Final Project Report
Abhi Wagh

Figures

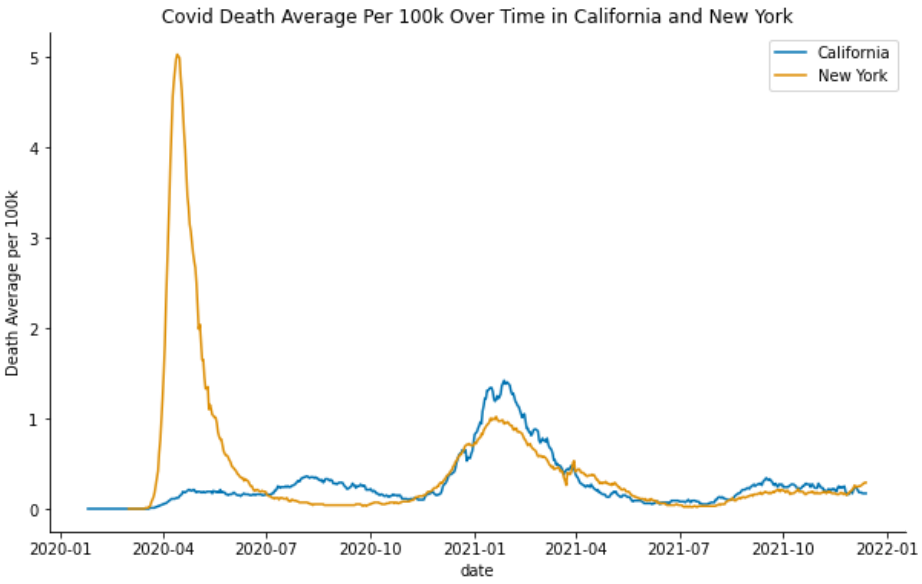


Fig. 1: COVID Death Average Per 100K Over Time in California and New York- This figure shows the average number of deaths per 100 thousand people for each California and New York. There is a large peak in April 2020 for New York that flattens out until it re-increases around February 2021. California's major peak is around the same time as New York's 'second wave.' Lastly, cases seem to be going up in December 2021 in New York and staying relatively constant in California.

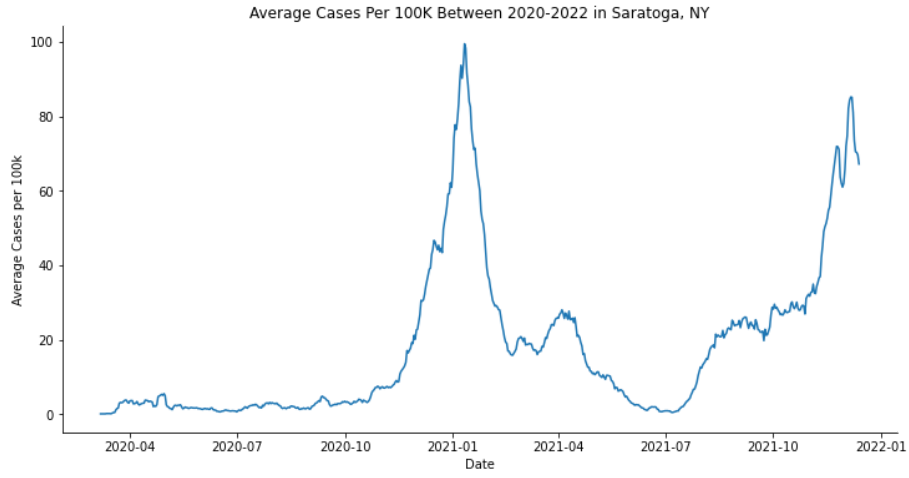
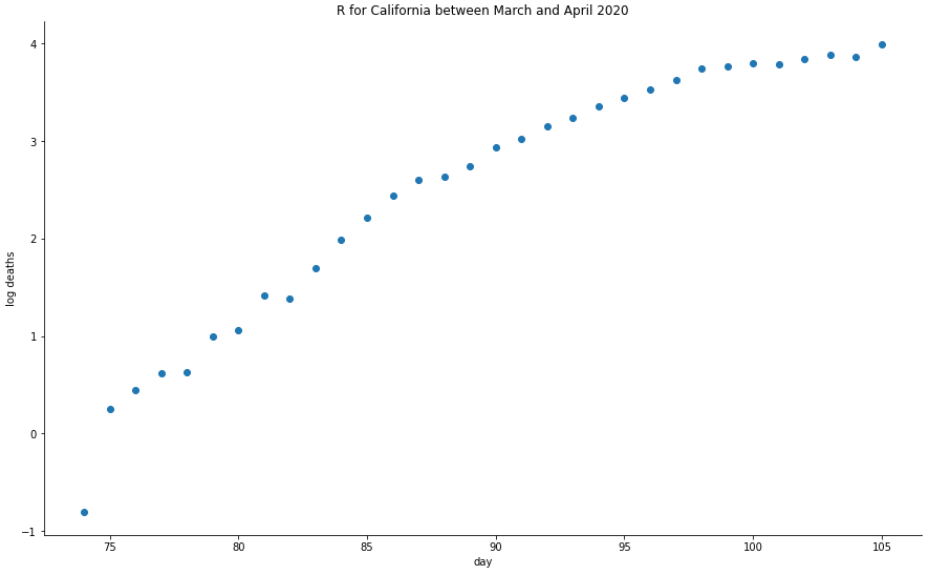
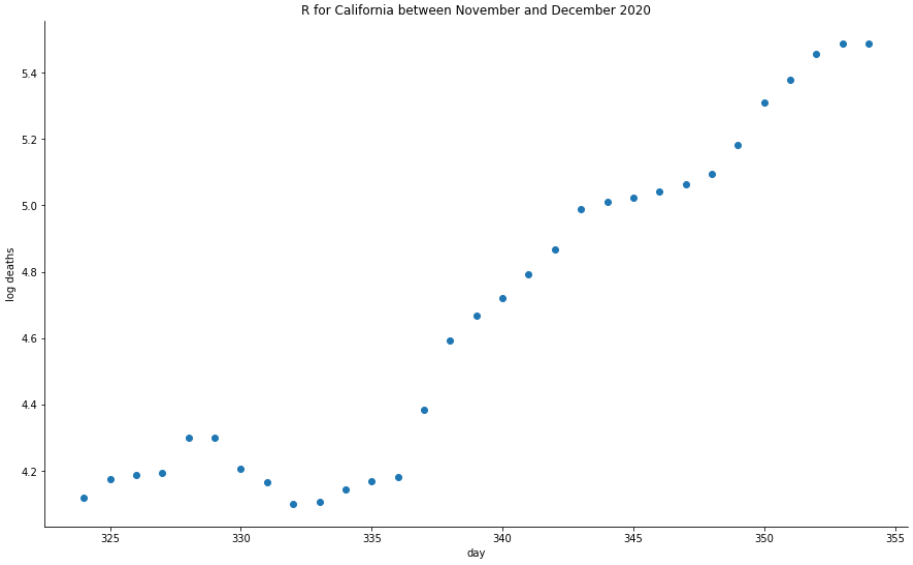


Fig. 2: Average Cases Per 100K Between 2020-2022 in Saratoga, NY- This figure shows the average number of cases per 100 thousand people in my hometown, Saratoga, New York. For us, the largest peak was in January 2021 and currently in December 2021.





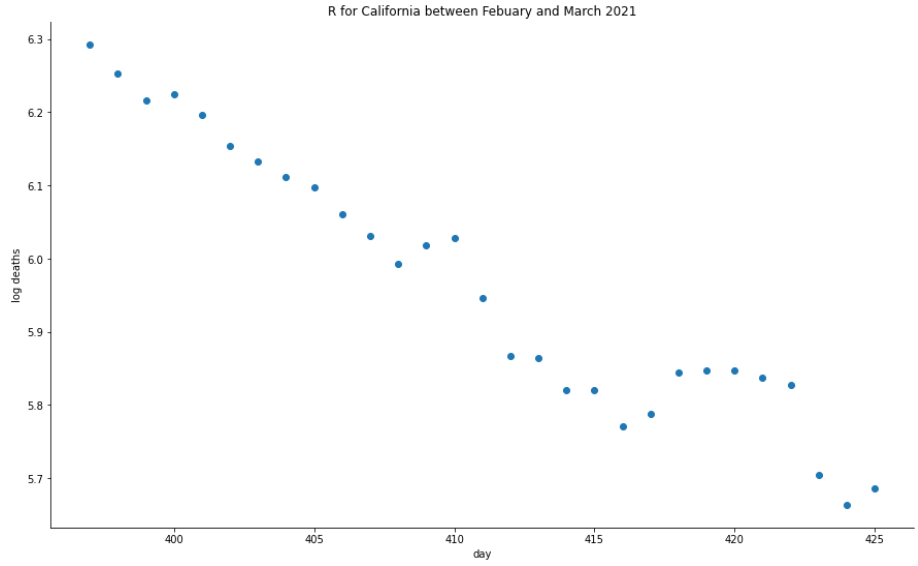
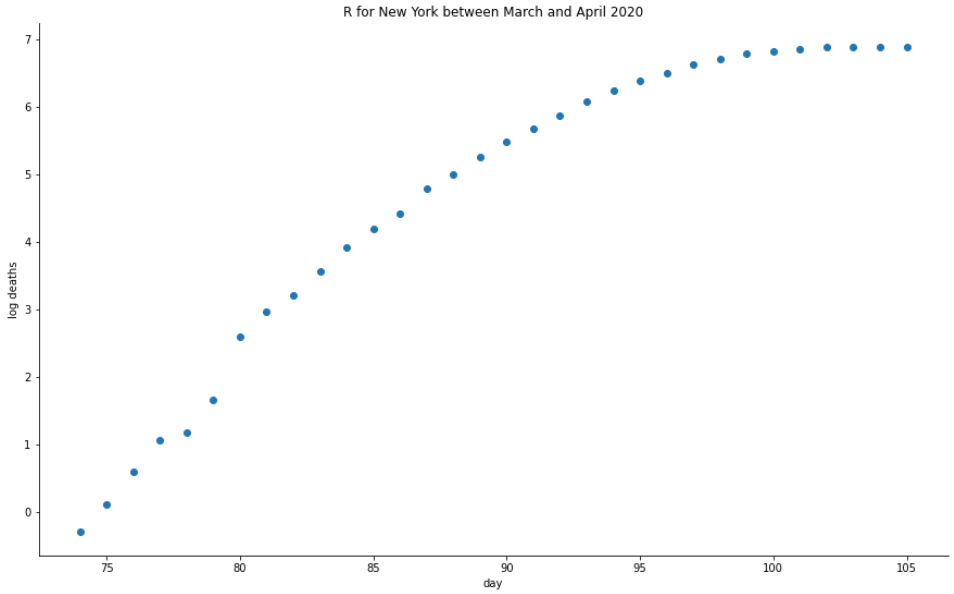
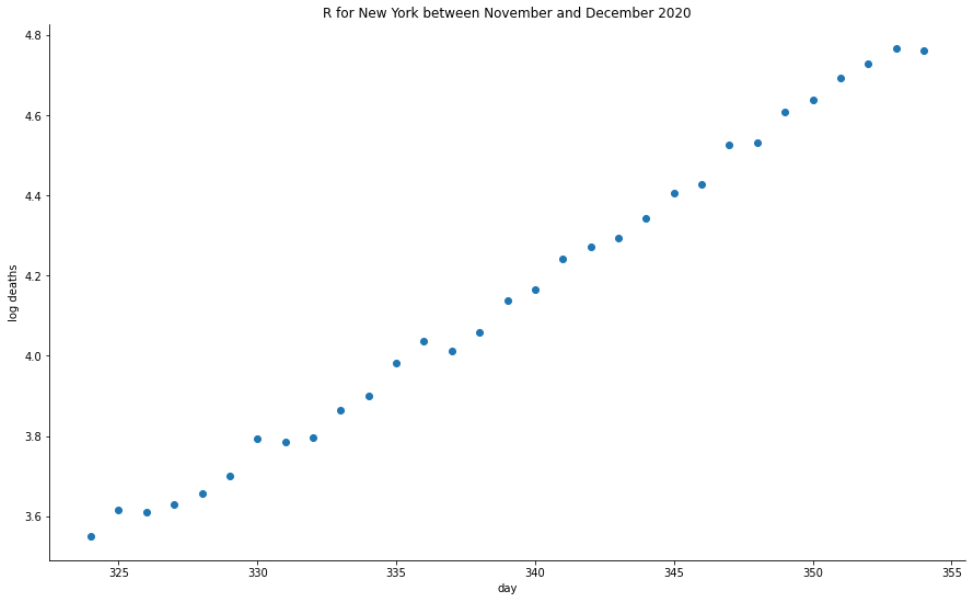


Fig. 3: R for California between 3/20-4/20, 11/20-12/20, and 2/21-3/21- This figure has 3 subplots and shows how R went up high for the first 2 time periods and starkly decreased in the last time period.





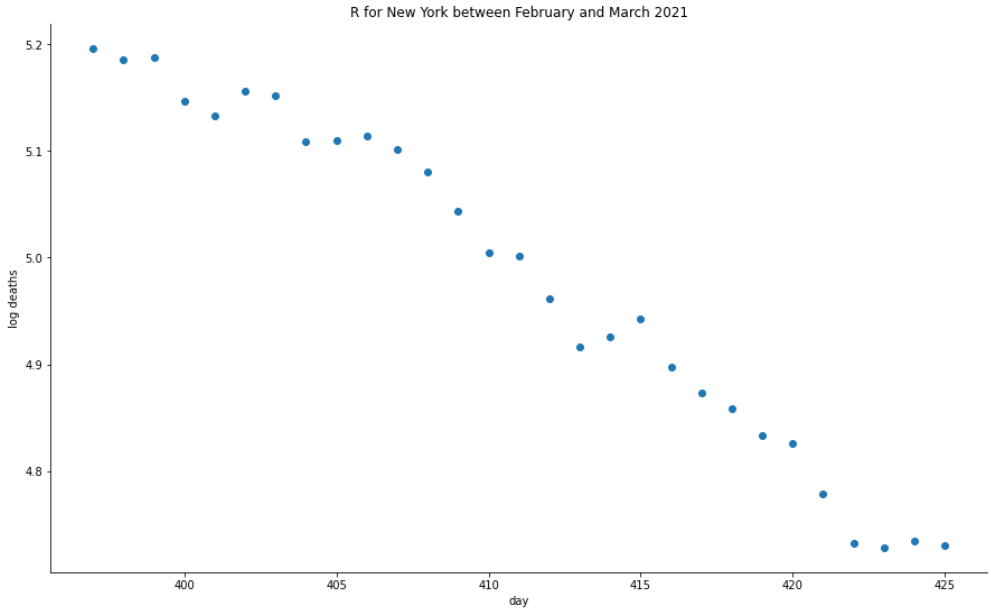


Fig. 4: R for New York between 3/20-4/20, 11/20-12/20, and 2/21-3/21- This figure is very similar in its trends to Fig. 3 showing R data for California. This shows how COVID infectiousness was very high at the start and end of 2020 and how in early 2021 it decreased starkly, likely due to the implementation of vaccines.

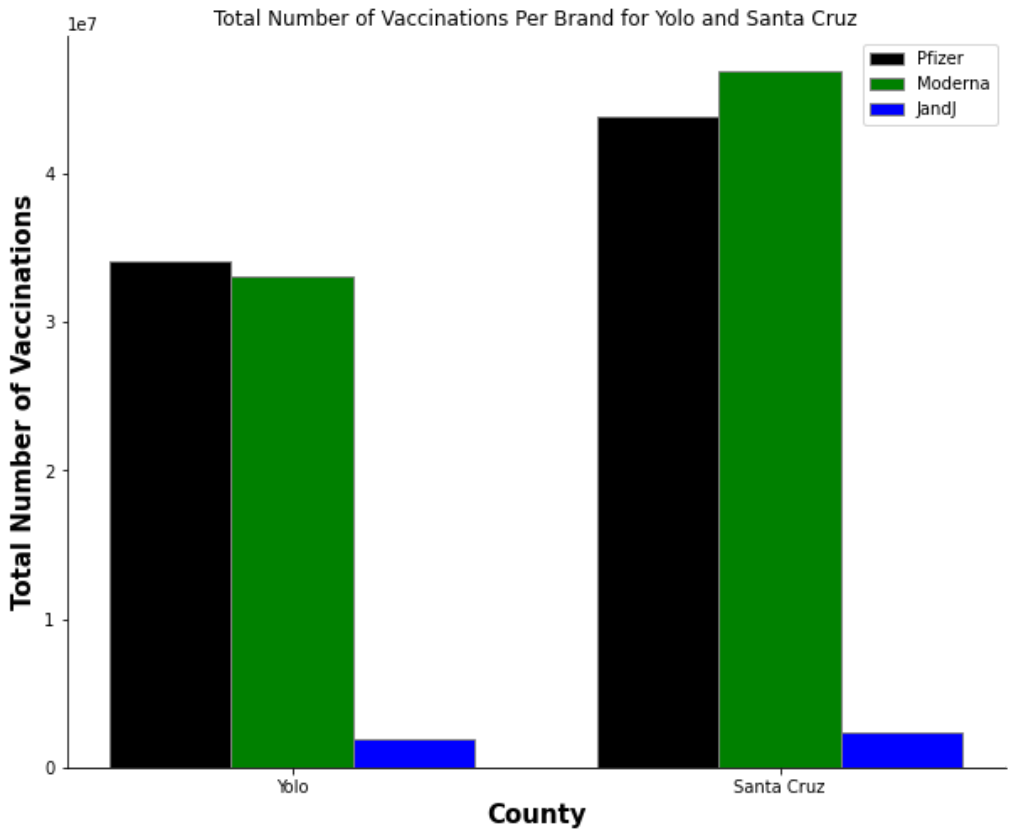


Fig. 5: Total Number of Vaccinations Per Brand for Yolo and Santa Cruz (from 7/27/20-12/12/21)

Part A

COVID at the national level likely looks different from COVID at the local level, as there are many parameters that factor in. Parameters such as geographical location, population size, access to resources like hospitals, and overall health are only some of the factors that impact COVID infection rates. At the national level, since there are far more people than at a local level, the numbers and trends will certainly deviate in terms of magnitude. Fig. 1 shows data for two states, California and New York. At the very start of the pandemic, California has about an average of 0.2 deaths per 100K people, whereas New York has an average of 5 deaths per 100K people. That's a stark difference between states, which is more local than the national level. The R value for California decreased from 1.97 to 1.29 to .90 over those three given time periods listed in Fig. 3. The R value for New York decreased from 3.20 to 1.24 to .91 over the same time periods also listed in Fig. 4. It's likely social distancing and mask mandates caused the initial decreases between the first two time periods, and the continuation of those protocols with the addition of vaccine distribution en masse helped the R value decrease more in the last time period in 2021.

The past year and a half in Contra Costa shows how the first wave of COVID wasn't comparatively as high in case numbers or deaths compared to the second wave in January/February 2021. However, as vaccinations picked up in number, the cases and deaths on average decreased and stayed constant for about 2 months. And in December 2021, the

cases are starting to go up again even though vaccination rates are high. This is likely because of various factors. The main factors are likely that new variants have arisen, such as Delta or Omicron that don't look like the initial strain(s) of COVID that were infecting the public and the ones the vaccines were designed to provide immunity against. Additionally, social distancing and mask use is still occurring, but not strictly as before, because travelling and small to large sized family/friend gatherings are once again allowed. Lastly, there is still a subset of the US population that refuses to get vaccinated, which can allow viruses to survive, adapt, and mutate more effectively as well.

Part B

Vaccines have been an integral part of decreasing COVID infection rates and allowing most Americans to return to some semblance of 'normal.' My partner and I were curious about how the different brands were distributed between 2 counties of similar population size (to keep that variable constant). We used data from the county_vax dataset for the counties of Yolo and Santa Cruz. Both counties have similar population sizes as well as are both college towns. In Fig. 5, the bar graph shows how the number of J&J doses given out across both counties was very low, compared to Pfizer and Moderna. This could be due to the fact it was a one-dose vaccine, and there was also news that came out after distribution began that this vaccine may not be as effective as those of the other two brands. Additionally, in Yolo County, the number of Pfizer and Moderna doses distributed are very close in range, about 3.3E7 and 3.2E7, respectively. The Santa Cruz data shows that the highest number of doses given out in the county were of Moderna, at about 4.8E7. This data shows a possible correlation between vaccine doses given per brand per county and how many vaccines were distributed from manufacturers according to brand to each county. However, this is not necessarily directly related, as other factors such as patient choice, doses of other brands expiring, new research coming out later about J&J's decreased efficacy, etc. definitely factor in. More research and analysis would need to be done to account for these confounding variables.