



## VULNERABILITY SCALE

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# Our Approach



## PROBLEM



## SOLUTION



## IMPACT

- State government and local nonprofit have difficulty prioritizing different areas when allocating resources to combat pandemics

- Created a dynamic geospatial map that displays relative demand (in units per person) for resources of different counties in CA

- Better allocation of resources during pandemic
- More awareness knowing the vulnerability of your area

# Our Method

	Label	Alameda County, California!!Households!!Estimate	Alameda County, California!!Households!!Margin of Error	Alameda County, California!!Families!!Estimate	Alameda County, California!!Families!!Margin of Error	Alameda County, California!!Married- couple families!!Estimate
0	Total	585,632	±3,709	381,906	±6,110	295,523
1	Less than \$10,000	4.2%	±0.4	2.2%	±0.4	0.9%
2	10,000to 14,999	3.4%	±0.4	1.3%	±0.3	0.7%
3	15,000to 24,999	4.9%	±0.5	3.0%	±0.4	2.2%
4	25,000to 34,999	4.8%	±0.5	3.7%	±0.5	2.6%
5	35,000to 49,999	6.4%	±0.5	5.6%	±0.6	4.2%
6	50,000to 74,999	11.6%	±0.7	10.3%	±0.9	8.8%
7	75,000to 99,999	10.7%	±0.6	10.8%	±0.8	10.0%
8	100,000to 149,999	19.0%	±0.9	20.3%	±1.0	20.2%
9	150,000to 199,999	12.8%	±0.7	15.4%	±1.0	17.1%
10	\$200,000 or more	22.2%	±0.9	27.4%	±1.1	33.3%
11	Median income (dollars)	108,322	±2,704	130,556	±2,709	150,772
12	Mean income (dollars)	141,427	±2,381	164,374	±3,184	184,728

data on income by county from the US Census

## Features

01. Income
02. Age (Elderly)
03. Population Density
04. Uninsured Population

## Relative Demand Score

- Unit demand per person
- Scaled from 1 - 100
- Average of all four features

## Data Sets

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### 01. Income

- [Income per county in California](#)
- [Income in CA](#)

### 02. Age

- [Population by race + sex + age](#)

### 03. Population Density

- [Population by race + sex + age](#)
- [County size in square mileage](#)

### 04. Uninsured Population

- [Percent uninsured \(education, income, etc\)](#)

# Creating a Score

```
1 incomes = incomes.set_index("Label").loc["Mean income (dollars)",:].filter(regex=".*Households!!Estimate")
1 incomes = incomes.to_frame()
1 incomes = incomes["Mean income (dollars)"].str.replace(",", "").astype(int)
1 standard_dev = incomes.std()
2 standard_dev
32799.81948999224
1 def scoring(value):
2     return (value - 113563)/standard_dev
1 incomes = incomes.apply(scoring)
```

01. Clean up the data

02. Calculate standard deviation

03. Use the STD to calculate a z score

Alameda County	0.849517
Butte County	-0.667016
Contra Costa County	1.000737
El Dorado County	0.156037
Fresno County	-1.127750
Humboldt County	-1.118390
Imperial County	-1.509551
Kern County	-1.155311
Kings County	-1.252812
Lake County	-1.390374
Los Angeles County	-0.289636
Madera County	-0.913816
Marin County	2.043426
Mendocino County	-1.275342
Merced County	-1.037811
Monterey County	-0.349301
Napa County	0.516344
Nevada County	-0.482289
Orange County	0.415033
Placer County	0.343904
Riverside County	-0.548753

## Future Improvements



Implement machine-learning and feature selection method to incorporate more relevant factors to serve as drivers— improving the model's accuracy

Incorporate disease-specific factors such as mortality and infection rate for COVID19 to create models more relevant to the current pandemic

Work on backend of Figma app so end-users can use its function readily