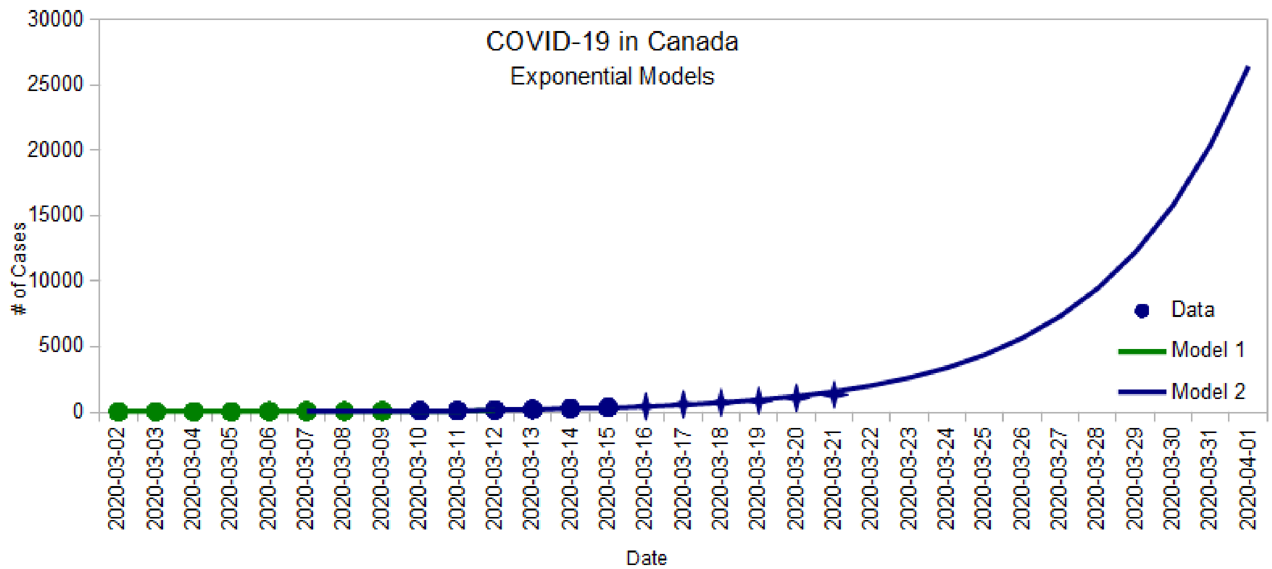
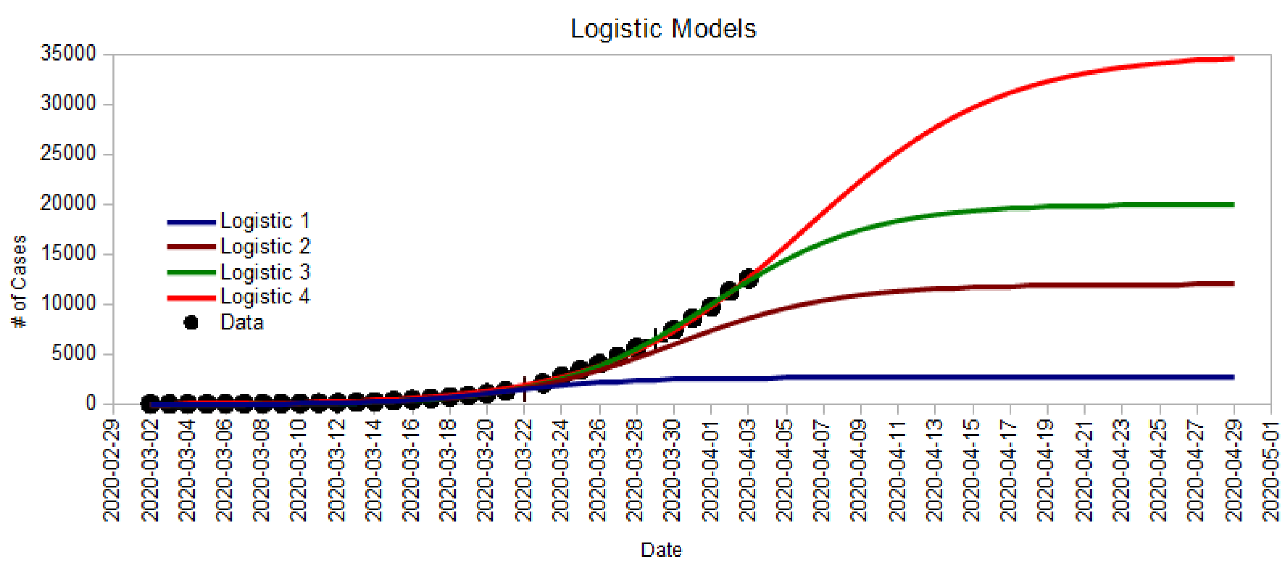
Covid-19 Spread (Part III)

A year ago, I wrote two posts looking at the Covid-19 numbers for Canada.

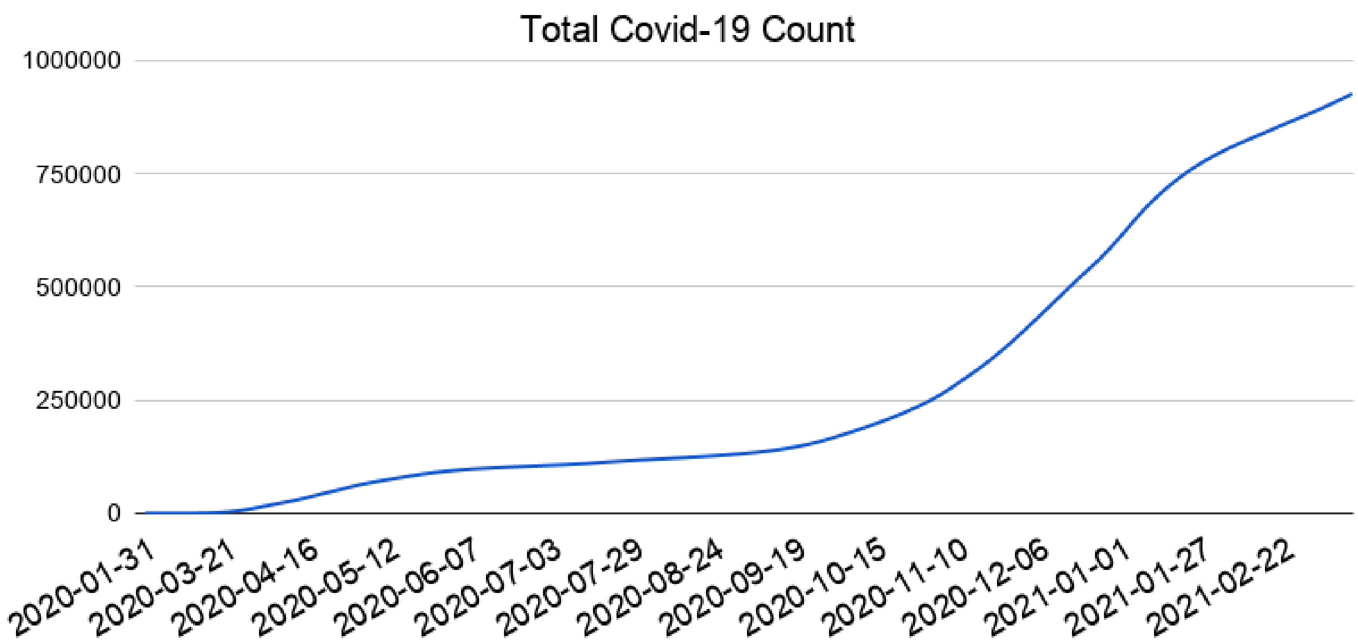
- Part I looked at a basic exponential model built at a time (mid-March 2020) when we only had 350 reported cases across the country. It predicted that we'd have 26,000 two weeks later, which sounded absolutely crazy. It was wrong by about two weeks. We hit 26,000 in mid-April 2020.



- Part II (beginning of April 2020) looked at different logistics models that we could fall on depending on how hard we worked at flattening the curve. As of today, we have 927,069 cases country-wide so that didn't happen.



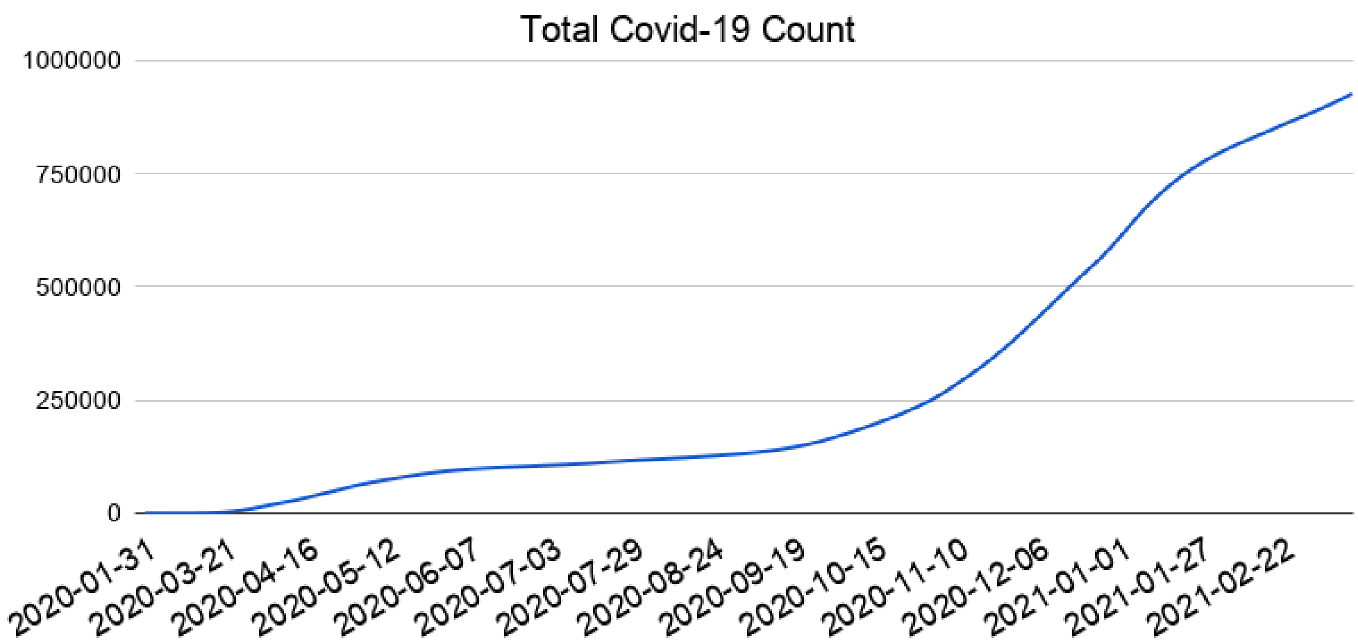
Instead, this is what happened:



- We can think of it as a logistics curve that plateaued at a little over 100,000 cases around June 2020.
- But then in September 2020 it kicked into exponential gears again (the second wave).
- It looked like it was starting to plateau again in mid-January 2021, but instead, we might be headed into a third wave.

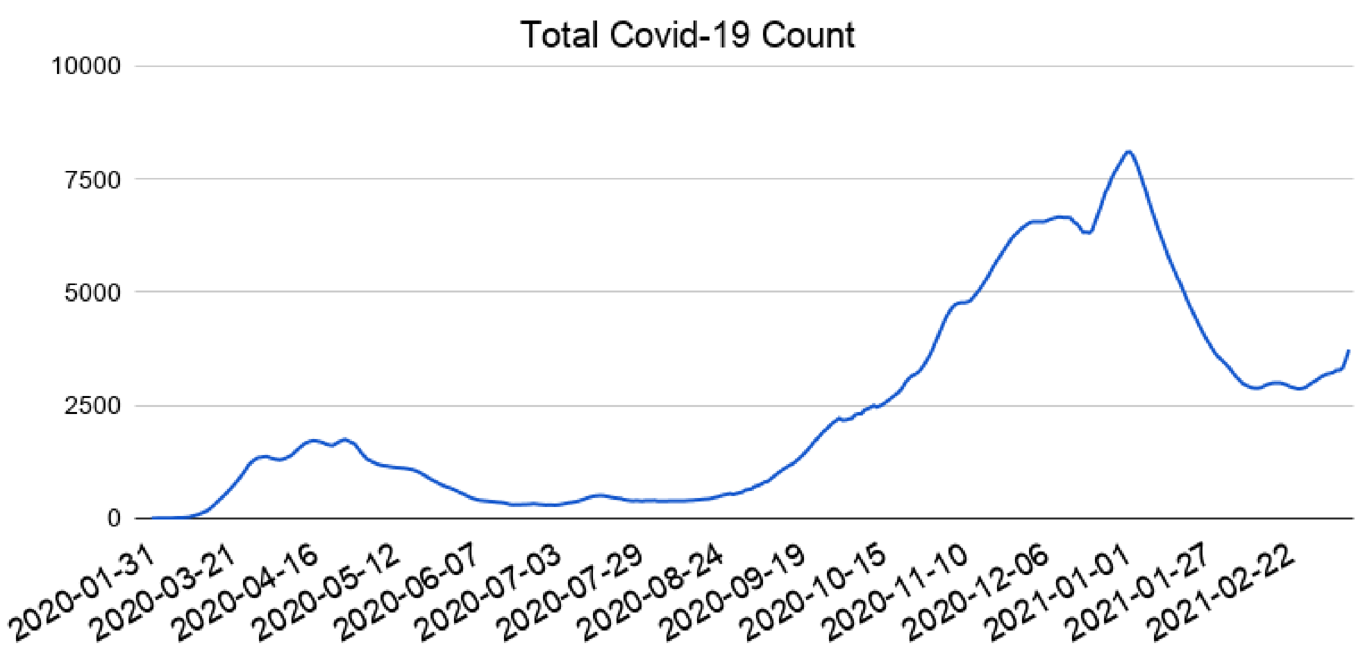
I'm now keeping a public spreadsheet analyzing all of this where I use four different graphs to gain insights into where things are going.

The total Covid-19 count



This graph is a “smoothed out” version of the actual reported counts. Testing backlogs that get caught up later creates noise in the original data that I reduced using a 7-day running average, which seemed to be a good balance between details and noise level.

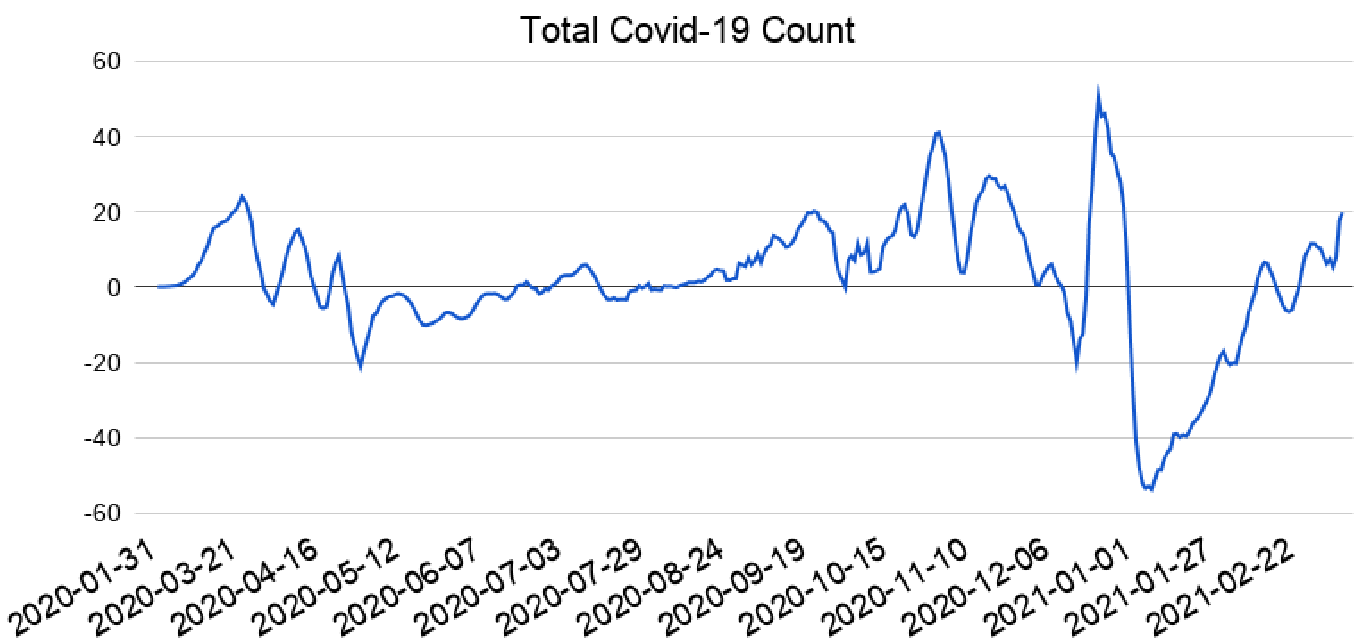
The number of new daily cases



This graph represents the number of new cases each day. Mathematically, it's the first derivative of the previous graph. Numerically, I computed the slope of 5-day secants of the smoothed curve, again to reduce on the overall trend.

Here, we clearly see that from June to September were our lowest number of new cases, which translated into an almost horizontal curve above. And we can clearly see the “height” of the second wave in the winter, and how we might be about to start a third wave now without even having finished the second one.

The daily change in daily cases

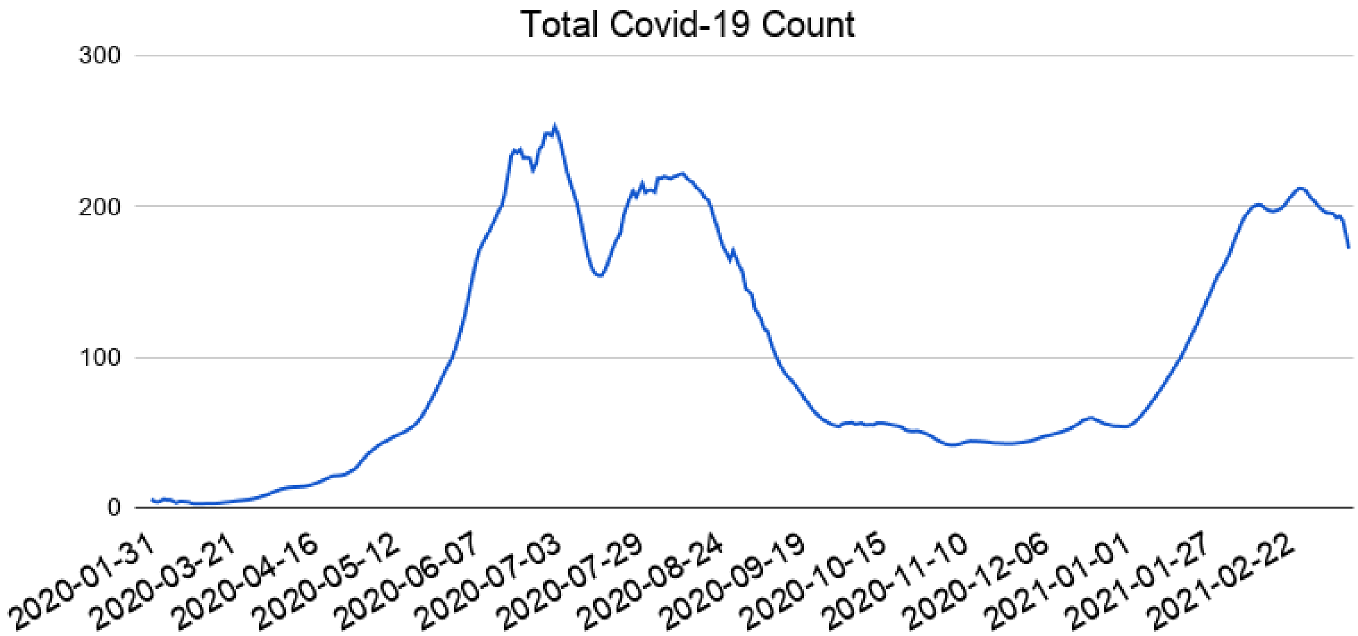


This graph is a little more abstract: it represents the daily increase of daily cases. Mathematically, this is the second derivative of the first graph, which is a measure of acceleration.

When this graph is negative, the number of new cases each day is decreasing. When it's zero, the number of new cases each day is the same. And when it's above zero, the number of new cases each day increases each day.

We can see that in January, we started putting the breaks on the high infection rate of December, except we have now lost that ground in March, indicating we're starting a new wave.

The doubling time



This last graph represents the time (in days) that it would take to double the total number of cases were the trend to continue. Here, the vertical axis is a time scale (in days), not a number of infections.

A small number is bad because it means the total number of cases doubles in a short amount of time.

For example, between October and January, the doubling time was roughly 50 days (for the country), and looking back at the first graph, we can see that the number of cases doubled in about that time.

A constant doubling time means that the growth is exponential. An infinite doubling time means no more new cases. We can see that the doubling time of 200 days we had last month is starting to decrease, again indicating that we are starting a new wave.

BC, Alberta, Canada

Finally, I do this same analysis for BC and Alberta as well as Canada. The spreadsheet includes the calculations, the raw data, and the source of the data on the government website. I'll probably be updating the numbers every week or two.