

CoviTrac

W200 - Summer 2021
Final Project

Prakash

Eric

Sharat

Where are
we as a
Nation with
Covid-19

Table of Contents!



Research Questions

Covi-Trac research questions

Trends

Vaccinations, Cases, Deaths Trends



Correlations

Correlation of Cases, Deaths, Vaccinations, Hospitalizations

Double Click on CA trends

A deeper look at California trends

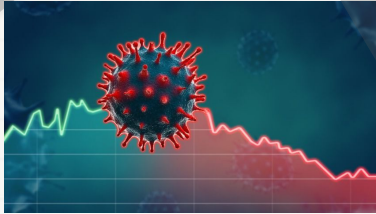
A graphic of a spiral-bound notebook with a white page, a red cover, and a green background. The page has a spiral binding at the top. On the left side, there are two horizontal rectangular tabs, one yellow and one orange. In the center of the page, the number '01' is displayed in a large, bold, black font, enclosed within a light green circular arrow that points clockwise. Below this, the text 'Research Questions' is written in a bold, dark red font. Underneath that, the text 'Let's Go-over CoviTrac Research Questions' is written in a smaller, black font.

01

Research Questions

Let's Go-over CoviTrac
Research Questions

Research Question - 1



Where are we as a nation with Covid-19?

- What is the nation's progress on vaccinations?
- How is each state doing?
- What % of people in each age bracket have received Covid-19 Vaccinations?
- Compare vaccination progress by state?
- What do the long-term and short-term trends in cases and deaths tell us?
- When and why did peaks and valleys occur?

Research Question - 2



Correlations

What is the data telling us?

- Understand the correlation between cases and vaccination rates
- Understand the correlation between daily cases and daily deaths
- What is the data telling us about Delta variant?
- Explore select counties in CA for differences

Datasets

Covid Vaccinations in the US

Source: CDC



Cases and deaths by state overtime

Source: CDC



CA state wide cases, deaths, tests

Source: CA Gov Open
Data Portal



CA state wide hospitalization

Source: CA Gov Open
Data Portal



CA state wide vaccinations

Source: CA Gov Open
Data Portal



Steps to Analyze The Questions





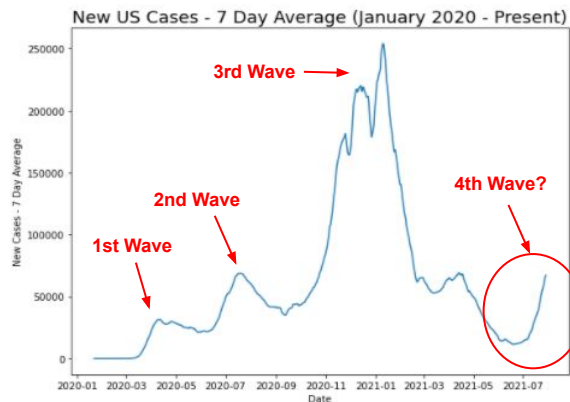
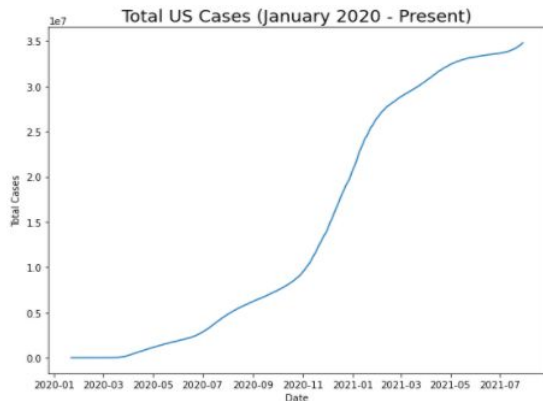
02

National Trends

Let us understand the
National Trends in Cases,
Deaths, and Vaccinations

United States Covid-19 Pandemic: Cases & Deaths

Cases



Total US Cases: **34,818,278**

Total US Deaths: **610,264**

First Wave: **April 2020**

- Peak Daily Cases: 35,058 cases / day
- Peak Daily Deaths: 2,706 deaths / day

Second Wave: **July 2020**

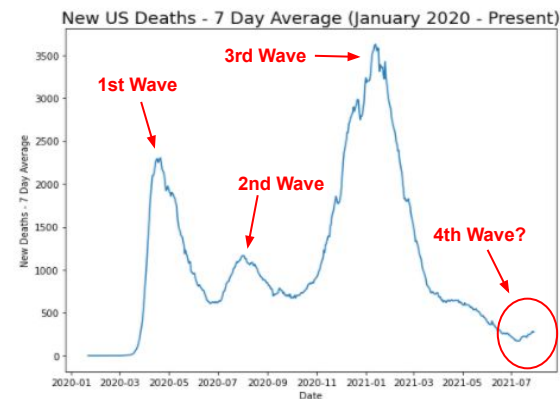
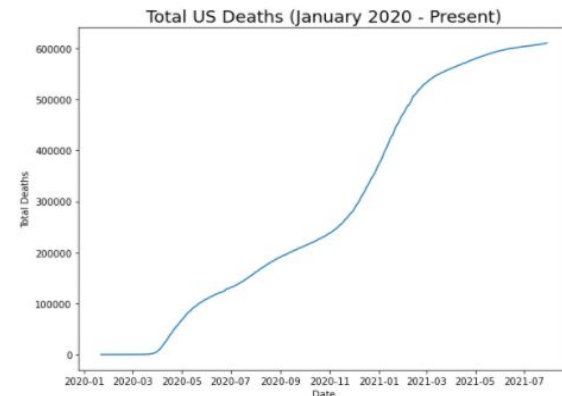
- Peak Daily Cases: 79,332 cases / day
- Peak Daily Deaths: 1,376 deaths / day

Third Wave: **Dec. 2020 - Jan. 2021**

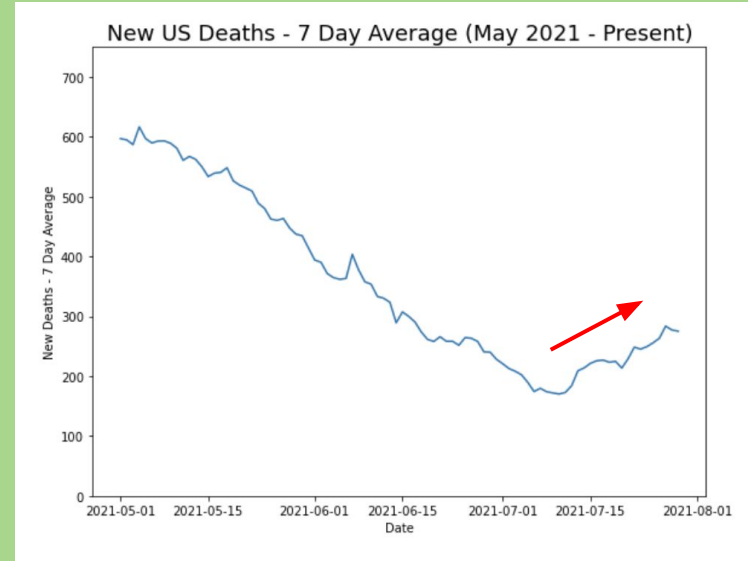
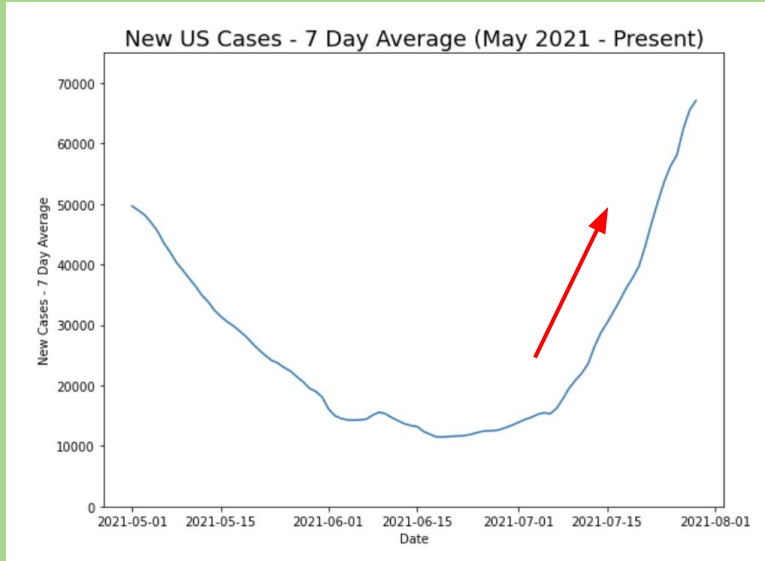
- Peak Daily Cases: 295,872 cases / day
- Peak Daily Deaths: 4,593 deaths / day

Fourth Wave: **Are we currently experiencing a Fourth Wave?**

Deaths



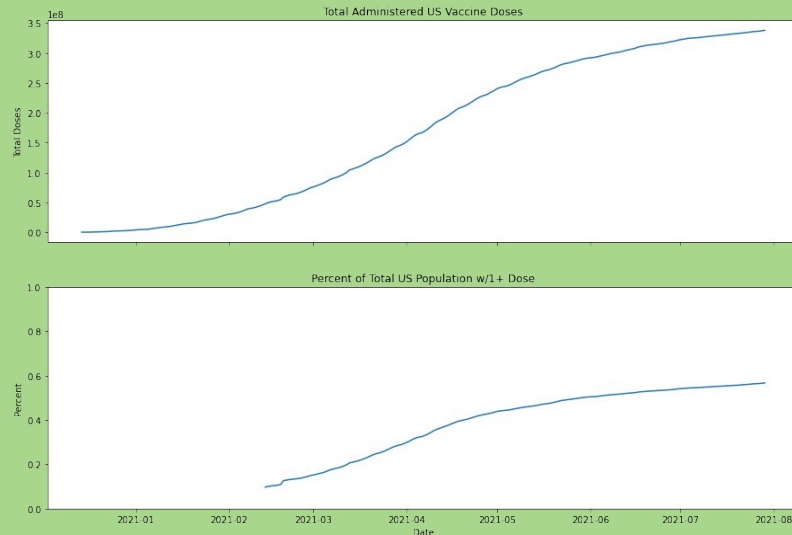
United States Short Term Trends (last 3 months)



Recent months have shown a resurgence in Covid-19 cases and deaths. The CDC has attributed the increase in infections to the spread of the new **Delta Variant**.

United States Covid-19 Vaccination Trends

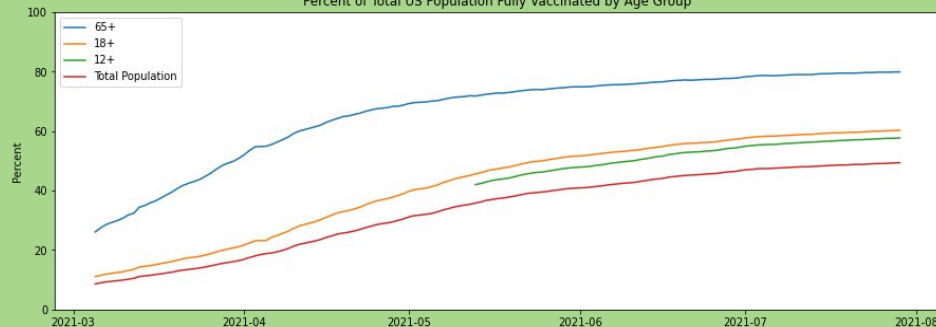
Covid-19 Vaccine Doses Administered Over Time
(December 2020 - Present)



Doses Administered & Vaccinated Individuals:

- Total Vaccine Doses Administered: **337,941,314**
- Percent of US with 1+ Dose: **56.64%**
- Total Fully Vaccinated Individuals: **160,535,336**
- Percent of US Fully Vaccinated: **49.40%**

Percent of Total US Population Fully Vaccinated by Age Group



Percent of US Fully Vaccinated by Age Group:

- Total Population: **49.40%**
- Individuals Aged 65+: **79.90%**
- Individuals Aged 18+: **60.30%**
- Individuals Aged 12+: **57.70%**

Target Herd Immunity: 70 - 80% of Population

State-Level Differences in Vaccination Rates

	State	Percent Fully Vaccinated	Vaccines Distributed per 100k
1	VT	67.4	152110
2	MA	63.7	144883
3	ME	63.4	142153
4	CT	63.1	137907
5	RI	61.3	147143

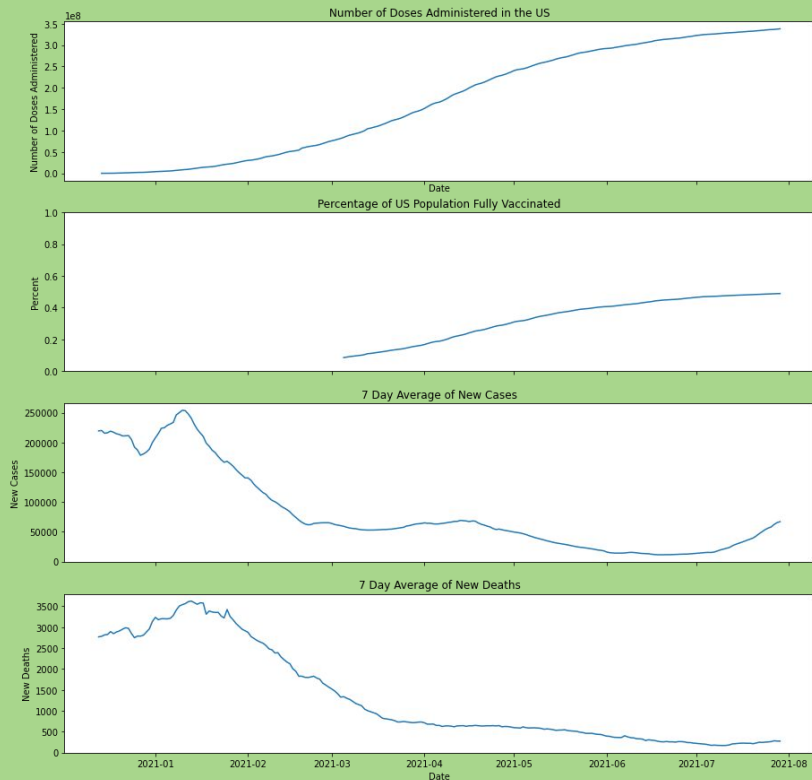
	State	Percent Fully Vaccinated	Vaccines Distributed per 100k
47	LA	36.8	92111
48	WY	36.6	91039
49	AR	36.2	98991
50	MS	34.4	93603
51	AL	34.2	103006

Top 5 vs Bottom 5 States by Vaccination Rate:

- There are substantial differences in vaccination rates by state:
 - **Vermont** has the **highest rate** of **67.4%**
 - **Alabama** has the **lowest rate** of **34.2%**
- All 5 of the states with the highest vaccination rates are from the Northeast Region of the United States
- All 5 of the states with the lowest vaccination rates are from the Midwest and Southern Regions of the United States
- In order to achieve “herd immunity” levels of national vaccination, vaccination rates must increase in the regions of the United States where vaccine hesitancy is strongest.

Correlating Vaccinations with Cases & Deaths

Covid-19: Vaccinations vs New Cases vs New Deaths over Time
(December 2020 - Present)



	US New Cases 7-Day Avg	US New Deaths 7-Day Avg	US Percentage of Population Fully Vaccinated
US New Cases 7-Day Avg	1.000000	0.936966	-0.766211
US New Deaths 7-Day Avg	0.936966	1.000000	-0.866682
US Percentage of Population Fully Vaccinated	-0.766211	-0.866682	1.000000

Cases, Deaths, and Vaccinations since December 2020:

- Covid-19 Cases and Deaths are highly correlated (0.94).
- Cases and Deaths have decreased as Vaccinations have increased.
- Vaccinations are more strongly correlated with deaths (-0.87) than with cases (-0.77).

The Path to Defeating the Coronavirus:

- The Covid-19 Vaccines are highly effective at preventing infections and especially hospitalizations and deaths.
- Continuing to improve vaccination rates across all age groups and all geographic locations is the key to ending the Covid-19 pandemic.

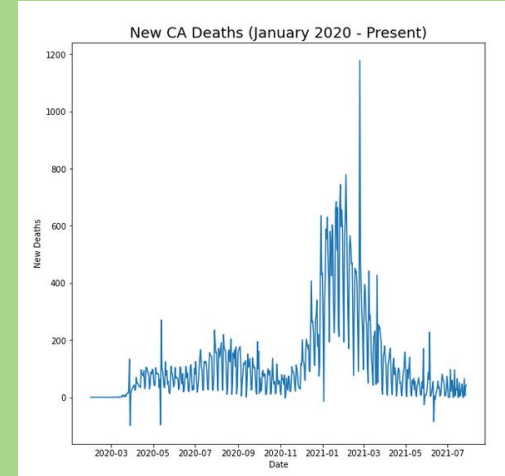
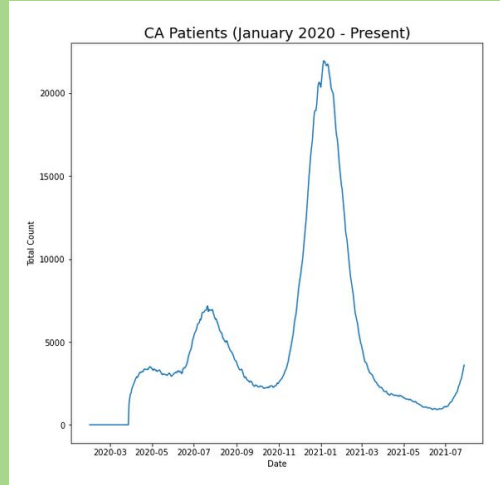
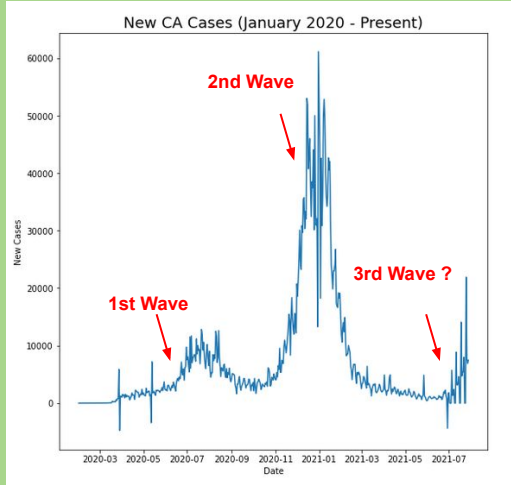


03

California Trends

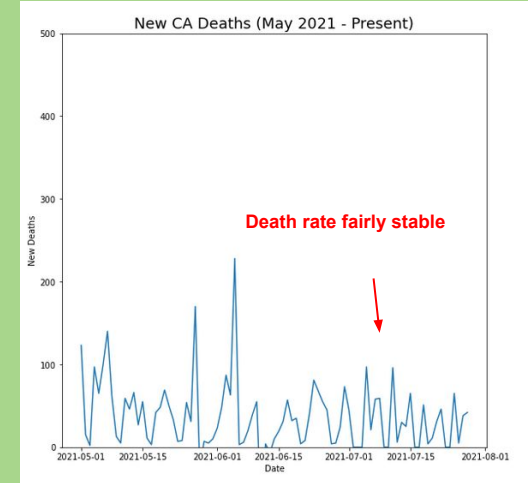
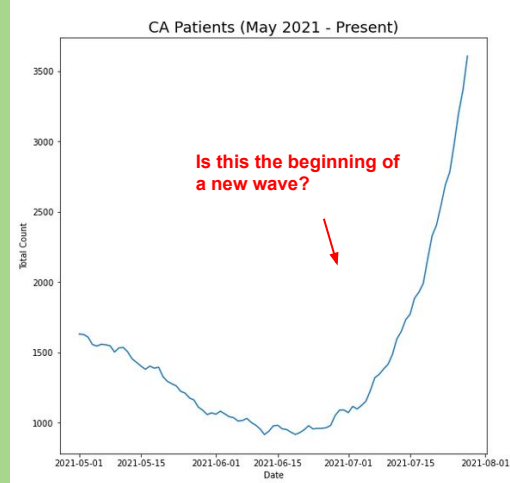
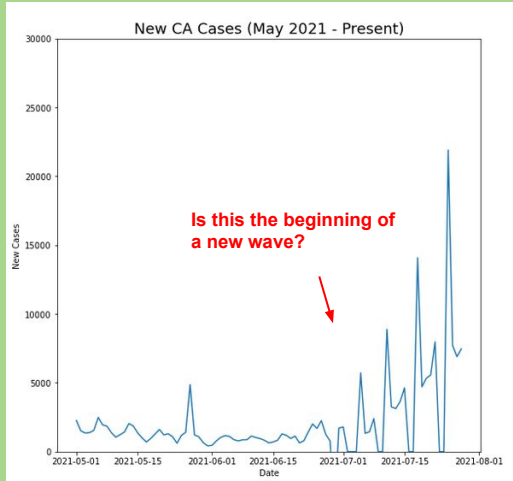
Let us deepdive into CA
trends

CA Long Term Trends



- Covid case To-Date: **3.84 million**
- Covid deaths To-Date: **63,935**
- Covid tests To-Date: **73.56 million**
- Fully vaccinated: **20.85 million**
- % of population fully vaccinated: **51.95% compared to US: 49.40%**
- Ranks 18th nationally in vaccination rate
- **CA did not experience the first wave seen in the national trends**
- Are we currently experiencing a Third Wave?

CA Short Term Trends (last 3 months)



- Cases are rising
- Hospitalizations is rising
- Thanks to vaccinations deaths are yet to increase
- Path to normalcy is in peril

CA - Correlations

Correlation Coefficient from Beginning of Pandemic to Beginning of Vaccinations

	CA_new_deaths	CA_new_cases	CA_new_patients
CA_new_deaths	1.000000	0.687368	0.798619
CA_new_cases	0.687368	1.000000	0.908218
CA_new_patients	0.798619	0.908218	1.000000



Correlation Coefficient from Beginning of Vaccination to Current

	CA_new_doses	CA_new_deaths	CA_new_cases	CA_new_patients
CA_new_doses	1.000000	0.050397	-0.322475	-0.510158
CA_new_deaths	0.050397	1.000000	0.608724	-0.240624
CA_new_cases	-0.322475	0.608724	1.000000	0.742664
CA_new_patients	-0.510158	-0.240624	0.742664	1.000000

Pre-Vaccination Period

- The correlation between deaths and patients in the hospital was **high**
- The correlation between new cases and patients in the hospital was also **high**

Post-Vaccination Period

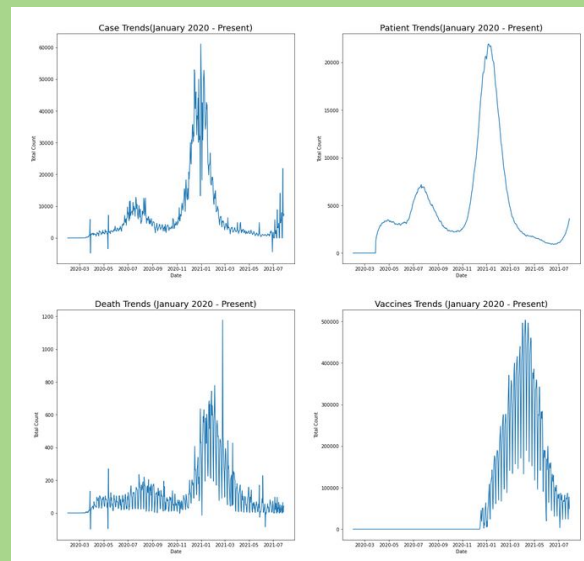
- The correlation between deaths and patients in the hospital has come **down significantly** implying vaccinations help in preventing deaths even if you are admitted
- The correlation between new cases and patients in the hospital has come **down** signifying the positive impact of vaccinations on hospitalization. Cases are not turning severe and requiring hospitalization.

California Conclusions

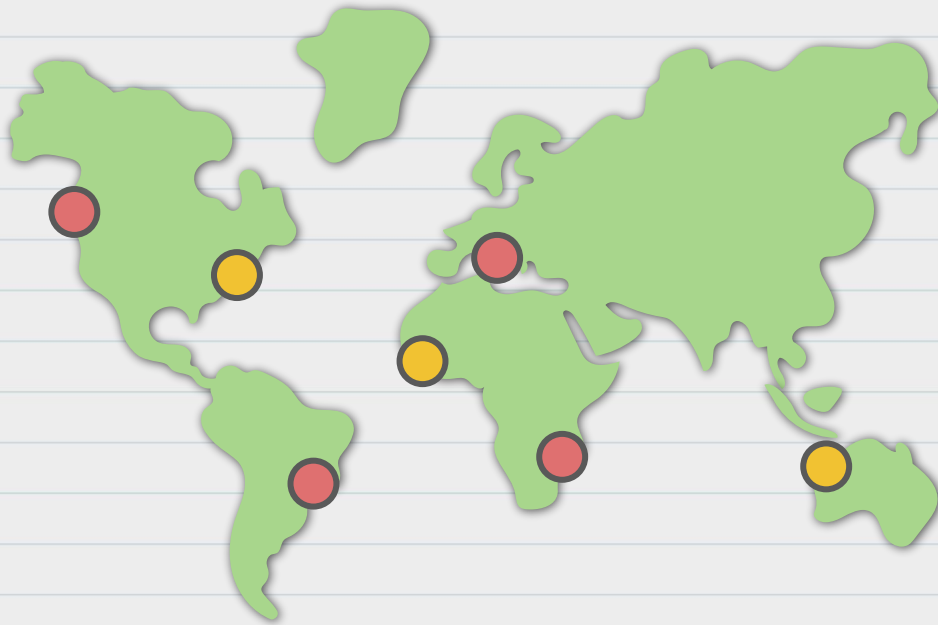
- Big disparity between counties
- Rural and smaller counties must increase vaccination rates
- Unvaccinated in big counties must increase vaccination rates
- Vaccines helps reduce new cases, prevent hospitalization and deaths
- We are at the beginning on a new wave
- Path to normalcy is hard but doable

Top Five CA County Vaccination Summary					
area	fully_vaccinated	at_least_one_dose	population	%_of_pop_fully_vaccinated	%_of_pop_atleast_one_dose
Marin	188,994	204,500	260,800	72.5	78.4
San Francisco	609,751	665,397	892,280	68.3	74.6
Santa Clara	1,324,402	1,441,527	1,967,585	67.3	73.3
San Mateo	517,568	568,621	778,001	66.5	73.1
Contra Costa	743,216	799,163	1,160,099	64.1	68.9

Bottom Five CA County Vaccination Summary					
area	fully_vaccinated	at_least_one_dose	population	%_of_pop_fully_vaccinated	%_of_pop_atleast_one_dose
Modoc	2,954	3,190	9,475	31.2	33.7
Mariposa	5,275	8,061	17,795	29.6	45.3
Tehama	19,437	21,763	65,885	29.5	33.0
Kings	44,067	52,374	156,444	28.2	33.5
Lassen	6,060	6,716	30,065	20.2	22.3



CoviTrac - Time Series Demo



Thank You

Prakash

Eric

Sharat