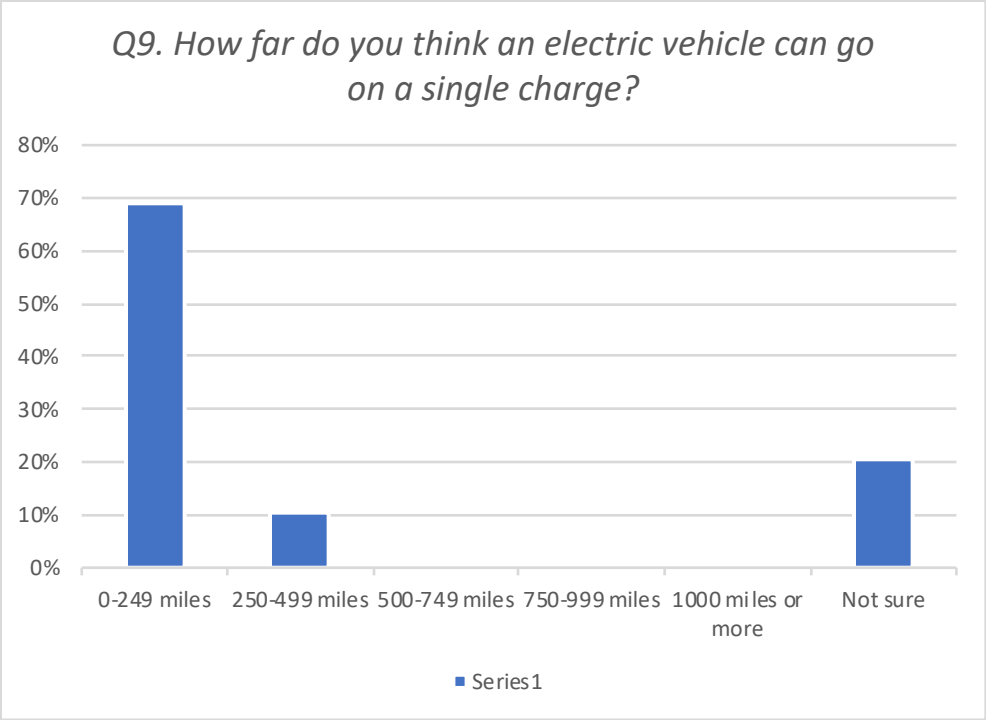

Q4. On an average day, how much time do you spend commuting to and from work or school?
60%
50%
40%
30%
20%
10%
0%
0-60 minutes
61-120 minutes
121-180 minutes
181-240 minutes
241-300 minutes
301-360 minutes
361+ minutes


Q5. What kind of home do you live in?
Rent an apartment, 10%
Other, 10%
Own, 42%
Rent a house, 39%

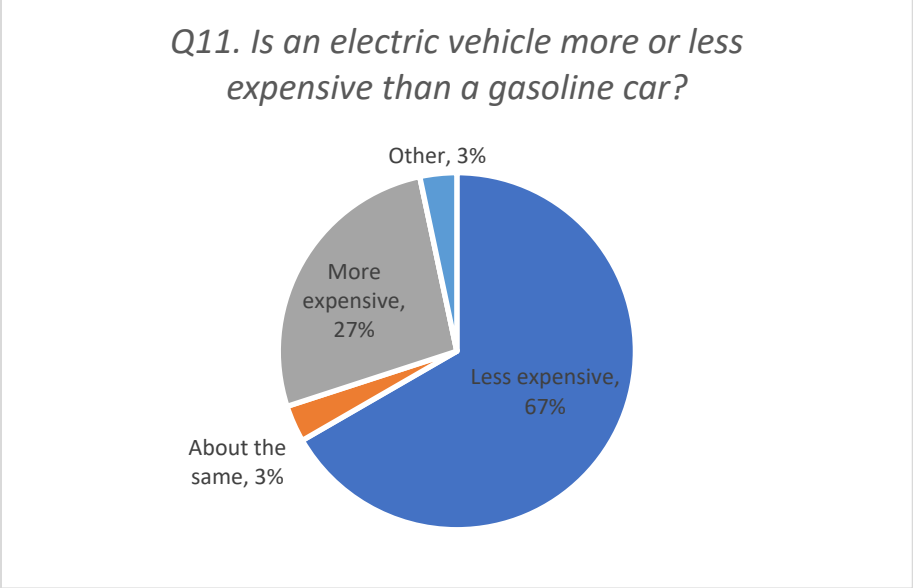

Q6. How much money do you think you spend on getting yourself around in a day?
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
77%
10%
10%
0%
3%
$0-$24
$25-$49
$50-$74
$75-$100
More than $100

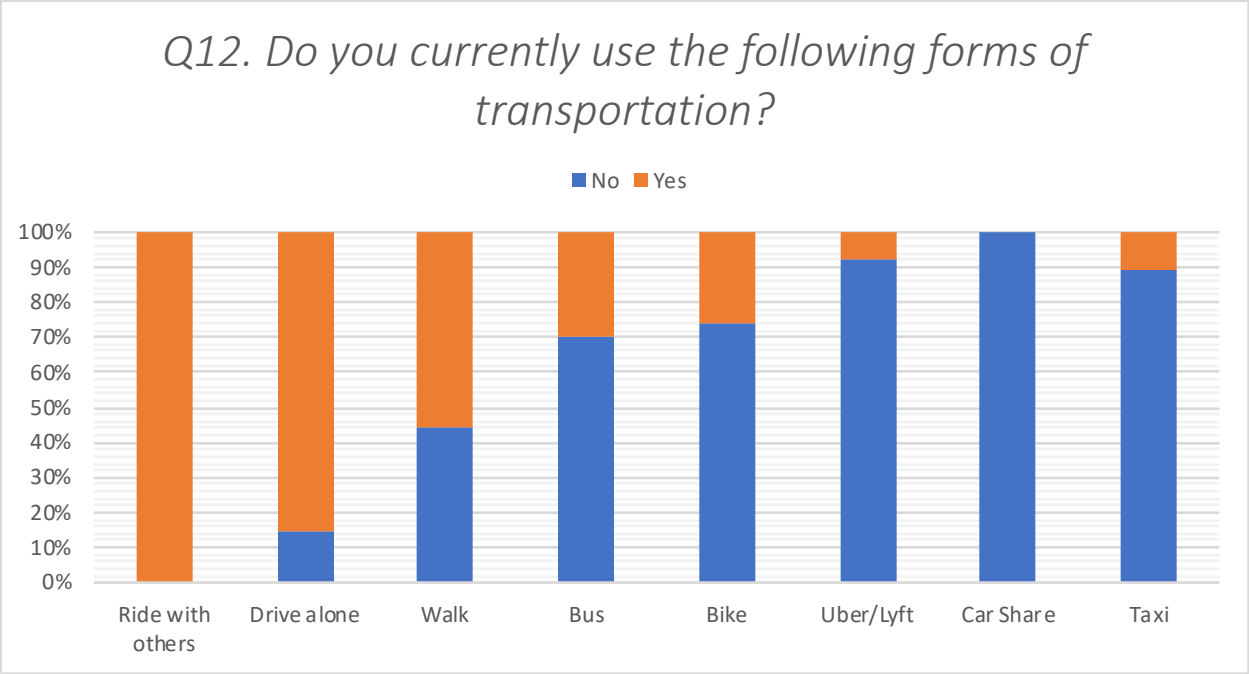

Q7. How do you currently get around?
Ride with others/carpool, 3%
Drive, 97%

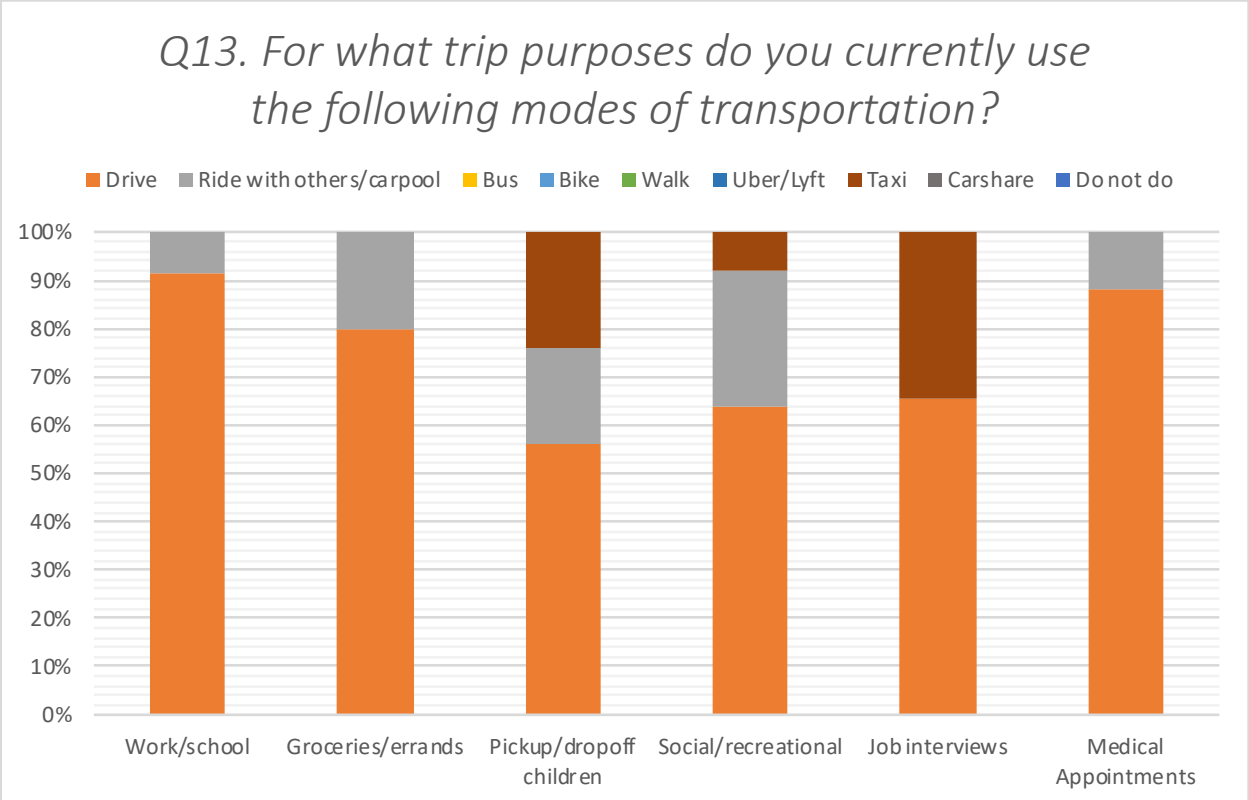

Q8. Where do you go?
Social/recreational, 17%
Pickup/dropoff children, 7%
Work/school, 50%
Groceries/errands, 27%

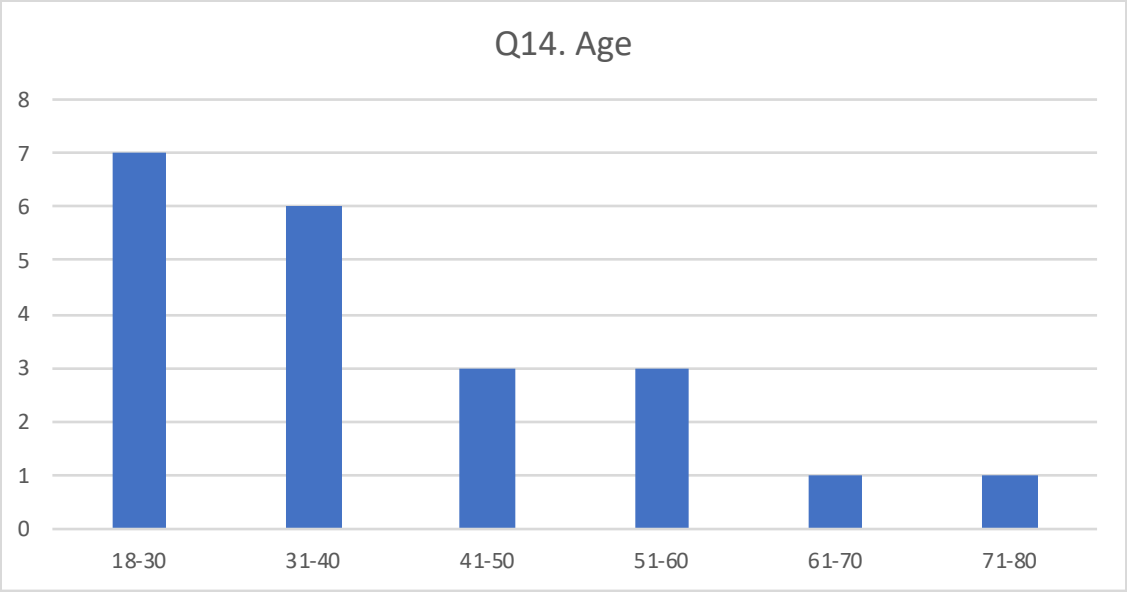


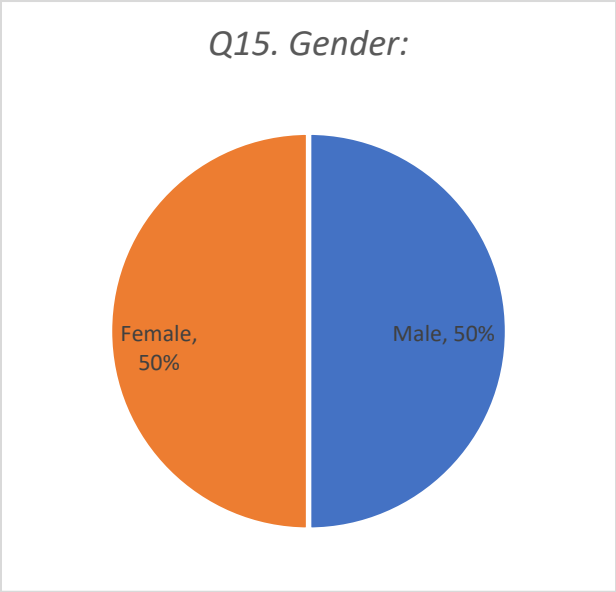
*Did not make a visual for Q10; similar question to Q9

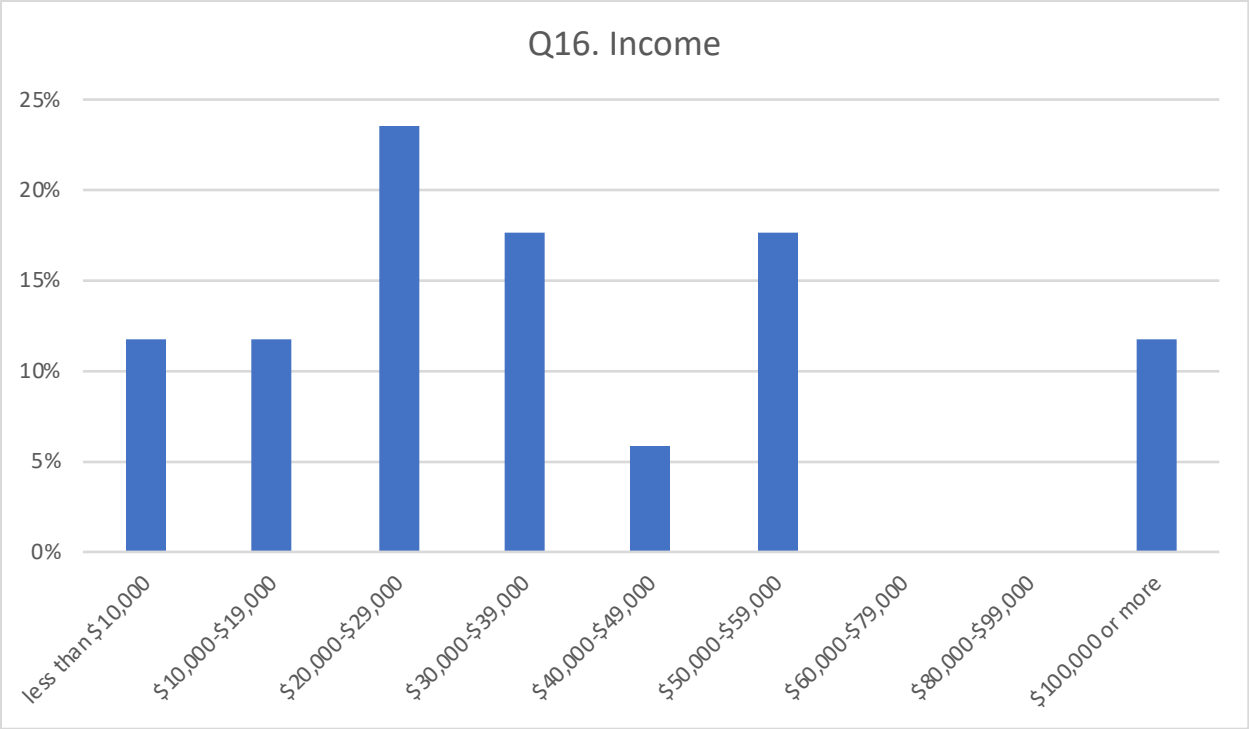



Q12. Do you currently use the following forms of transportation?
No
Yes
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Ride with others
Drive alone
Walk
Bus
Bike
Uber/Lyft
Car Share
Taxi

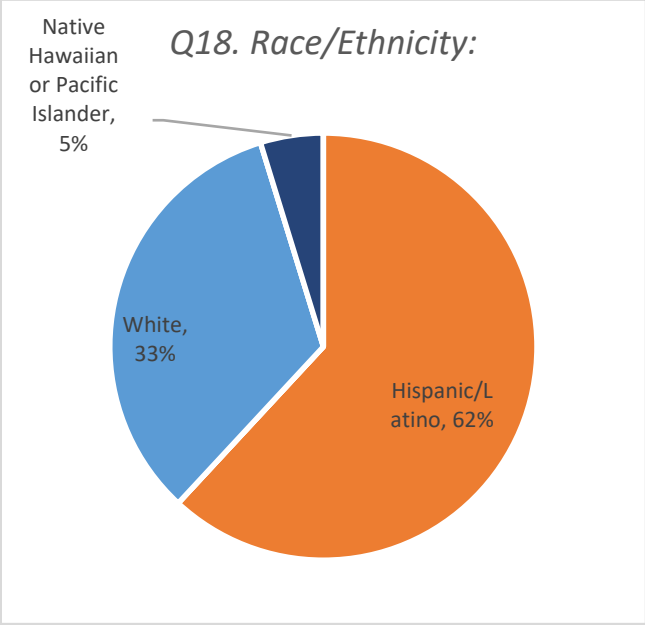

Q13. For what trip purposes do you currently use the following modes of transportation?
Drive
Ride with others/carpool
Bus
Bike
Walk
Uber/Lyft
Taxi
Carshare
Do not do
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Work/school
Groceries/errands
Pickup/dropoff children
Social/recreational
Job interviews
Medical Appointments


Q14. Age
8
7
6
5
4
3
2
1
0
18-30
31-40
41-50
51-60
61-70
71-80


Q15. Gender:
Female, 50%
Male, 50%



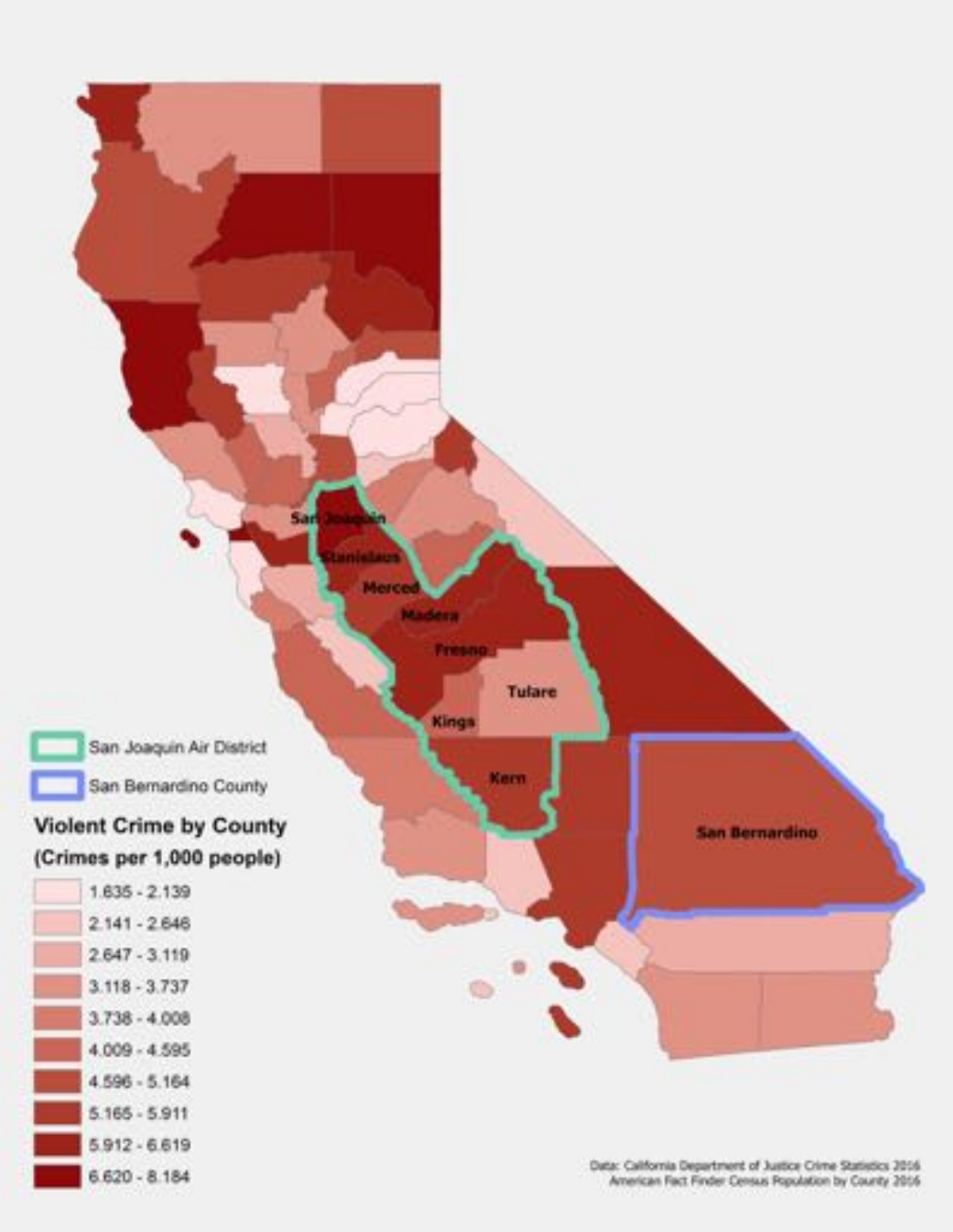
*Did not make visual for Q17, zip codes



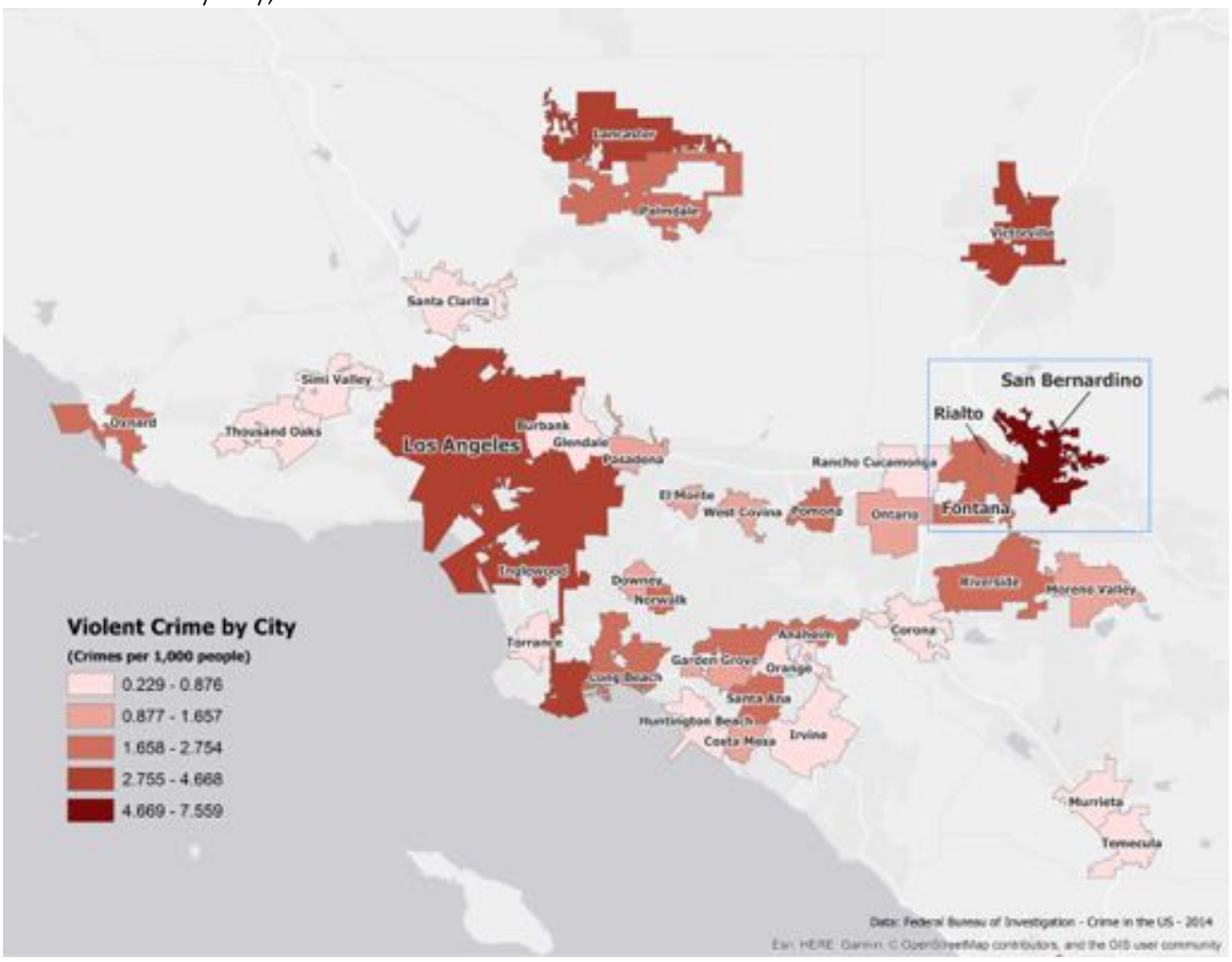
Crime Rate Maps

(made by Cam Denney)

Violent Crime by County



Violent Crime by City, southern California area



Crime Rate Map Data Sources

City crime rate data was gathered from the FBI 2014 Crime in the United States website. Retrieved from https://ucr.fbi.gov/crime-in-the-u.s/2014/crime-in-the-u.s.-2014.

County crime data was gathered from:
• FBI Table 4 Crime in the United States by Metropolitan Statistical Area, 2016. Retrieved from https://ucr.fbi.gov/crime-in-the-u.s/2016/crime-in-the-u.s.-2016/topic-pages/tables/table-4.
• Department of Justice OpenJustice website, Crimes and Clearances Statistics for California counties, 2016. Retrieved from https://ucr.fbi.gov/crime-in-the-u.s/2016/crime-in-the-u.s.-2016/topic-pages/tables/table-4.

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