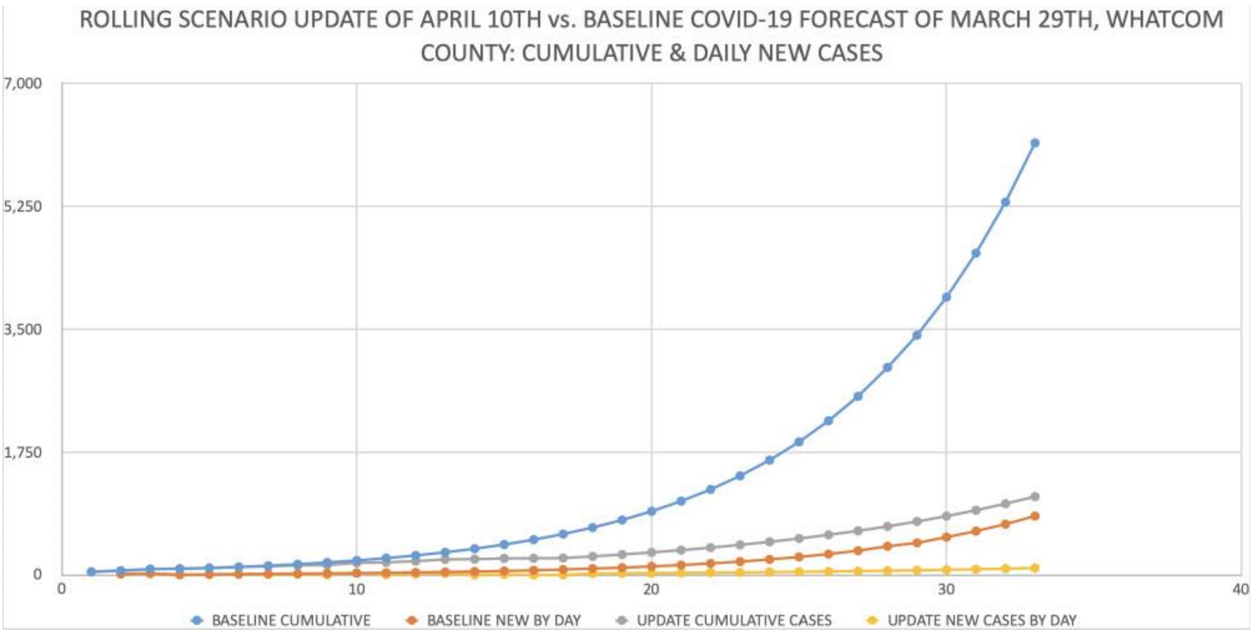

Monitoring the COVID-19 Surge Peak in Whatcom County - Update 2

By **David A. Swanson** • On Apr 10, 2020
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On March 30th, *Northwest Citizen* published **a baseline COVID-19 surge peak forecast** I did for Whatcom County. The forecast used March 28th as its launch point. It showed 6,151 total confirmed cases by April 25th, the date that this initial surge will likely peak. While the baseline reflected the social distancing and other containment measures that were proclaimed by Governor Inslee on March 25th, they had not long been in place. As such, the baseline largely represents what could be expected by April 25th in the absence of them. On **April 3rd I provided the first update,** which suggested that the social distancing and other containment measures were having the desired effect: The update showed 2,696 total confirmed cases by April 25th, a 56 percent reduction in the number of total confirmed cases.

This 2nd update shows 1,118 total confirmed cases by April 25th, of which 102 would be added on that day. Clearly, the social distancing and containment measures are continuing to drive down the total number of confirmed cases. Here is a comparison between this second update, on the one hand, and the baseline and 1st update, on the other.

As of 25 April (surge peak)	Baseline	Update 1	Update 2
Cumulative number of cases	6,151	2,696	1,118
# of new case on April 25	841	310	102
Daily rate of change	1.1584	1.1298	1.1001

Click graph to enlarge.

Keep in mind that I deliberately used a simple geometric model to do the forecasts for Whatcom County because sophisticated ones require so much data that they typically are not usable for a small area finding itself in the initial surge of a pandemic. I believe it is vital that people living in counties and small towns have some idea of what they might be facing rather than remaining in the dark. Now that more data has become available, I am moving toward a more sophisticated approach.

As I concluded in the article describing the 1st update, this second update brings welcome news. Keep in mind, however, that these new results suggest that by the time we expect this initial surge to peak, there is still a noticeable impact on the population of Whatcom County and its healthcare system. It suggests we can expect that between 715 (0.3 percent) and 1,207 (0.5 percent) of people in Whatcom County will have been infected by April 25th. With 21 deaths recorded as of April 9th and 243 confirmed cases, we can expect between 41 and 83 more deaths by April 25th.

In addition to providing this update, I am now able to give you some idea of the reliability and validity of the simple geometric models I have been using. With 17 days of data (March 24th to April 9th), I turned to a more complex model, exponential in nature, to generate a forecast. In addition to using all of the information available – the 17 days of data – the adequacy of the model can be assessed and, importantly, it generates a probabilistic forecast. This simultaneously allows us to both assess the uncertainty in the model and to assess the accuracy of the simple geometric model because the exponential model provides "prediction intervals. To get to the point, I will described the exponential model, its "goodness of fit" to the 17 days of data, and describe its prediction intervals. Those interested in more details should feel free to contact me.

The exponential model takes the following form:

Predicted number of cases = $e^{((0.0787)*((Day)-(-54.2867)))}$

Where e = 2.71828…, the base of the "natural logarithms."

*Day = number of days from the start of the data (March 24th)
for which a forecast is desired. For example, April 10th is Day 18
and April 25th is Day 33.*

The coefficient of determination (r^2) for this model is 0.94. This suggests that the model reduces the variance by 94 percent beyond what would be found if we were using the mean number of confirmed cases for the 17 days of reported observations as the expected daily number in the future. This interpretation is often expressed as "the model explains 94 percent of the variation in the variable of interest." Either interpretation suggests that the model provides a good fit to the data we have on hand.

The exponential model yields a forecast of 961 total confirmed COVID-19 cases as of April 25^{th} and the prediction interval states that with a 95 percent degree of certainty the lower limit of the forecast is 715 cases and the upper limit is 1,207 cases. Importantly, the prediction limits contain the April 25^{th} forecast provided by the simple exponential model, 1,118 confirmed COVID-19 cases. This suggests that the simple geometric model is doing a reasonable job.

A second issue to keep in mind is that the simple geometric model not only requires fewer data points to construct, but it provides a crucial piece of information that is not directly available from the exponential model, namely, the average daily rate of change (r). We can get it indirectly, however, by using its forecasted number for April 25^{th} in conjunction with the number found on March 24^{th}, the start of the base period for the baseline, update 1, and update 2. In this case, the daily rate of change is 1.0982, where $r = (961/48)^{(1/32)}$. You can see how close this is to 1.1001, the daily rate of change used in this 2^{nd} update of the simple geometric model. Not surprisingly, the difference between the two models as of April 25^{th} is small as well, only 157 confirmed COVID-19 cases, a relative difference of 16.3 percent, where 16.3 = [(1,118 – 961)/961]*100.