

Visualization Explanation

The visualization shows the change points in the time series data for changes in daily confirmed cases data in Maricopa county in Arizona state in the United States. The X-axis represents the day of the data point. The Y-axis represents the daily infection rate change. The X-axis essentially did not require any pre-processing as the data available seemed complete and accurate. The Y-axis was derived using the confirmed cases data provided by [John Hopkins Hospital](#). We took this value, then calculated the daily infection rate change by calculating the change/slope over the cumulative cases given by the data. The colors of the data points show the national-level masking policy by the CDC (as indicated in the legends) and the blue vertical lines indicate the change points calculated using the Pelt Search method. The best way to read the graph for the viewer is to go from left to right and see how a change in masking policy was causing a change point in the data after almost 1 month in at least 2 instances. The graph is also indicative of the fact that the CDC changed the policies to less strict ones when these infection rate changes were negative and more strict ones when the other way round.

The primary reason we use CDC guidelines as the masking policy is that the data obtained from [CDC Policy Surveillance](#) shows there were no mask mandates established by the state of Arizona in any of the counties, let alone Maricopa County. The initial intuition was to use the voluntary mask data but it would be unfair to generalize the data obtained from a 2-week survey to a very large timeframe. The voluntary masking survey shows us that 73.4% of the people in Arizona always wore masks and 95% of people wore masks more than sometimes. This timeframe (July 2 - July 14) was when CDC had nationwide guidelines for wearing masks. So, technically our assumption is people in the county were following CDC guidelines religiously without a state mandate. Hence, we use CDC guidelines as the basis of the analysis. Following are the dates for the masking policy changes ([Source](#)):

- First Mask Mandate - 3rd April 2020
- Mask mandates removed - 1st January 2021 (Only closed spaces required)
- Next mask mandate - 1st February 2021 (All places)
- Mask mandate removed - 10th June 2021 (Only closed spaces required)
- Mask Mandate closed spaces removed - 25th February 2022

Overall, we see that the mask policies were changed during the increase in cases or when they just started to drop. The masking policies did actually help show some difference in daily infection rate reduction with almost a month's delay. One important thing to note here, is we do not consider hospitalizations, herd immunity, recovery, or other implicit factors in our analysis. One interesting finding is that after vaccines (Late December 2020) were available, the CDC changed to a closed-space masking policy but still saw an increase in cases reason being people traveling across states during Christmas and New Year. But as we see the 4 months following that had stricter masking policies but with more people getting vaccinated the infection rates dropped and masking policies were made less strict. In summary, if we stick to the timeframe of our research question from February 1, 2020, to 1st October 2021, we see that masking had some impact on daily infection rates with a 1-month delay. This delay includes infection, COVID-19 reports, and case count actually fed-to-database delay.