The plot displays the pivot points in the time series data for changes in the daily confirmed case data for New Haven County in the Connecticut state. The day of the data point is shown on the X-axis. The daily change in infection rate is shown on the Y-axis. Basic pre-processing for the X-axis was performed because the data seemed precise and full, only the date conversion is done to represent in the timeseries format. The data on confirmed cases provided by John Hopkins Hospital was used to create the Y-axis. Using this value as a starting point, we computed the gradient across the total cases provided by the data, which allowed us to determine the daily infection rate change. Further we use the joined masks data from the CDC mask mandating data to obtain a single data view for each day containing the number of confirmed cases, mask mandating in the county and the rate of infection which is derived from the number of confirmed cases. We have represented the masking data using red/green background fill in the plot. This data had few missing values, where are assumed as no mask mandating during that time period. We calculated the policy change dates and used them to plot the policy at a given date. This resulted in a total of three bands – initial stage when there is not mask mandating, intermediate stage where the mask was mandatory as per CDC, the later stage where the masks are not mandatory.

To algorithmically detect the change points in our time series data, ruptures module is used. This enabled us to obtain the exact dates where there is a significant change in the rate of infections. These dates are plotted in the visual as bright red vertical lines that clearly portray the raise/fall of infection over time. This data when combined with the mask mandating data, we can draw interesting finding that are discussed below. We see that masks are mandated between 2020-04 and 2021-08. When the masks were initially mandated, we see a significant change in the infection rate, however, there is a peak in between which might be due to the new variants resulting in higher spread. From the voluntary masking survey, we see that the New Haven County population has a 79.5% of 'Always' category in the mask status followed by 11.5% of 'Frequently' category, which comprises of about 90% of the total population. This explains a lot of data that falls after removing the mask mandating policy which is post 2021-08.

The plot shows us few interesting findings, we see the first change point around 2020-04, which was the first peak of the pandemic, which pushed the mask mandating and eventually reducing the transmission rate by second change point. The third change point shows an increase in the cases despite the use of masks, this is the peak stage of infection. At the 5th change point, we see an increase, despite that the mask mandating was removed, which might be due to the vaccination spread. At the 6th change pint, it is quite interesting to see why the masks are not mandated despite the peak infection rate at this time, will this be because people are already aware about the pandemic and have been voluntarily following the masking policy without mandating. In summary, we see a major drift in the infection rate during the initial months of the infection, however as we progressed there are many other variables like vaccination, public awareness, remote work etc. that effected the infection change which does not show much correlation with the masking policy.