For my daughters: April 24, 2020

The Coronavirus Pandemic

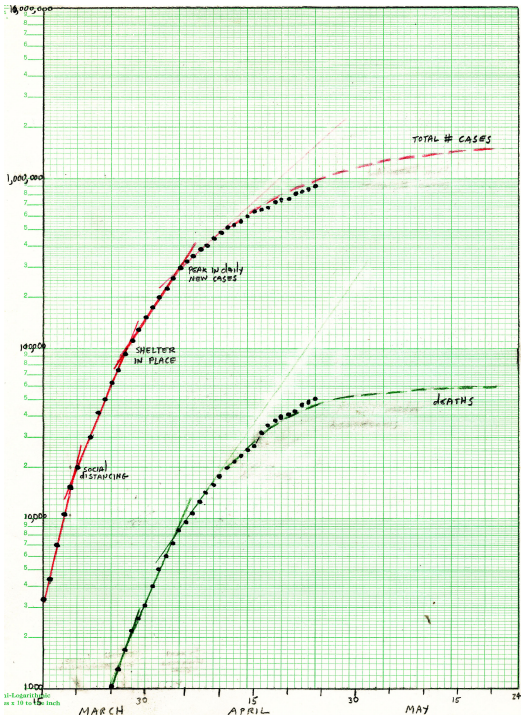
Not Exactly There Yet

Our family's journey through the coronavirus pandemic is not yet over, much as I want to hug my daughters and granddaughter. Today the number of COVID-19 cases in the United States topped 890,00, with 50,000 deaths, a very grim picture indeed. In our family ZOOM conversations you have been asking me how much more of this are we looking at? When will we be free? I wish I could answer these questions for you. The best I can give you is an educated guess, looking at what has happened in other countries for hints of what might happen here.

Using Models to Guess the Future

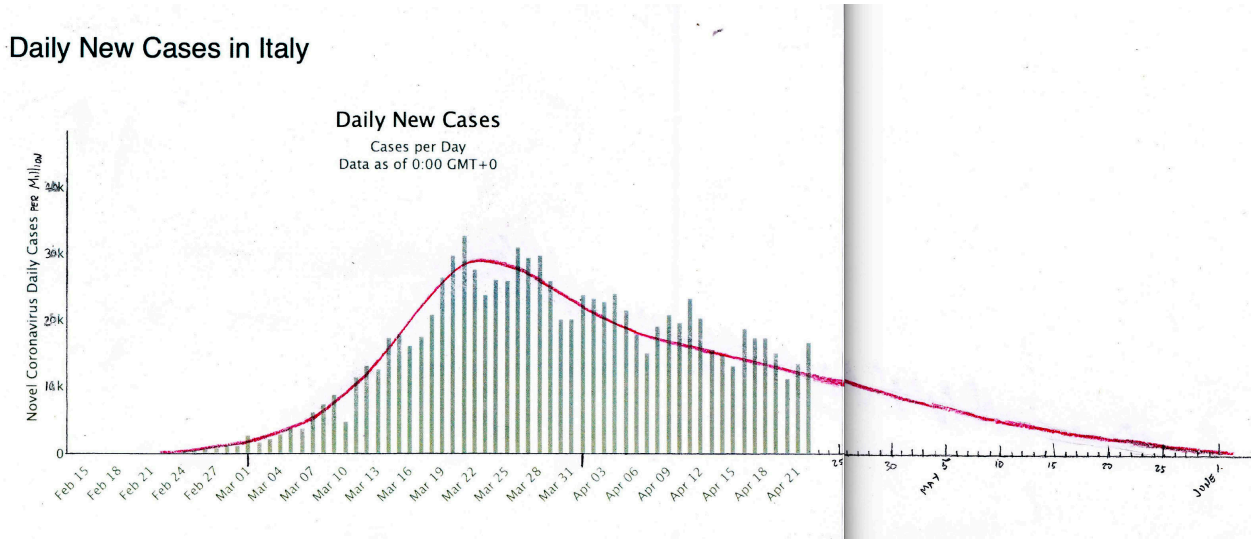
This sort of guessing is very much what our policy-makers have been doing in Washington, using so-called "models" to predict what might happen if we do this or that. The first model to get their attention was developed by the Imperial College in Britain. They built a sort of computer game of virus warfare, inputting how many people, how many of them are susceptible, how infectious the virus is (r_0, remember?), how deadly the virus is, and so forth. What happened when they played this game? An explosion of infection and death. The United States, the game predicted, was looking at hundreds of thousands of deaths without social distancing.

Now that's not the only way to guess what's going to happen. Another way is what I have been doing with you guys over the last six weeks: look at countries in Europe that have been hit earlier than the United States, like Italy, and use what happened there to predict what will happen here. This is the approach taken by the Murray Model developed at the Institute for Health Metrics and Evaluation (IHME). It's the dotted line on the graph we have been monitoring all these weeks. As you can see, it's been doing a damn good job of predicting the future:



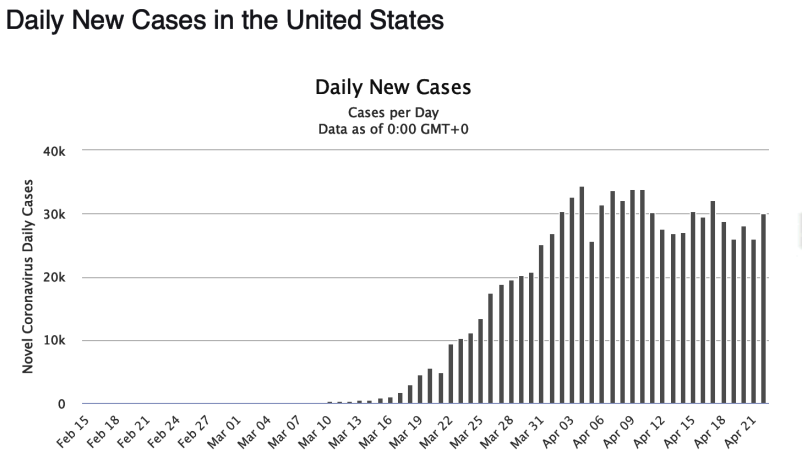
My graph of this Murray model predicted in my first letter to you girls on March 28 that deaths (which that day had reached 1,500 in the US) would reach 50,000 in thirty days, on April 26. We in fact reached that grim milestone one day earlier, on April 25. The model was spot on.

As looking at Italy does seem to be predictive, let's have a look at how Italy's pandemic has been progressing. As always, the key when thinking about what the future holds is to look at daily new cases:



The vertical bars are real data. Notice the bumpity-bump nature of this Italy graph – that's because the reporting of new cases in Italy falls off over weekends, so every week Saturday and Sunday numbers are low. The way to adjust for this is to present the data as a 7-day average, the red line I have drawn. I have taken the liberty of extending the red line along its journey into the future, to see on what date it might approach 1 per million, the point at which it should be safe to mill about. This extending lines is a very rough business -- a poke in the dark, really. But, while there is no certainty here, the hint is that Italy will be out of the woods sometime in early June.

Now let's have a look at the United States:



Everything is two weeks later than Italy and the plateau is more pronounced. Still, we seem to be seeing the same general form, a distribution highly skewed to the right. So our "*Let's Look at Italy*" Murray-like model points to mid-June as our family freedom break-out day. I've been predicting a family reunification date of June 1 all along, not that far off-target.

What Could Possibly Go Wrong?

There is, of course, an assumption built into all this, which is that the United States will continue to act like Italy, which has adopted very stringent community lock-down. Italy's hard social distancing policies lowered their country's COVID-19 r_0 from a scary 3.2 - 3.4 to between 0.8 and 0.9. Their keeping r_0 below 1 is the reason the graph of Italy's daily new cases slopes further and further downward as time passes. Said simply, an infected Italian cannot infect another person if he or she does not contact another person. And it really is just that simple.

The United States has followed the same social distancing course as Italy, with similar results: US initial r_0 numbers were around 3, and US numbers today are estimated as between 0.8 and 0.9. With an r_0 below 1.0, all we in the United States have to do is follow Italy down the graph until we too approach a "freedom" point of 1 daily infection per million.

Life of course is not that simple. Governors of several Southern and Western states (South Carolina, Georgia, Tennessee, Florida, Montana, Oklahoma) are releasing their states from severe social distancing as I write this. They see opening shops, beauty parlors and theaters as a way to reignite business and, by doing so, to relieve massive unemployment. Not a word about their states meeting the two conditions for mitigation laid out last week by Fauci's crew: two weeks of generally lower infection numbers, and sentinel surveillance with contact tracing. With 26 million unemployed (way more than the Great Depression's 15 million), they are caught between a rock and a hard place. I'm glad I don't have their job.

Whatever the governor of your state says, please keep hunkered down, my wonderful daughters. Keep wearing your face masks, like your dad (mom made mine):

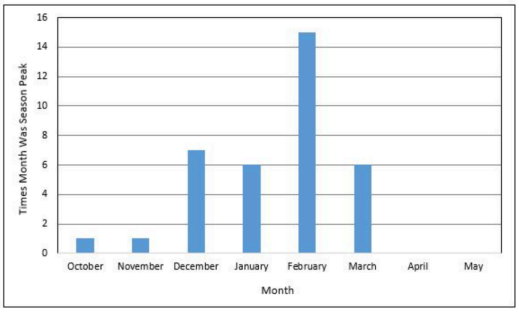
It's Coming Back In the Fall, Damnit!

There's another matter we most look into, if we are to properly prepare ourselves for coming times. To understand what I want to tell you, we will need to go back and take a closer look at COVID-19. COVID-19, like other respiratory viruses, passes from individual to individual within tiny water droplets that spray out as we breath. To survive this journey is actually no mean feat, when seen from a virus's perspective. It is bombarded by UV radiation, cooked by hot sunlight, dried out in dry air as its droplet evaporates. How does it get by? It wears a protective coat. Remember the map of the COVID-19 genome I showed you last week? Nestled among three other structural genes is one called "E" that encodes a protein which forms a protective gel-like envelope that coats the virus particle.

Why am I pointing this out to you here? Because this coat is not a perfect barrier. It's fine in cold, dry temperatures, but its protection breaks down come summer. Its not the higher temperature *per se* – viruses are relatively simple nanomachines whose operation is not greatly affected by ambient temperature. However, higher seasonal temperatures affect other environmental factors, particularly relative humidity. Its not that drying out kills the virus, but it makes the virus adhere to whatever surface it lands on so firmly that it's much harder for contact by a human hand to lift it off. So. Much more infectious in winter.

The seasonality of respiratory viruses varies quite a bit. Some like polio and hepatitis are summer diseases spread more by touching; others like influenza are winter killers:

Peak Month of Flu Activity
1982-1983 through 2017-2018



The flu season killed 34,299 Americans this last winter, according to the CDC, peaking in February, and that's with a widely-used vaccine. But not in summer months.

But should we expect COVID-19 to be seasonal, like flu? In a word, yes. A University of Michigan study conducted over ten years tracked 1,441 individuals in 890 households, characterizing any respiratory infections. Among the viruses they monitors were four coronaviruses (OC43, 22(E, HKU1 and NL63) that together cause about 20% of human colds. In this study they caused 993 infections, most detected between December and April. Infections peaked In January; only 2% occurred between June and September. Coronaviruses are seasonal viruses. While we can look for a virus-free summer, fall will be a different matter.

Next fall we can only hope our federal government gets its act together and oversees a program of widespread sentinel surveillance, with extensive contact tracing. This can't be left to the states, who simply don't have the money. It will be at least a year before a vaccine can be suitably tested – and there are no safe shortcuts, as many vaccines that should work turn out to have unpleasant side effects. While we wait for sanity to prevail, be sure and get your flu shots early next fall. Without fail. At the first sign we need to hunker down, I'll give you all a shout.

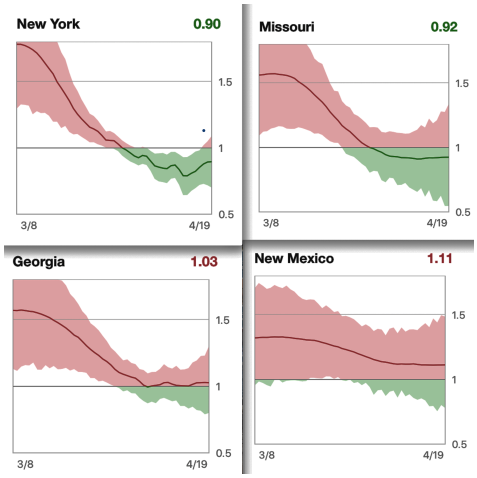
Meantime…

No matter how we score it, we are only half-way home, and are looking at five-six more weeks of isolation. I feel its drawing us together as a family, I truly do. Our Sunday ZOOMS are both fun and an important way for us to strengthen our family connections. I cannot hug my rapidly-growing granddaughter, or any of the rest of you, but please consider yourselves hugged.

As Sue & Ben are the only ones of you with pets, Nikki and Caitlin can ignore this next bit: be sure to practice social distancing with your dog. All over the country vets are reporting cats and dogs with COVID-19 infections, and today the Bronx Zoo reports eight big cats (3 lions and 5 tigers) have tested positive for COVID-19, infected by a keeper who showed no symptoms. A thorough dog wash after outdoorsing is also a good idea. Below you see Paddington just after mom washed her this week in the sink, looking a little puzzled and very clean.

Please during the coming weeks remember to keep up your social distancing. As more governors "open up" their states for business, it will be harder and harder to do this, but do not slip back. Sue & Ben's state (Georgia) is open now, while mom's and mine (Missouri) is open for business in a week, on the first of May. Haven't heard a peep from New Mexico's governor. Even Cuomo in New York is making noises. The economic pressure is getting too great to resist. But you guys stay hunkered down.

I took a closer look at our four states, trying to get a better idea of how things are going. While the numbers are a little goosey (hence the wide error margins), I was able to get r_0 estimates for all our states:



New York and Missouri are fine, with r_0 values well below 1.0. Georgia is just about there, and New Mexico, at 1.1, is not far behind. Caitlin, the reason your state's r_0 value isn't already below 1.0 is a set of three counties west of Santa Fe (military bases) which are showing explosive growth while Santa Fe and the rest of the state show little. In Santa Fe you should be fine.

I was delighted with these r_0 numbers, as it means all of us are in relative safety. While no reason to relax, it does means things are not getting scarier. And there is always your mother's solution to calm daddy's nerves after a day of writing about COVID-19: the quarantini:

A "quarantini" is an extra-lime sort of gimlet (named after Surgeon Admiral Sir Thomas Gimlette KCB (1857–1943), who is said to have first added lime cordial to the daily gin tot of the men of the Royal Navy to help combat the ravages of scurvy on long voyages). The description of a gimlet in the 1953 Raymond Chandler novel *The Long Goodbye* stated that "a real gimlet is half gin and half Rose's lime juice and nothing else." Barbara's quarantini is one third gin, one third Rose's lime juice, and one third freshly-squeezed lime juice, shaken over ice and served in a cold martini glass straight up with a slice of lime. It bites back.

Love you all
Your scurvy-less Dad