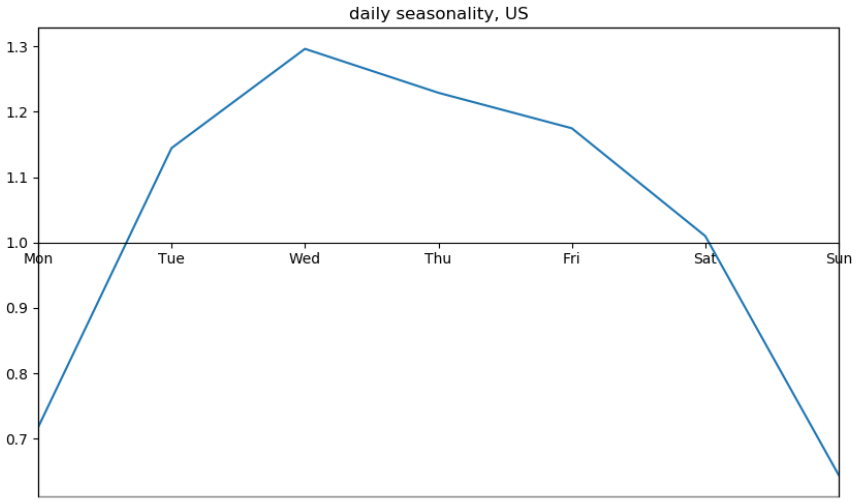
15 June 2020

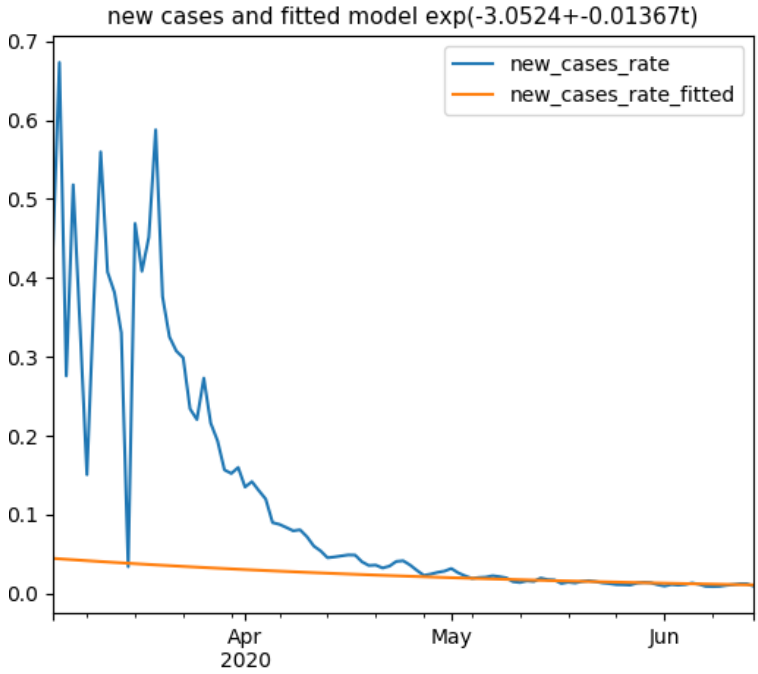
Allowing for new cases seasonality in COVID-19 deaths projection

In the original article, *'Squashing the sombrero - negative binomial model for COVID-19 deaths'*, we discussed how we hope to see the downward trend in new cases following measures to contain the spread of infection.

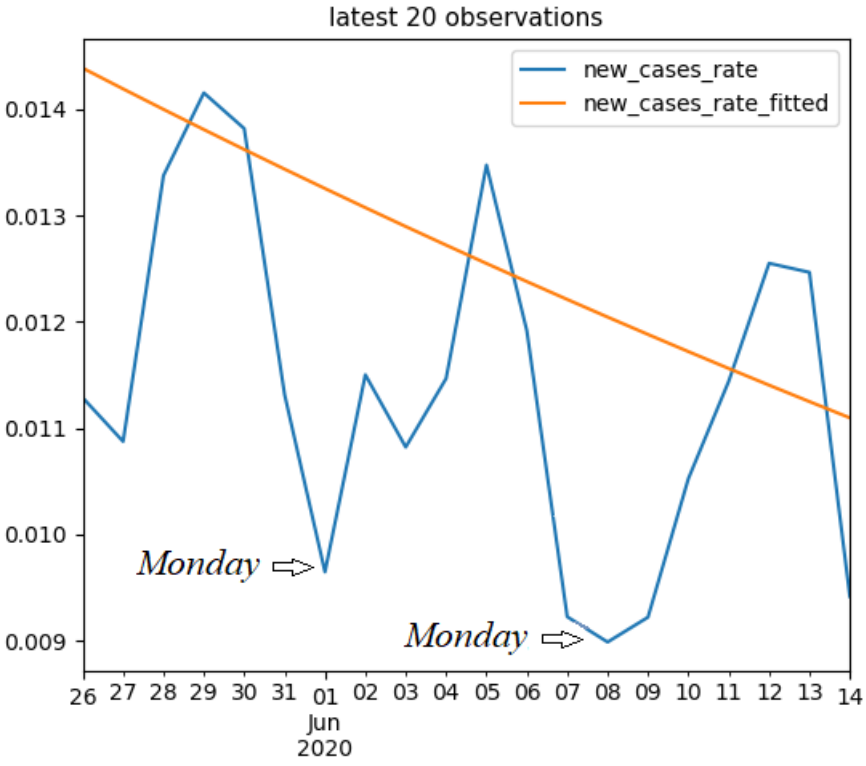
There is a clear weekday pattern in ***deaths*** reported, as the daily seasonality plot shows for the US:



Weekday seasonality in ***new infections*** has so far been ignored. An exponential curve of the form ***exp(k+βt)*** is used to project the rate of new infection. The fit for the USA as at 14 June 2020 is plotted below. :

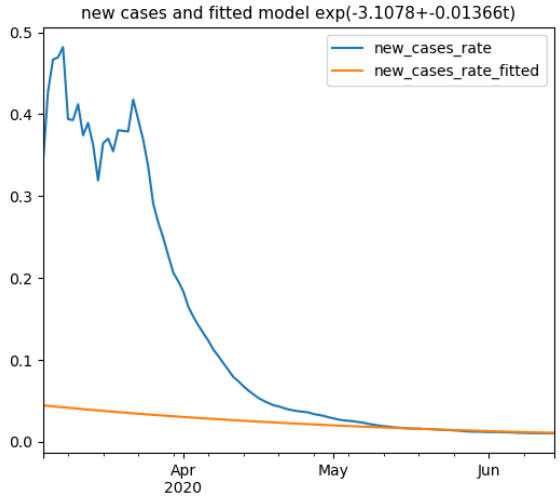


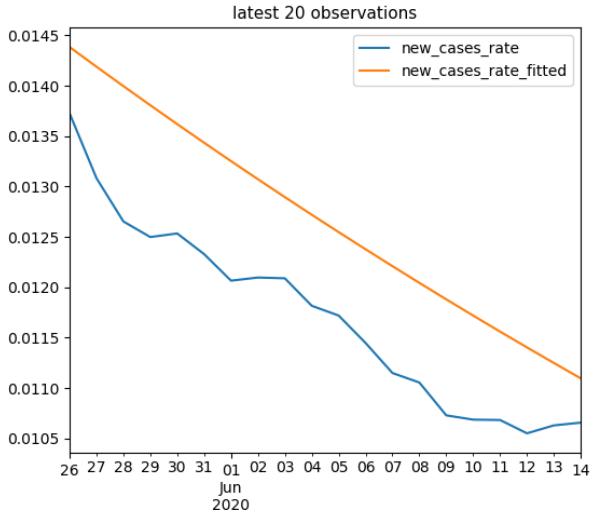
Examining the last three weeks in closer detail we see that few cases are reported on a Monday:



In order to account for this pattern in new cases, we ***now fit the new cases projection to a rolling 7-day growth rate*** in the function `find_median_halflife_days()`.

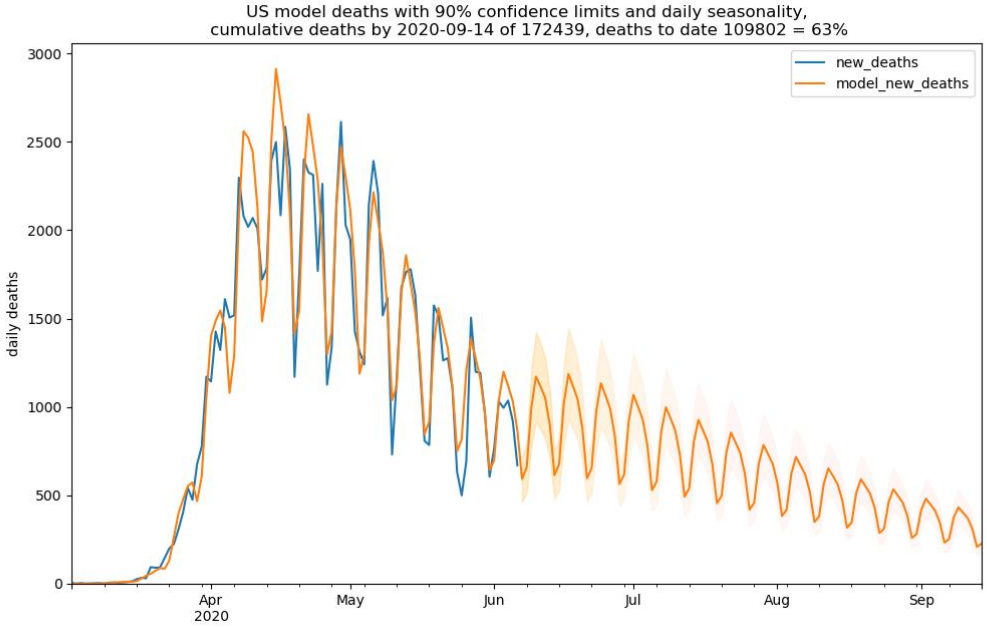
This ensures projected cases are not disturbed by the weekday reporting pattern.



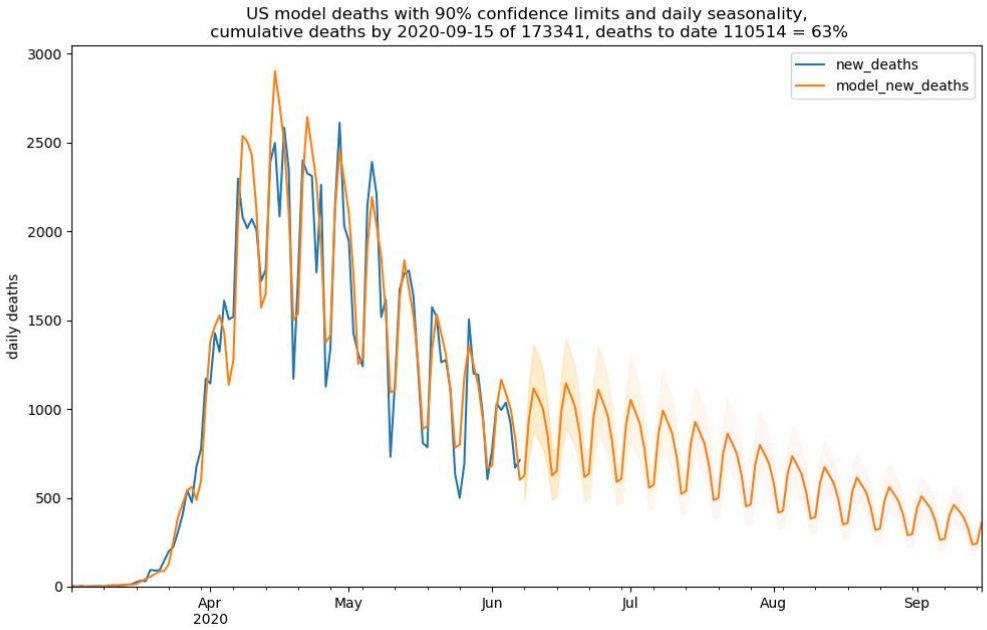


Seasonality is later applied to the pattern of projected deaths at each future date. This will reduce the spurious day to day changes caused by the weekday reporting pattern that is shown in the 7 plots below where deaths projected over the next 100 days varied by 20k without much change in the model parameters:

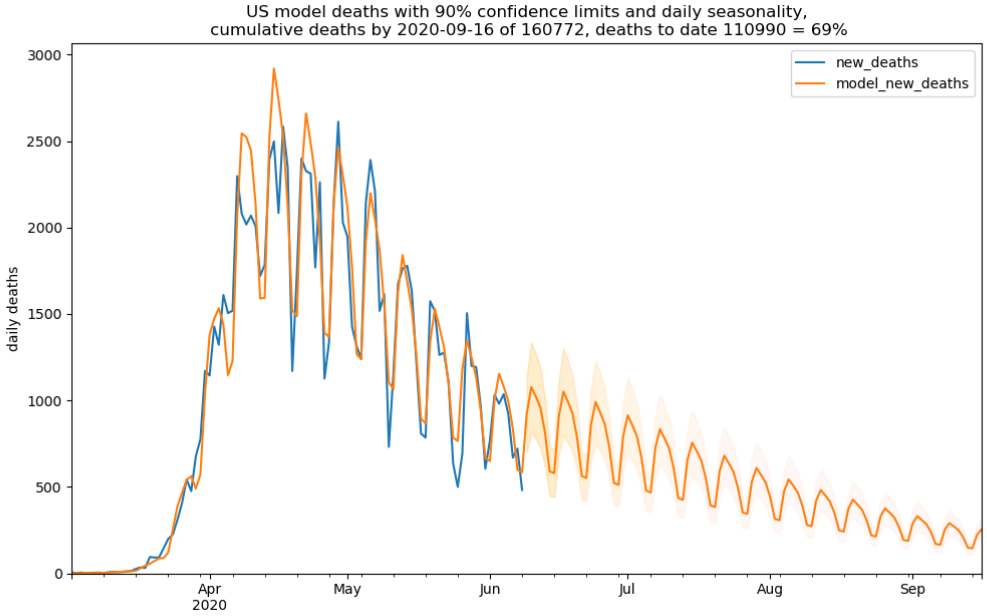
Sunday 7 June 2020, 172k deaths in next 100 days:



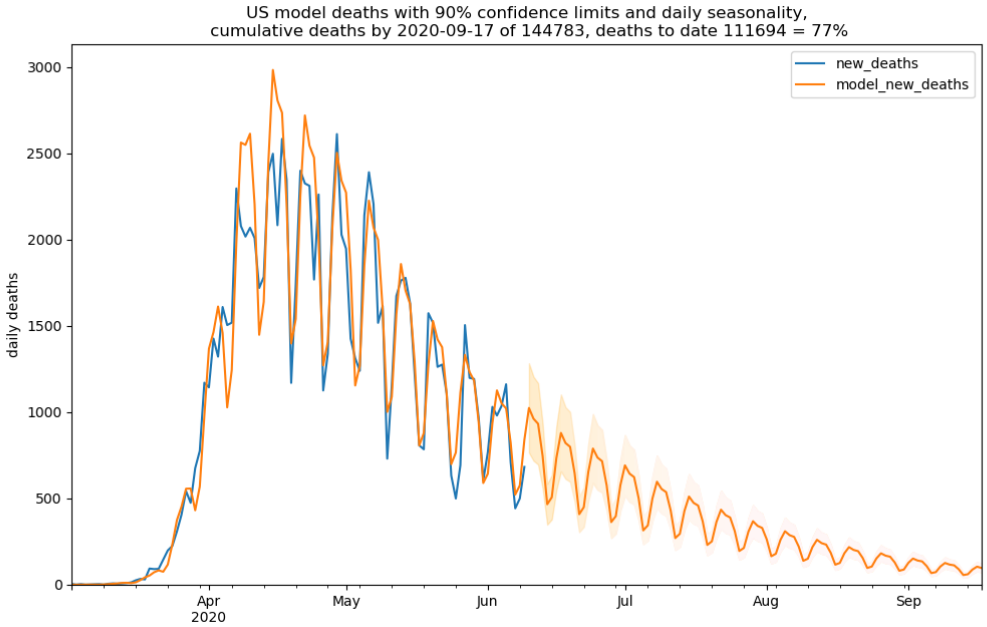
Monday 8 June 2020, 173k deaths in next 100 days:



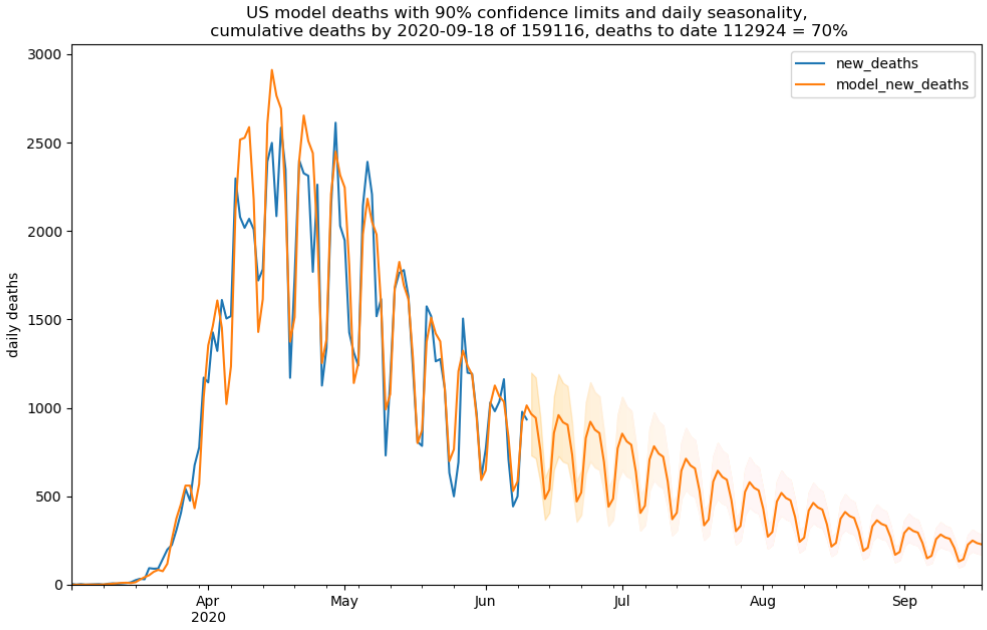
Tuesday 9 June 2020, 161k deaths in next 100 days:



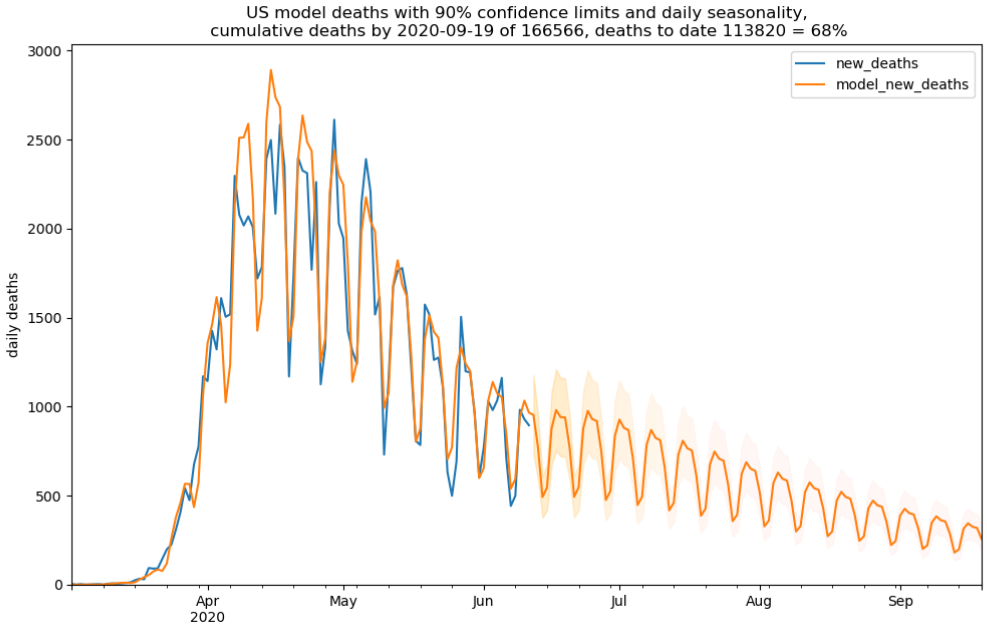
Wednesday 10 June 2020, 144k deaths in next 100 days:



Thursday 11 June 2020, 159k deaths in next 100 days:



Friday 12 June 2020, 167k deaths in next 100 days:



Saturday 13 June 2020, 176k deaths in next 100 days: