

For my daughters:

August 14, 2020

## The Coronavirus Pandemic

### *A Long Hot Summer*

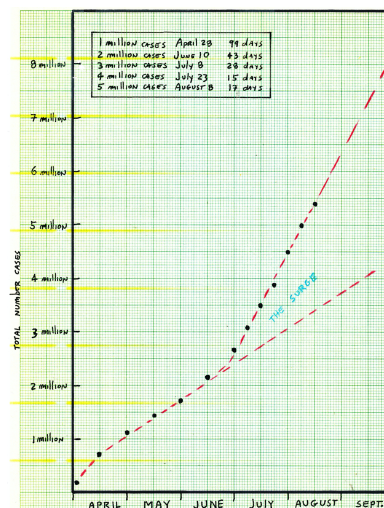
Summer has finally arrived in Saint Louis – with a bang. Violent thunderstorms at night and hot, humid days. This morning it rained so hard the streets flooded, as you can see in the photo taken at noon only a few blocks from St Louis University:



As the temperatures and waters rise, so do COVID-19 deaths: 1,478 people died of COVID-19 in the United States yesterday; the seven-day average of deaths has now remained above 1,000 for 18 consecutive days. With more and more people contracting – and dying -- from the virus, it is important to ask why things aren't getting better. I will address that in my letter to you this week, then ask what seems an unrelated question – only it's not: Why do some people who contract COVID-19 get sick, while others don't? We rarely discuss B and T cells over the family dinner table, but understanding how they operate is crucial to answering this question – and, I think, to being able to see the way forward out of this pandemic.

### The Pandemic Continues

We shot passed 5 million U.S. coronavirus cases without a blink on August 8<sup>th</sup>. Unless something changes, we are going to pass 8 million before the end of next month:



Why do things continue at this grim pace? Because as a country we are failing to observe what Dr. Fauci calls “the core principles,” as these four photo demonstrate:

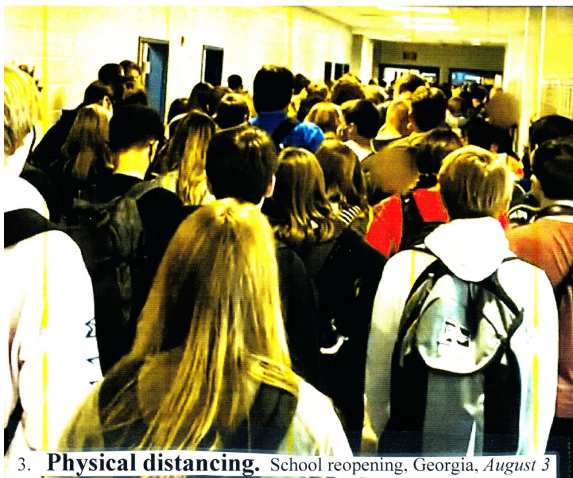
1. **Not wearing face masks.** Three months after the CDC recommended that all Americans wear face masks in public, you would think everyone would be on board with this simple and very effective strategy. Nope. A recent Gallop poll finds only 44% of Americans faithfully wear face masks in public. A Pew survey from June found the same sort of casualness: only 44% of the people surveyed wear face masks in stores or businesses all or most of the time. In big cities like New York, more do than in small more rural towns.
2. **Not avoiding crowds.** This photo is of the Sturgis motorcycle rally in North Dakota the second week of August. With over 250,000 attending and face masks rarely seen, this 10-day rally was an invitation for infection. Luckily, such clusterings are rare. Most large gatherings like political conventions and sports events have been cancelled.
3. **Ignoring physical distancing.** Maintaining a distance of 6 feet is a very effective way of reducing the spread of the virus. In this recently-reopened school in Georgia, you can see that “social distancing” is difficult in school settings. This school closed again after six students attending classes and moving through the hallways tested positive for COVID.
4. **Not avoiding bars.** Bars are notorious for close-quarters and crowding. In Saint Louis all the bars are open for business, although required not to exceed 75% capacity. The bar in the photo is one of four closed by the mayor on July 28 for ignoring this rule. Yesterday she reduced Saint Louis bar capacity to 50%.



1. **Universal wearing of masks.** Manhattan, July 28



2. **Avoiding crowds.** Sturgis motorcycle rally, August 10

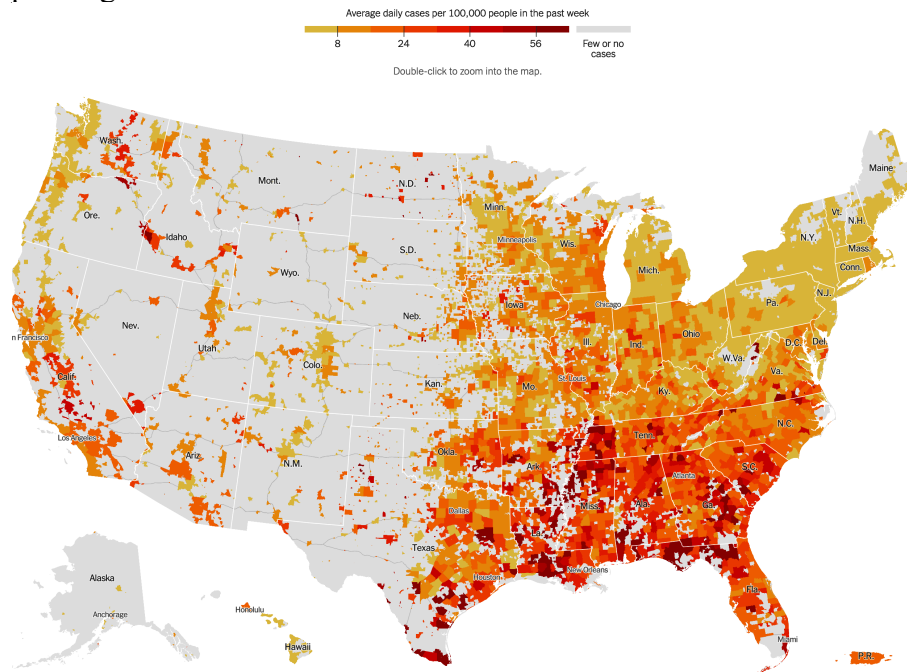


3. **Physical distancing.** School reopening, Georgia, August 3



4. **Avoiding bars.** St Louis, August 6

As you might expect, The COVID-19 caseloads are greater in states that “opened” more than 3 months ago (Mississippi, Florida, Tennessee, Alabama, Louisiana, Georgia, Texas, South Carolina, Oklahoma) and less in states that opened less than two months ago (Michigan, New Jersey, New York). These “early-opening” states are clustered in the South, which goes a long way toward explaining the distribution of new cases last week:



To summarize: The pandemic is ongoing, with few signs of slowing. We still add some 50,000 new cases each day, mostly in communities that ignore Dr. Fauci’s core principles.

### Don’t Believe All You Read

This month the papers all carried a story about how Governor Mike De Wine of Ohio had an inaccurate COVID-19 test. The *New York Times* article headlined “*INACCURATE RESULTS: A False Positive Shows The Risk of False Tests.*” The reporter goes on to describe a positive COVID-19 test taken by DeWine, followed the next day by a negative test. The first test was a rapid antigen test, the report recounts, and the second test was a more time-consuming PCR test. The reporter concludes that the antigen test was less sensitive and less accurate. This same picture was presented in the corresponding *Wall Street Journal* article.

So, girls, imagine this was an exam question: What is wrong with the conclusion these reporters present?

Answer: The “antigen test” doesn’t test for the virus antigen, but rather for antibodies directed against the virus antigen! What these two tests tell you is that Governor DeWine has antibodies in his blood against COVID-19, but no virus in his nasal passage. If he had had the virus, the PCR test would have detected the virus as RNA binding to the COVID-19 template. What the two tests tell us is that he has had the virus, but doesn’t anymore! In this Governor De Wine is like 2.6 million other Americans who have recovered from COVID-19, all of whom would yield exactly these results if given these two tests. He, like many of them, had no symptoms. The two tests both worked fine. Reports to the contrary were simply poorly informed.

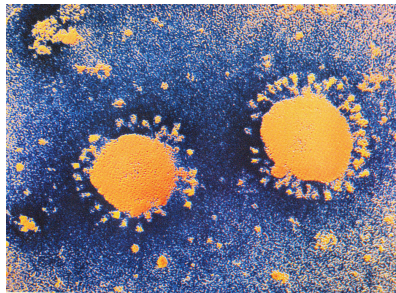
## So Why Are So Many People Asymptomatic?

That Governor DeWine had no symptoms when infected by COVID-19 is a very interesting and I think profoundly important fact. He is not alone. A Boston homeless shelter had 147 infected residents, but 130 of them had no symptoms. Of 3,277 COVID-infected inmates in state prisons, 3,146 had no symptoms! The Center for Disease Control and Prevention estimated last month that the proportion of infected people with no symptoms is about 40%.

How do so many people escape symptoms, when infected with a virus that has killed 165,000 Americans?

Some scientists speculate that age and race play a role: Children are infected less often (age), and people of African descent are infected more often (race). But while these factors are important in determining who gets sick, 40%? Something else is going on.

What then? An alternative explanation, attracting a lot of attention recently, would be that many of the people walking among us already have partial immunity. COVID-19 is commonly assumed to be a “novel” virus that has never before infected humans, so that people have no immunity to it whatsoever. But what if that assumption is wrong? A flurry of recent studies suggest that many Americans have partial immunity to COVID-19 because of previous exposure to other coronaviruses. This photo depicts one of them, the coronavirus that causes



some 30% of the common colds from which we all suffer. “*This might potentially explain why some people seem to fend off the virus and may be less susceptible to becoming severely ill,*” blogged National Institute of Health Director Francis Collins last week (he is a Nobel Prize winner and Fauci’s boss).

There is a problem with this partial immunity hypothesis, however. Unlike the immune response to many virus infections, memory B cells induced by common cold coronavirus don’t seem to stick around long – only two or three months in many patients. So if antibodies produced by common-cold-induced memory B cells gave us partial immunity, that immunity would only protect us for two-three months – and we are in month six in the United States!

Where might partial immunity come from, then? Researchers are excited by the possibility that partial immunity to COVID-19 may come from the other arm of the human immune system, T cells. T cells are the part of our immune system trained to recognize and destroy virus-infected cells. T cells patrolling the body for evidence of viral proteins on cell surfaces can leap immediately into action, killing virus-infected cells quickly. This cytotoxic (cell killing) action eliminates the infection long before any disease symptoms appear. Researchers have found people in the United States and several other countries who, although they have never been exposed to COVID-19, carry T cells that react to COVID-19 when their blood is tested in the lab.

If previous exposure to the coronaviruses causing common colds had produced a population of T cells directed against these coronaviruses, a protection which lasts for years, might this protection extend to COVID-19?

A team at La Jolla Institute for Immunology studying T cells published data this week in *Science* indicating that blood samples collected from people *before* 2019 (when COVID-19 first arrived in this country) contained pre-existing memory T cells that respond both to COVID-19 and to the four common cold coronaviruses. Researchers call such cells “cross reactive.”

This is a very exciting result, suggesting that T cells may confer long-lasting immunity to COVID-19. However, I don’t want to mislead you girls. The La Jolla study is more indication than confirmation. There is a lot we still don’t know. Other studies done in different ways have failed to show this cross-reactivity. A lot of researchers are looking at this possibility as I write these words.

### **T Cell Vaccines?**

Most vaccines kick-start both B cell and T cell immune responses. The interactions between the two defenses are complex, and I have told you girls very little about this give-and-take. While evaluation of the COVID-19 vaccines now being rushed through clinical trials will focus on antibody production, it will be important to assess to what degree they also promote a cytotoxic T cell immune response. A T cell defense may be far more long-lasting than a B cell antibody defense.

Enough pandemic for this letter. Your mother and I tested negative for COVID-19 this past week, and are keeping as safe as we know how. I shaved my “since March” beard, but kept the mustache. Mom cut my hair, washed the dog, fixed my car tires, somehow acquired piles of groceries, and in a thousand other ways kept me sane and nourished with her affection. Paddington’s old detested ‘crate’ has been replaced with a new “dogacile,” what mom calls Paddington’s Place. Paddington seems to find escape and comfort there. Would we were all so lucky, this long summer.



Dad