



# **DRIVING TRANSFORMATION**

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# Designing Behavior-Change Program Dashboards to Ensure Equity Takes a Front Seat in Decision Making

November 13, 2023

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# Center for Sustainable Energy

Center for Sustainable Energy® (CSE) is a national nonprofit that accelerates adoption of clean transportation and distributed energy through effective and equitable program design and administration.

Governments, utilities and the private sector trust CSE for its data-driven and software-enabled approach, deep domain expertise and customer-focused team.

Our vision is a future with sustainable, equitable and resilient transportation, buildings and communities.

We have one mission – Decarbonize.®

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# California Light-Duty ZEV Incentive Programs Insights Dashboard

**One-stop location** for everything related to California Air Resources Board (CARB) light-duty EV incentive programs

Unifies quantitative and qualitative characteristics of California:

- **EV sales**
- **Applications**
- **Incentives**
  - Clean Cars 4 All (CC4A)
  - Clean Vehicle Rebate Project (CVRP)
  - Clean Vehicle Assistance (CVA)
  - Statewide CC4A and Finance Assistance\* (Coming in 2024)

*Does not include public charging, charging infrastructure or medium- and heavy-duty EVs*



# California Light-Duty ZEV Incentive Programs Insights Dashboard

## Q1 2023

- Identify Dashboard Goals ✓
- Identify Stakeholders ✓
- KPI Interviews ✓

## Q4 2023

- Enhancements ✓
- User Acceptance Testing ✓
- Dashboard Launch ✓



## Q2 2023 – Q3 2023

- Wireframe and Mockup ✓
- Create MVP ✓
- Stakeholder Feedback ✓

## 2024

- Updates & Refinements
- Training Sessions
- Monitoring Usage
- Dashboard Maintenance

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# Three Aspects of Inclusive Dashboard Design

- 1 **Equity definitions** – Decide what information matters
- 2 **Inclusion** – Embrace culturally appropriate language/ADA compliance standards
- 3 **Visualization practices** – Aid appropriate interpretation



# Equity – Definitions

Which visuals will shift narrative toward equity communities?

Emphasize data that shows ...

## Geographic Disbursement

- Rural/urban
- Isolated/concentrated
- Legislative districts

## Adoption Patterns

- Income level x subregion
- Program x ethnicity

## Demographics

- Race/ethnicity
- Income
- Gender
- Age

## Risk Factors

- Pollution burden
- Energy burden
- Fire risk
- Health factors



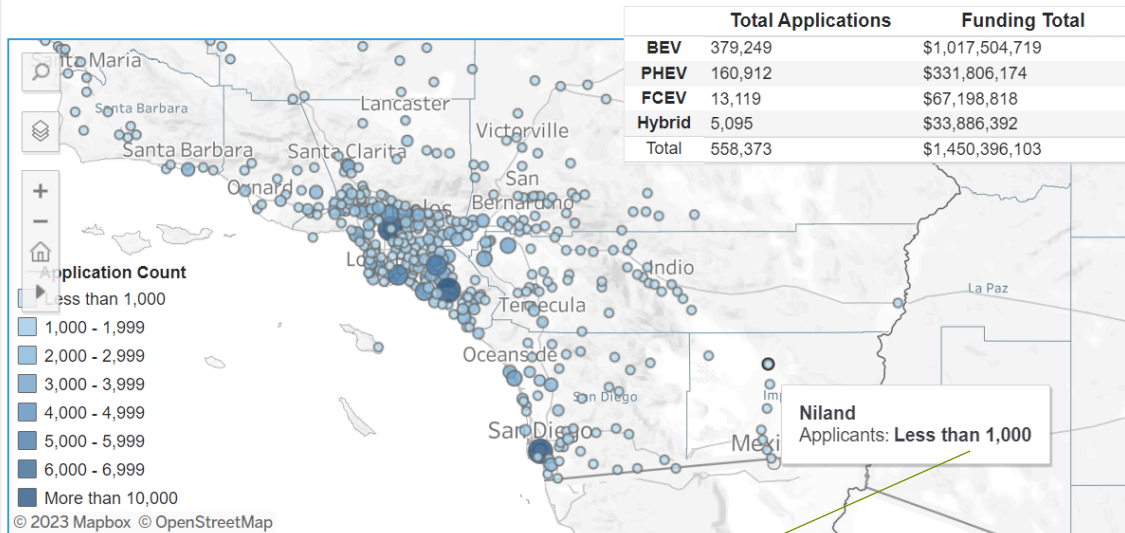
# Equity – Definitions

Demonstrate concentrations at **different levels of granularity**

Compare equity concentration of participation, funds distributed

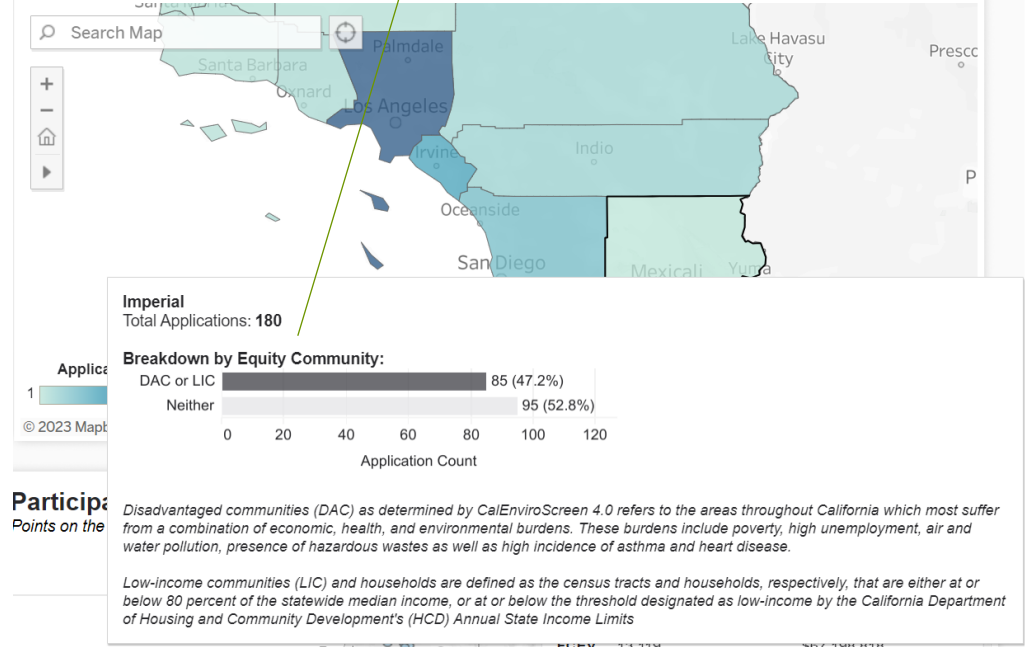
## Participation by City

Points on the map show the center of each city and are not indicative of individual locations.



## Participation by County

Hover over the map for more information on disadvantaged communities (DAC) and low-income communities (LIC). Filter and zoom in all the maps on the dashboard by clicking a county.



Protect confidentiality, check for appropriate level of aggregation





# Equity – Questions to Address

## Eligibility & Outreach

Who *can* receive incentives?

Who are we reaching out to so they're aware of the program?

Who is disproportionately affected by multiple burdens?

Where can we find people who most need the incentives?

## Evaluation

Who *is* receiving incentives?

How many people in equity communities are participating relative to other communities?

Relative to typical adoption patterns, who is and is not adopting clean technology?



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# Inclusion – Access

Embrace ADA compliance guidance to improve accessibility

Design for visual and cognitive limitations

- **Length** is easier to interpret than proportion
- **Alternative text** and contextual description help low-vision users and those who interpret words better than images
- **Minimal color palette** reduces clutter, improves readability
- **Color accessibility** tools check for color blind-friendly palettes
- **White space** reduces overwhelm



# Inclusion – Access

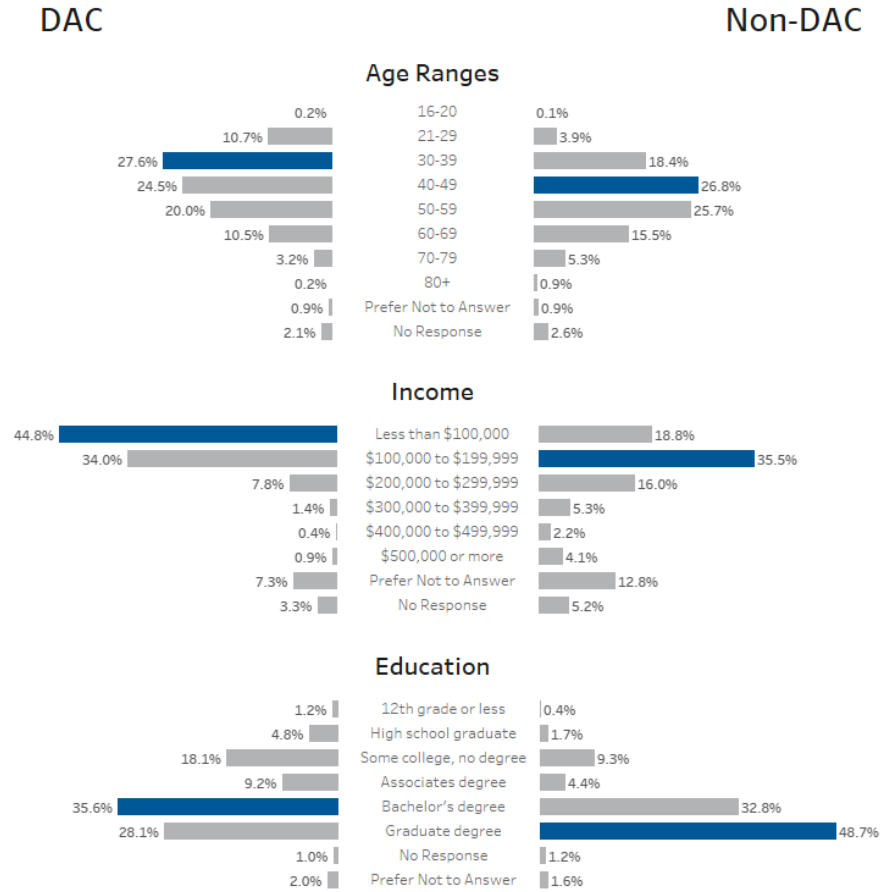
**Length** and **highlight color** used to compare between two categories

Back-to-back visual – easier to comprehend groups **at a glance**

White space **reduces overwhelm**

Compilation of demographic charts convey a **portrait of participation**

Example visual



# Inclusion – Language, Culture

Embrace culturally appropriate language and design

All **visuals are subjective**; acknowledge perspective

- Use narrative to describe the perspective being shared
- Visualizing time as cyclical may be more appropriate than linear

Use **culturally meaningful** palettes

- Red may represent life and vitality, not danger

**Combat stereotypes**

- Use non-racist iconography
- Direct racial comparisons may reinforce false narrative of underperformance; small multiples emphasize comparison of trend lines



# Inclusion – Language, Culture

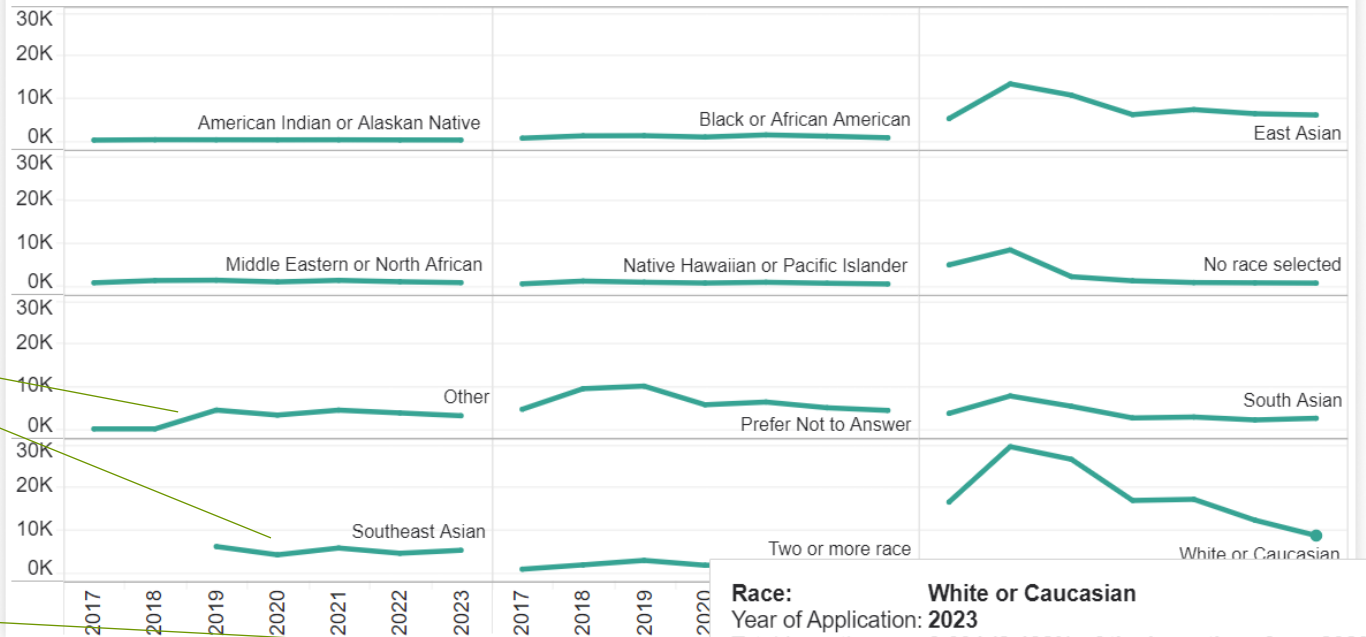
Narrative emphasizes that data follows US Census guidelines (Latin American communities **not adequately represented**)

Small multiples emphasize comparison of participation **trend lines**

Hover-over boxes show specific **numbers** and relative **proportion** of incentives

## Participant Race

By percent of program total by year. Please note that race is self-reported via survey and follows the US Census Bureau guidelines for race. Groups with fewer than 10 participants are excluded for privacy and will show up as blanks.



### Notes:

- As of Aug 2023 the only program reporting applicant information from surveys is CVRP. Demographic data from CC4A, CVAP, and DCAP programs are marked as 'Not Reported.'
- Filtering by any geographic data (county, zip code, city, etc.) has been disabled to protect personally identifying information.



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# Visualization – Interpretation

## Language & Framing

- Use **full sentence titles** where possible to frame visualization and highlight key takeaways
- **Prepare to modify** labels and identity categories that evolve over time

## Address order bias

- What is listed **first** is often seen as **more important**
- **“Other”** hides diversity and may be exclusionary

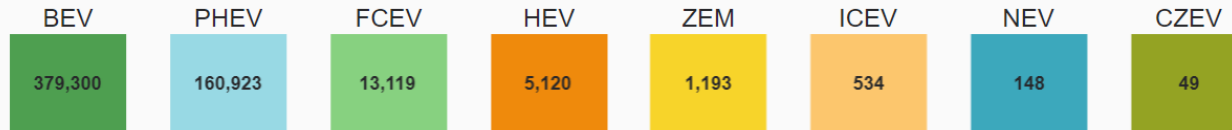




# Visualization – Interpretation

## Total Incentives by Vehicle Type

Hover over each vehicle type for more information.



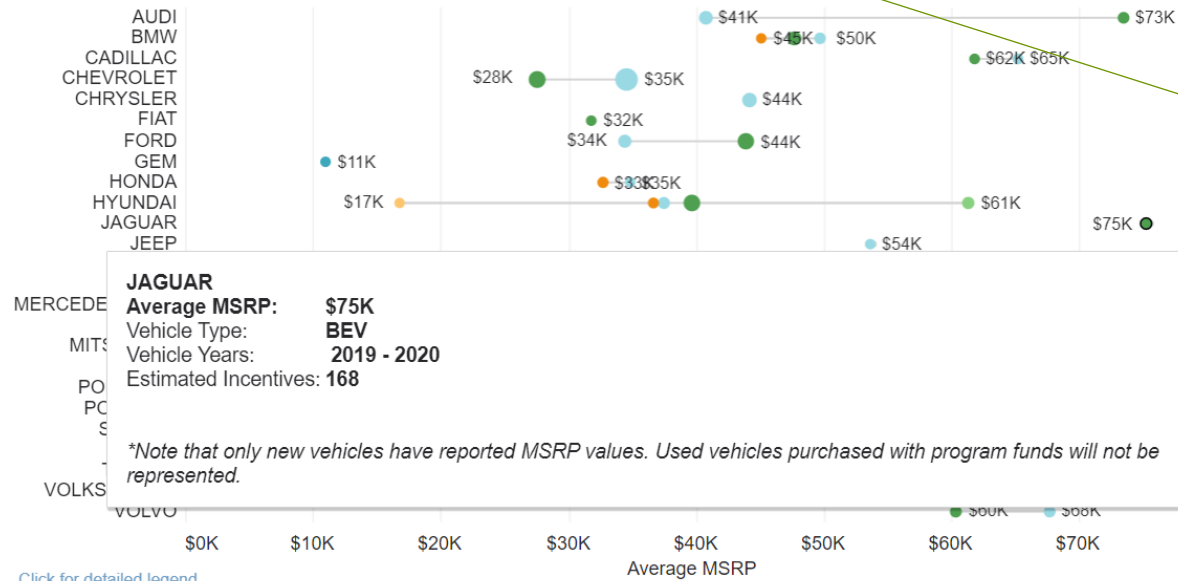
Internal combustion engine vehicles (ICEVs) are included since they are offered by some CC4A programs.

Address notable incongruity – combustion-engine vehicles in electric vehicle program

## Average MSRP by Vehicle Make for New Vehicles

[Show Average Vehicle Purchase Price](#)

The size of the points correspond to the number of incentives issued for that vehicle type



Explain how to interpret circle size

Avoid misinterpretation – note difference between MSRP and purchase price



# Visualization – Interpretation

Understand **bias** when it comes to ordering data

- What is listed first is often seen as "more important"

The "**other**" category can help reduce the density of a visualization and serve as a "catch-all," but it also hides diversity and may be exclusionary

## Numerical

What is your age?

16-20
21-29
30-39
40-49
50-59
60-69
70-79
80+
Prefer Not to Answer

## Alphabetical

What type of residence do you live in?

Apartment/Condominium
Attached house (townhome, duplex, triplex,
Detached house (single family home)
Other
Prefer Not to Answer

Vs.

## Implied Hierarchy

What type of residence do you live in?

Detached house (single family home)
Attached house (townhome, duplex, triplex,
Apartment/Condominium
Other
Prefer Not to Answer

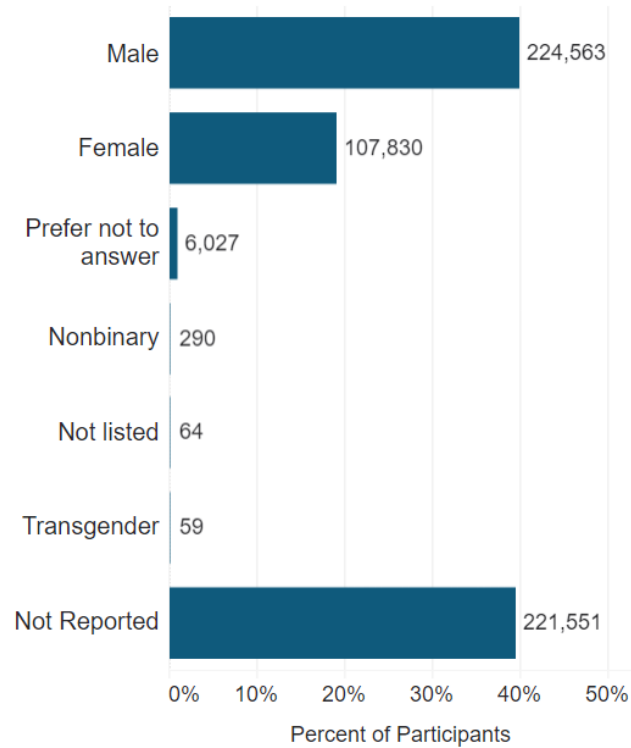


# Visualization – Interpretation

Ordered by  
number of  
responses

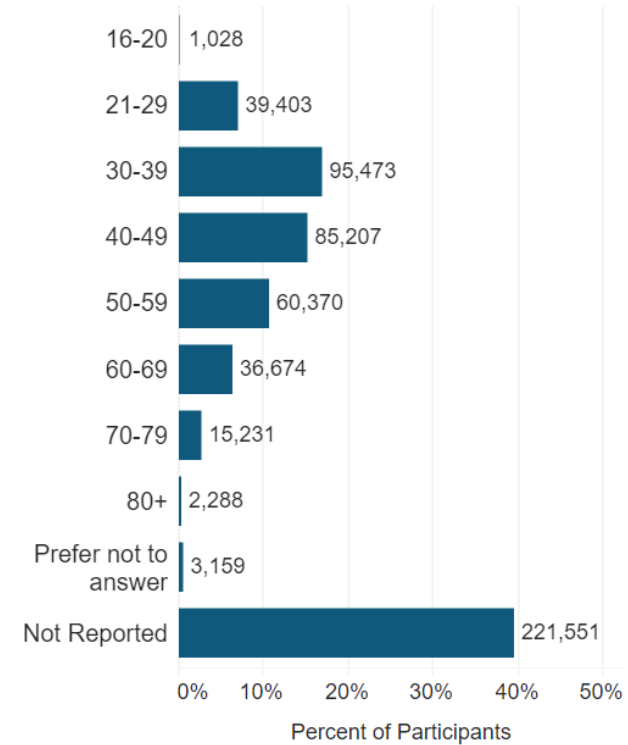
## Participant Gender

Self-reported via survey. Groups with fewer than 10 participants are excluded for privacy and will show up as blanks.



## Participant Age

Self-reported via survey. Groups with fewer than 10 participants are excluded for privacy and will show up as blanks.



Ordered  
chronologically



# Visualization – Interpretation

Mean average is misleading!

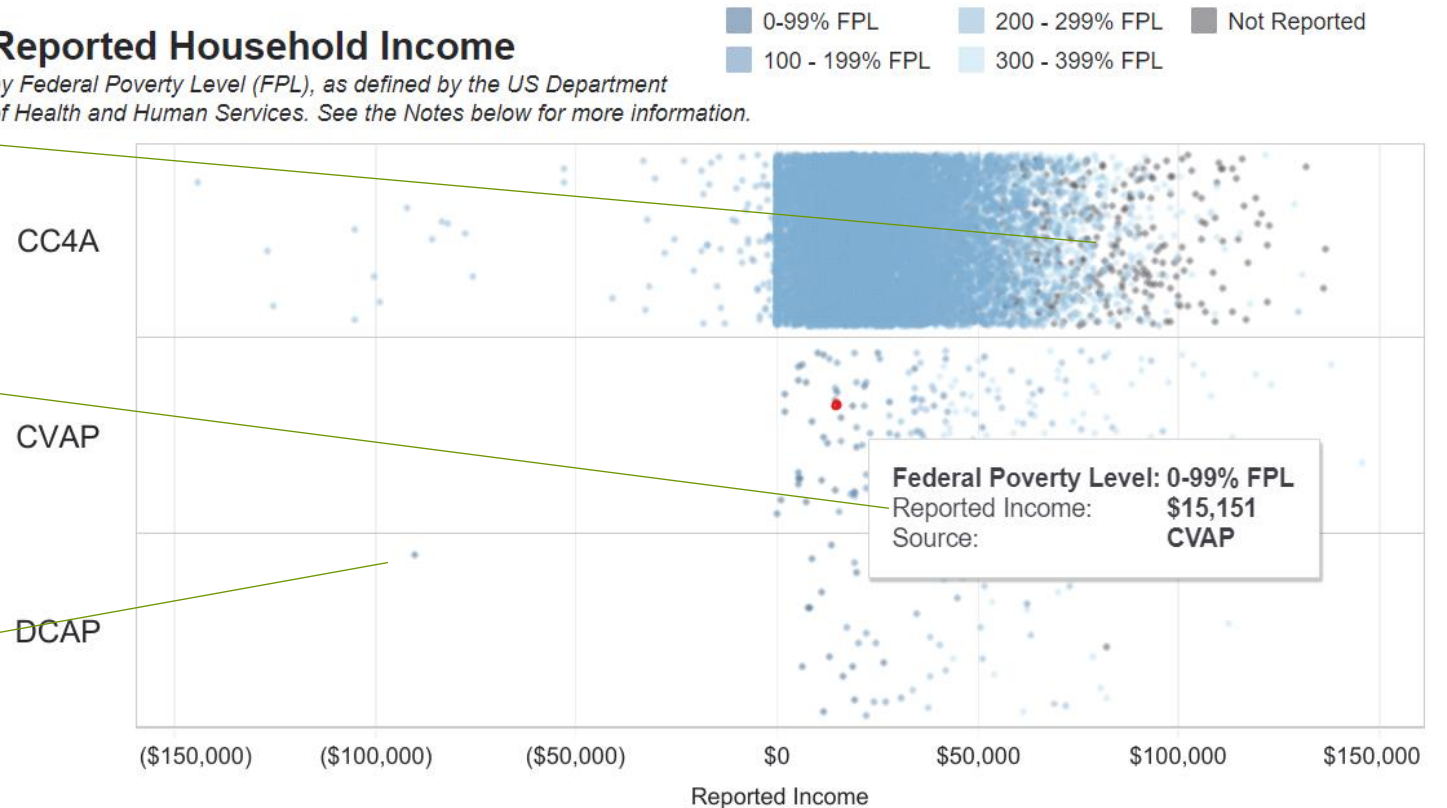
Illustrate the **diversity** within a single group

**Combat stereotypes** that can be reinforced with single measures

Identify data points that seem **off base** – Why are people reporting negative income values?

## Reported Household Income

by Federal Poverty Level (FPL), as defined by the US Department of Health and Human Services. See the Notes below for more information.



\*This is an earlier version of a CALZEV dashboard visual



# Thank you to CSE Data Visualization Team for CA Light-Duty ZEV Incentive Programs Insights Dashboard

Thank you to:

California Air Resources Board for their support  
BECC audience for your interest



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# Extra Material

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# Design Process: Center the User

## Pre-Design

Define dashboard purpose and function with key stakeholders

## Draft Testing

Observe user navigation & data interpretation while answering scenario-based questions

## Post-Launch

Revisit prioritization of version 2+ revisions based on user feedback



## Early Design

Interview likely dashboard users about their KPI needs using early draft of dashboard

## Pre-Launch

Prioritize list of revisions to make prior to launch and version 2+ based on user feedback

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# Design – Key Considerations

## 1 Define Equity Metrics

What do we mean by equity?

1

## 2 Use Framing Language to Orient Users

Narrate visuals and navigation

2

## 3 Be Cognizant of Order & Data Points

Control bias, “othering”

3

VISUALIZING  
EQUITY

4

## 4 Visualize Data with Depth

Use proportions, beeswarm, small multiples, back-to-back

5

## 5 Use Color To Direct Attention

Highlight takeaways & make everything accessible

6

## 6 Provide a Narrative & Acknowledge the Story

Embrace transparency

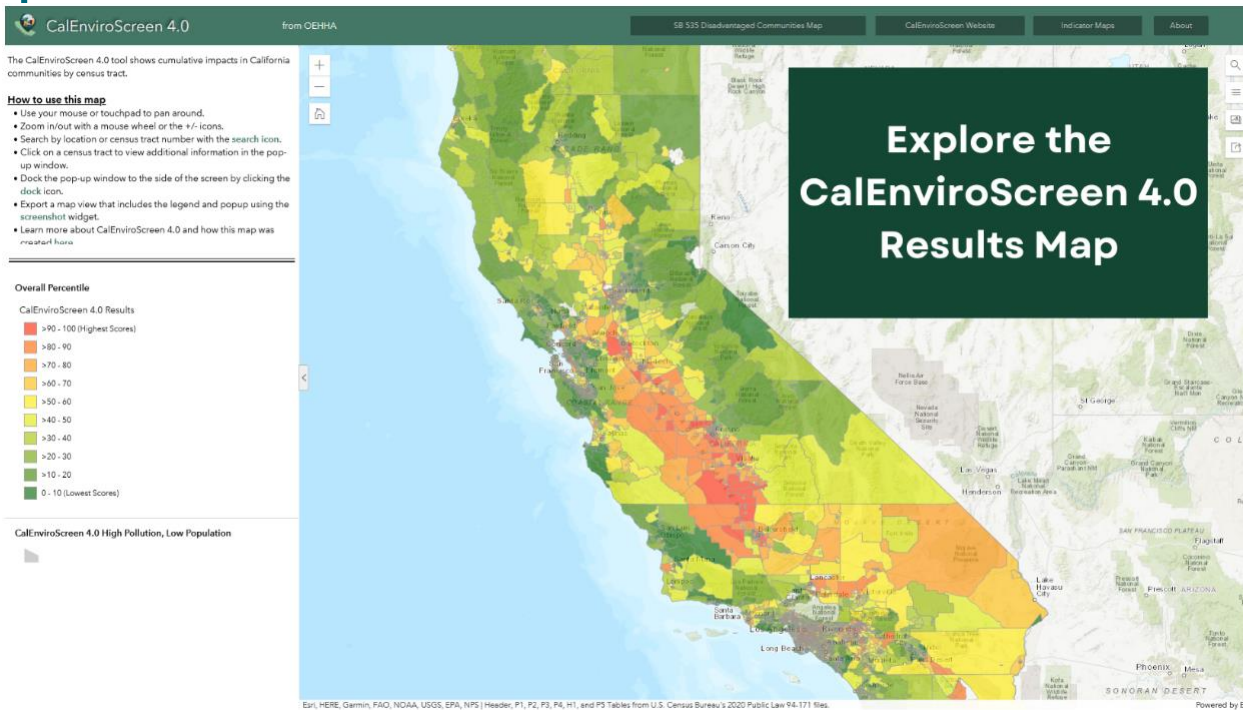
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1

# Equity – CalEnviroScreen



- Modeling is based on California Environmental Protection Agency’s definition of cumulative impacts
- Census tract level
- 4 main components:
  - Pollution Burden
    - Exposure
    - Environmental Effects
  - Population Characteristics
    - Sensitive Populations
    - Socioeconomic Factors
    - ‘Low Income Communities’

<https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40>

<https://oehha.ca.gov/calenviroscreen/scoring-model>

#BEC



# Equity – CalEnviroScreen

## Pollution Burden

### Exposures

- Ozone Concentrations
- PM2.5 Concentrations
- Children's Lead Risk from Housing
- Diesel PM Emissions
- Drinking Water Contaminants
- Pesticide Use
- Toxic Releases from Facilities
- Traffic Density

### Environmental Effects

- Solid Waste Sites and Facilities
- Groundwater Threats
- Hazardous Waste
- Impaired Water Bodies
- Cleanup Sites

## Population Characteristics

### Exposures

- Asthma
- Cardiovascular Disease
- Low Birth Weight Infants

### Socioeconomic Factors

- Educational Attainment
- Housing Burdened Low Income Households
- Linguistic Isolation
- Poverty
- Unemployment



# Visualization – Diversity, Comparison

- Illustrate **diversity** within a single group using beeswarm
- Address **representativeness** by showing population vs sample
- Use small multiples to **focus on within group comparison** to comparison metric and avoid direct comparison between different populations



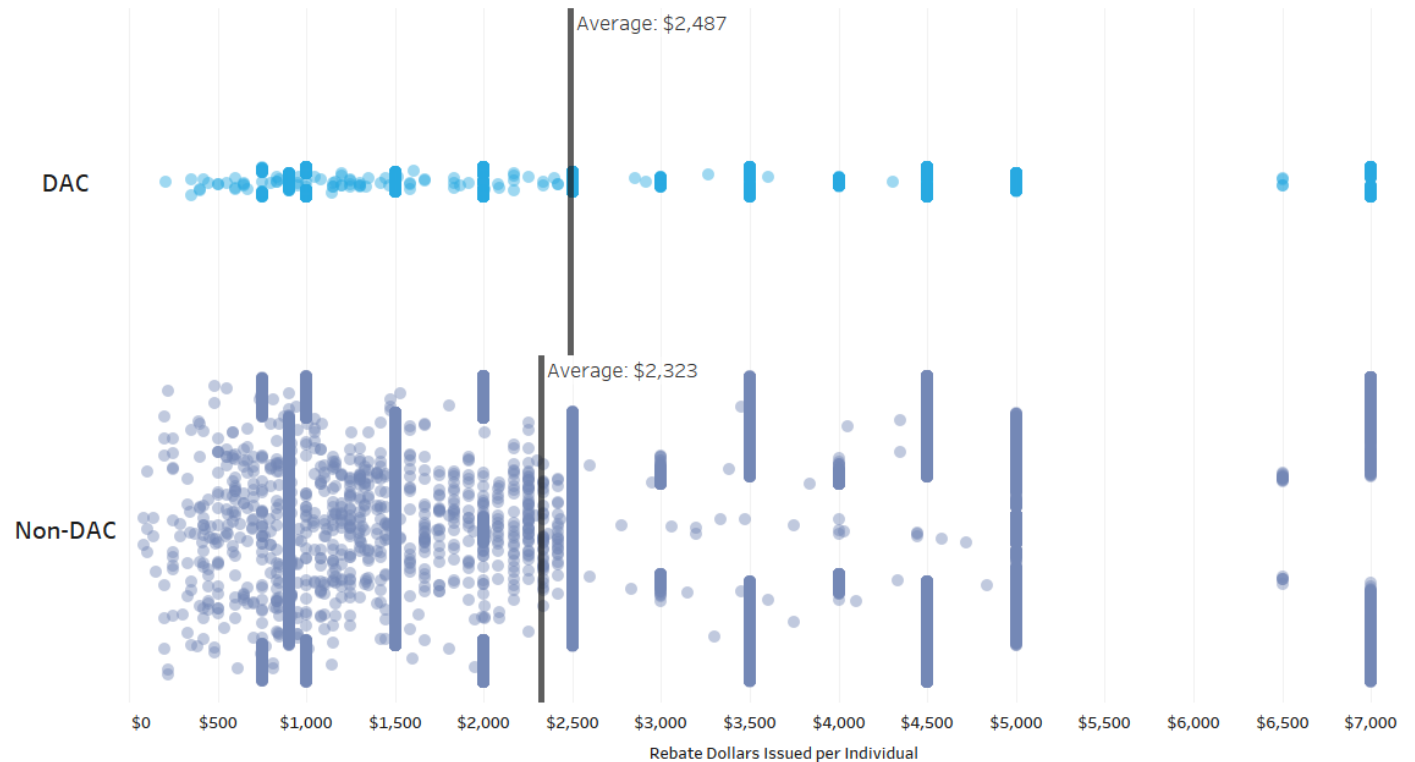
# Visualization – Beeswarm

## Means are Misleading!

Can see the range and skew of the incentive amounts more clearly than a bar chart would show

CVRP participants living in disadvantaged communities (DAC) receive - on average - \$164 USD more than those not living in DACs

The distribution of rebates between individuals varies widely and the average rebate is only part of the story



\*CVRP Rebates received by non-Individuals (e.g., non-profits, governments, businesses, etc.) are not included, nor are individuals reporting a \$0 USD Rebate



# Visualization – Proportion

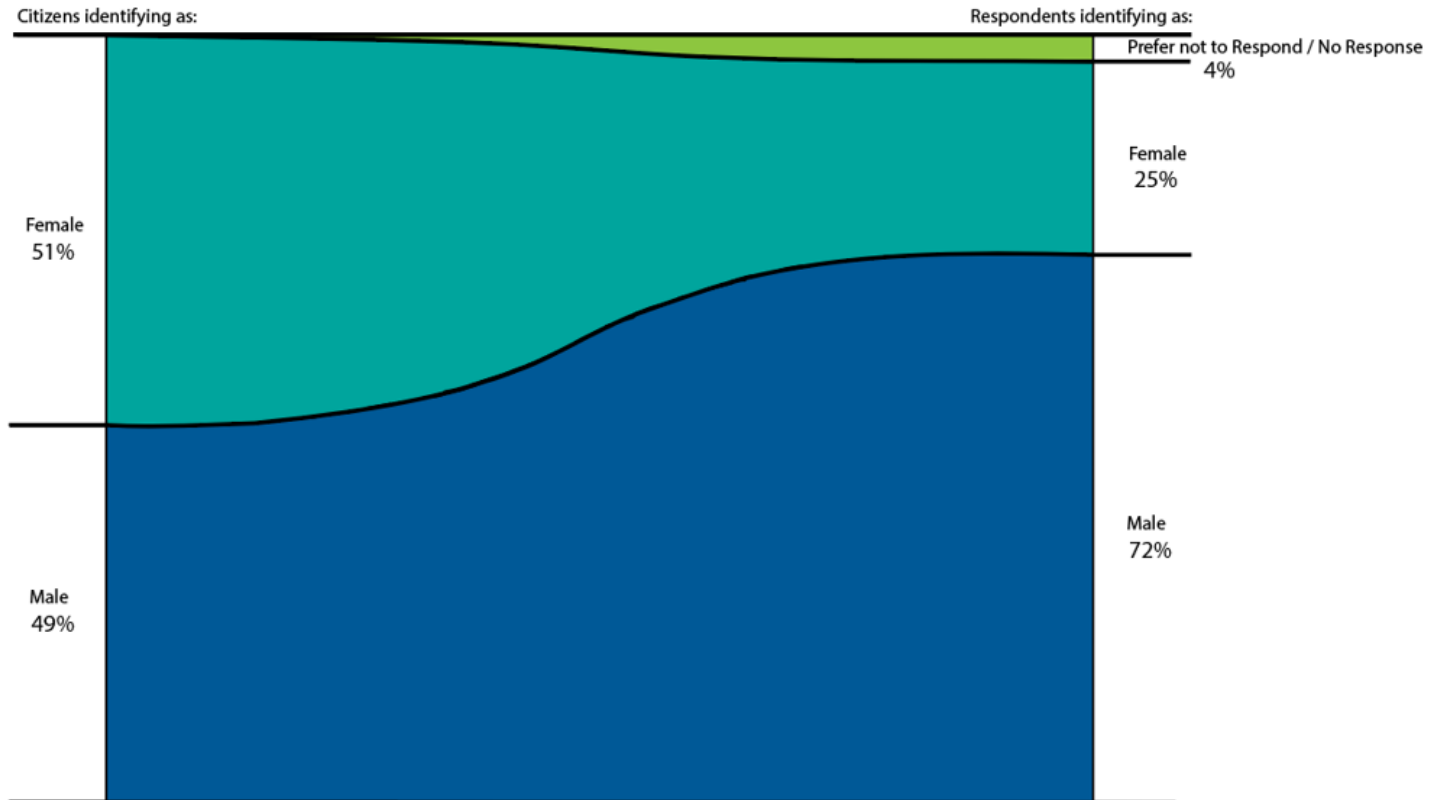
Understand the difference between the **population** and the **sample**

Is the data **representative?**

CVRP Participants disproportionately identify as male when compared to the population of California. If this program's participants were not skewed, the percentages would match between California and the CVRP program, and the lines would be flat

California Demographics by Gender  
American Community Survey 2017

CVRP Demographics by Gender  
Survey Responses, 2013 - 2017



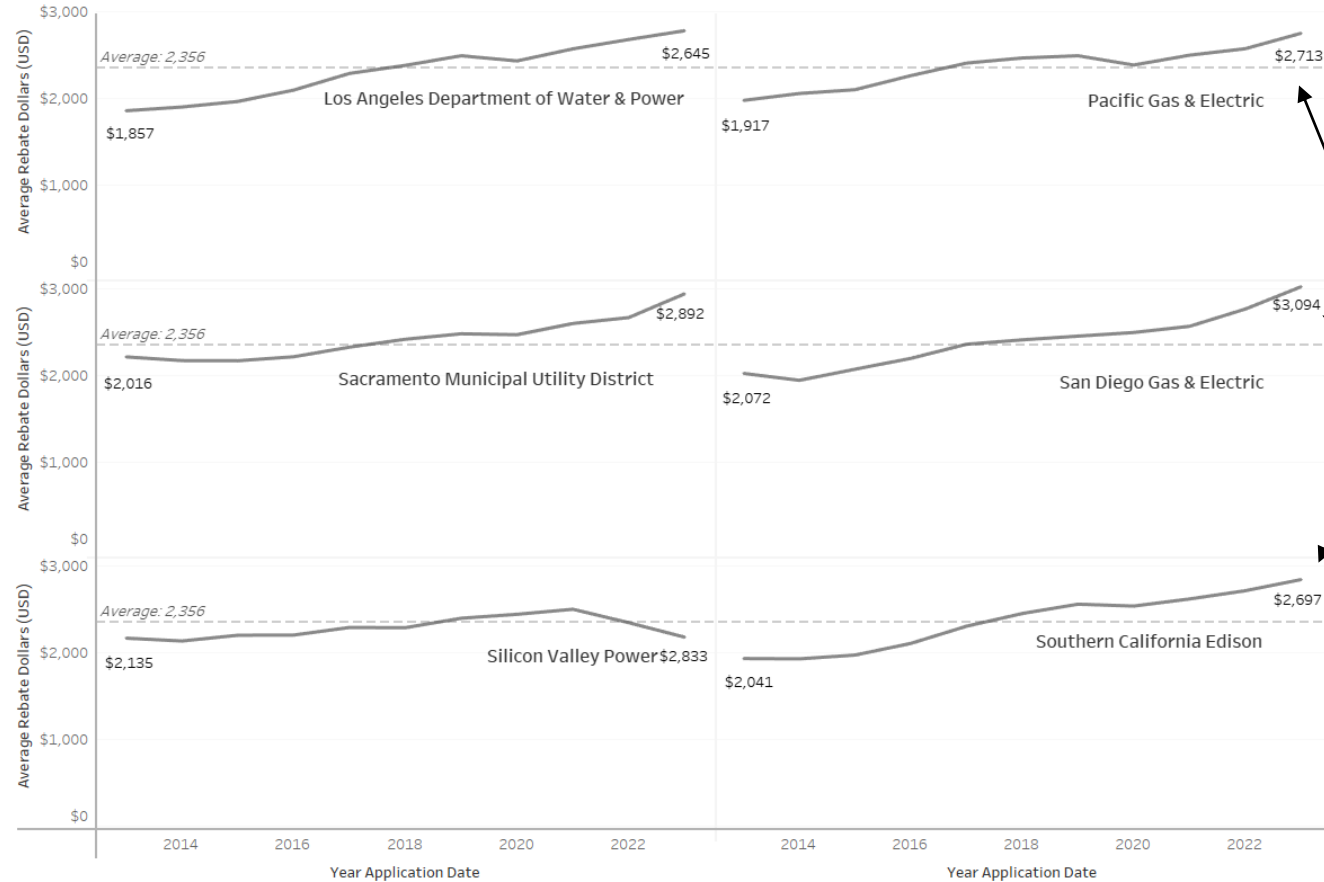
\*Percentages may not add up to 100% due to rounding



# Visualization – Small Multiples

- **Avoid direct comparison** between populations by comparing groups to a single, aggregated metric\*

Average Rebate Issued for Individual CVRP Applicants living in DACs from 2013 - 2023  
Utility service area



Each line is compared to the total average incentive amount for all individual DAC applicants



# Discussion Questions and Talking Points

- How are various stakeholder groups using the dashboard?
  - KPIs – Funds distributed to DAC+LIC, race+ethnicity+geography
  - What do stakeholders typically want – quick glance; filters for vehicle, demographics, time
- How do you avoid misuse or misinterpretation of equity-related data?
  - Look for masked trends due to rolling-up subgroups of people
  - Provide interpretive language around visuals
  - When choosing visuals, consider what is a good screenshot and what might underrepresent, mask, or exclude important information
- Why is the mean average a problem?
  - Does not show the full range of people's situations or experiences
  - Masks important trends, especially when the range is skewed
  - Gives a false sense of homogeneity

