Letter 32: Here We Go Again

August 3, 2021

Dear Daughters,

In June, when last I wrote, the pandemic in the United States seemed largely over, with a heartbreaking residual level of infection that seemed to me to have a political rather than scientific cause. Disgusted, I vowed to stop writing. “No more science to explain,” I said, “just wrong-headed political opinion dictating events.”

Well, time has proven me wrong. Much has happened in the two months since that letter, involving vaccine hesitancy and a new variant that very much needs explaining.

The Delta Variant

The daily number of new COVID-19 infections in the United States hovered just above 10,000 in June 2021. Importantly (although it didn’t seem important to me at the time), the proportion of these new infections caused by the Delta variant was only 3%. Newly arrived from India, the Delta variant had caused a huge spike in infection there. However, while this variant was known to be a bit more transmissible than the variant causing most United States infections in June, it’s appearance in this country did not seem a great cause of concern.

Well, it is.

Examined carefully, the Delta variant has a very different cluster of spike protein mutations than the variant (called the Alpha variant) that has been making so many Americans sick. The Delta variant lacks both the N501Y mutation that all previous variants have possessed, and the Eeek mutation of the Alpha variant (the N501Y mutation improves transmission of the COVID-19 virus, while the Eeek mutation helps the Alpha variant evade antibodies). Instead of these two key mutations, the Delta variant has two other mutations we have not seen before, P681R and L452R. These two new mutations do the same sort of thing as N501Y and Eeek -- only better.

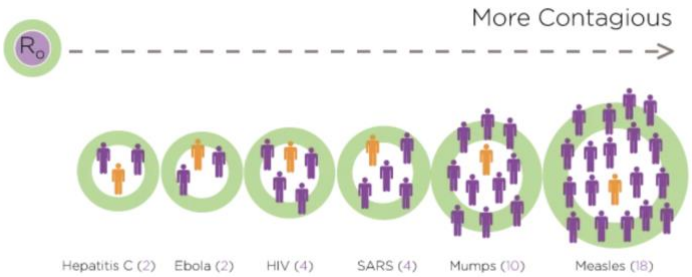
Acting together, they make infection by COVID-19 even more likely and antibody evasion far more complete.

I cannot say this more emphatically: the Delta variant isn't just a nastier version of the alpha variant. It's a whole new critter. The Delta variant of the coronavirus infects us differently, and our immune system responds to it differently. So do vaccines.

This is a new ballgame.

The Importance of R_0

The Delta variant is a super-spreader. Scientists measure how quickly a virus spreads using an estimate called "r naught", or r_0. Basically, it's a measure of how many people an infected person will infect. Any variant with an r_0 value above 1.0 will spread. The bigger the r_0 value, the more rapid the spread:

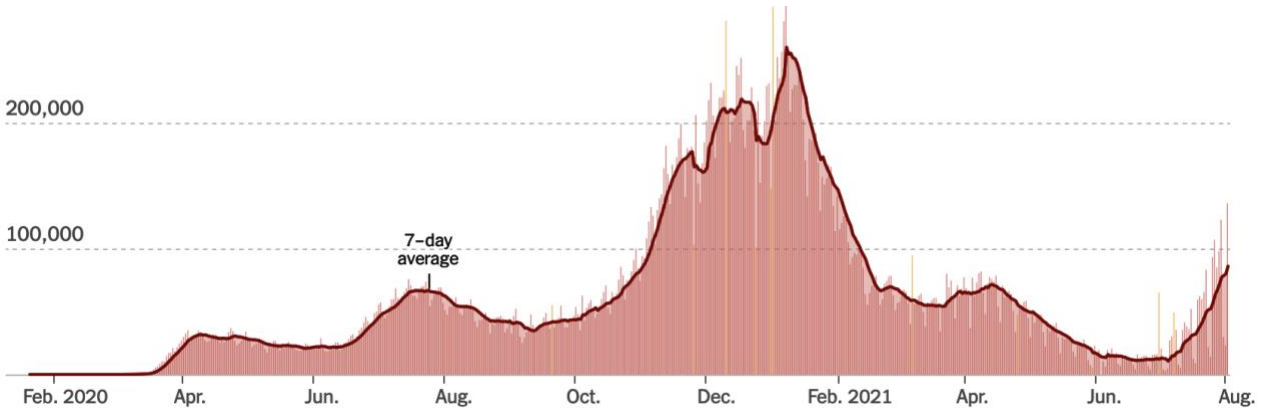


The original strain of COVID-19 virus, which originated in China but came to the United States largely from Europe, had an r_0 of around 2.3. The Alpha variant, which arose in the United Kingdom, has an r_0 value of 4-5. Twice as infectious as the original strain of the coronavirus, this Alpha variant quickly became the most common form of COVID-19 in the United States -- accounting for over 90% of all infections here by last June.

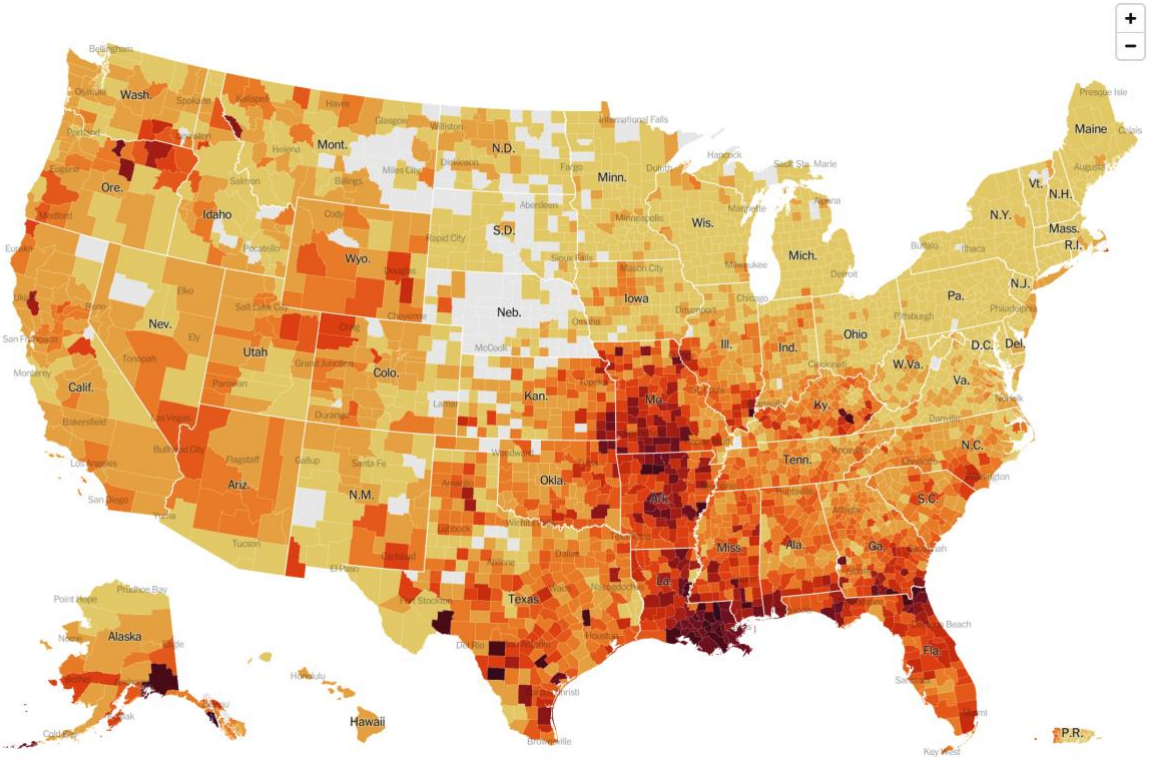
The Delta variant, which first emerged in India about a year ago, is twice as infectious as the Alpha variant, with an r_0 value of 8-10! That's a very, very high number, greater than flu or the common cold. It's even more contagious than scourges like the Spanish flu, smallpox or polio. Like chicken pox or mumps, even being in the same room with an infected person puts you at grave risk.

Another Wave of Infection

As you might expect from its scary r_0 value, the Delta variant has spread explosively in the United States since June. It now accounts for over 90% of all new reports of COVID-19 illness, with daily new cases rising from 10,000 in mid-June to well over 100,000 today. Cases are still rising fast:



No part of our country has been spared, although reports of illness caused by the Delta variant are particularly common in less vaccinated states. Four states with very low vaccination rates (Missouri, Arkansas, Louisiana and Florida) account for over 40% of today's reports of new COVID-19 illnesses, essentially all of them caused by the Delta variant:



Breakthrough Infections

Clearly our nation needs to get more of its citizens vaccinated. Today 192 million Americans have had at least one shot, more than half the population. Before we have any hope of approaching herd immunity, we will need to vaccinate many more.

But our family is fully vaccinated against COVID-19. Aren't we safe from the Delta variant?

Nope. In the states which keep such data, it seems that some 1% of fully vaccinated people are reporting COVID-19 illness. When examined, almost all of them prove to be infected with the Delta variant. If these data are representative, then some 1.9 million fully vaccinated Americans are coming down with these breakthrough infections – the CDC estimates fully 35,000 breakthrough infections are occurring each week in the United States.

While vaccinated folks were being infected with COVID-19 and becoming sick, few of these breakthrough cases required hospitalization. Their vaccination was still protecting them from serious illness. Remember, however, the hallmark of COVID-19: many of those who become infected with COVID-19 show few or no symptoms. It follows that we can expect many more fully vaccinated Americans who show no COVID-19 symptoms are in fact infected with the Delta variant.

The Vaccinated Can Spread Delta

So a lot of us fully vaccinated folks may be infected with the Delta variant and not know it. But we are not getting sick, so no big deal, right?

Festivities over the July 4th weekend in Provincetown, on the tip of Cape Cod, MA. provide us with an answer to that question. The weekend proved to be a super-spreader, resulting in a cluster of 469 confirmed COVID-19 cases. Very surprisingly, 346 of the cases had been fully vaccinated! What form of the virus were they carrying? Genetically sequenced cases identify the culprit as the Delta variant. It seems that while vaccination offers protection from serious illness, it offers little or no protection from infection by the Delta variant.

It gets worse. When examined by doctors, 127 of the sick but fully vaccinated individuals at the Cape Cod July 4th celebration proved to carry as much virus in their noses and upper respiratory tracts as 84 unvaccinated or partially vaccinated other individuals who contracted COVID-19 at the celebrations of that weekend.

Why is the virus load up their noses important? It tells us that vaccinated people infected with the Delta variant are as contagious as those who are unvaccinated.

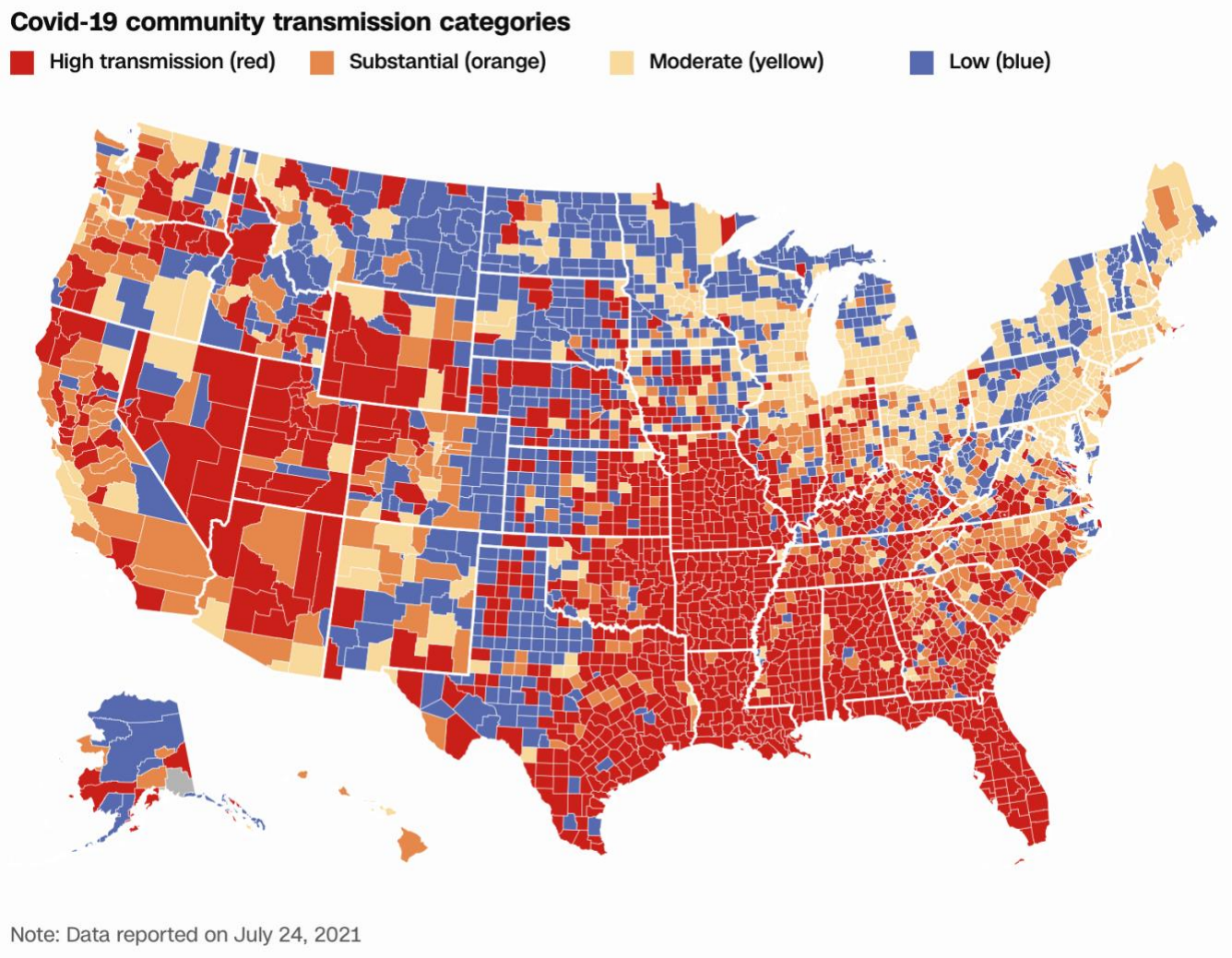
Adding all this up, the CDC came to a scary conclusion: Many fully vaccinated Americans are, without knowing it, carrying and transmitting the Delta variant.

To their great credit, the CDC then took a courageous step to address this threat: They reinstated their mandate that vaccinated individuals wear face masks indoors and when in large crowds outdoors. For this the CDC was promptly criticized as having changed their minds yet again. The chief Republican in the House of Representatives stated that the Democratic Party, by urging masks, was simply trying to keep the country in constant panic over COVID-19.

Should We Wear Masks?

Two months ago the CDC stated that fully vaccinated individuals need not wear masks indoors. Now they tell us we should. Actually, their advice is a bit more tempered. You only need to wear masks indoors if you live in a high-risk-of-infection area. You are at high risk if you live in a county with more than 50 new cases a day per 100,000 residents, or in a county registering 8% or more positives in COVID-19 tests.

Here's a look at the danger areas:



Fully 46% of the counties are high transmission (red) and another 17% are substantial transmission (orange). All of these are urged by the CDC to wear face masks.

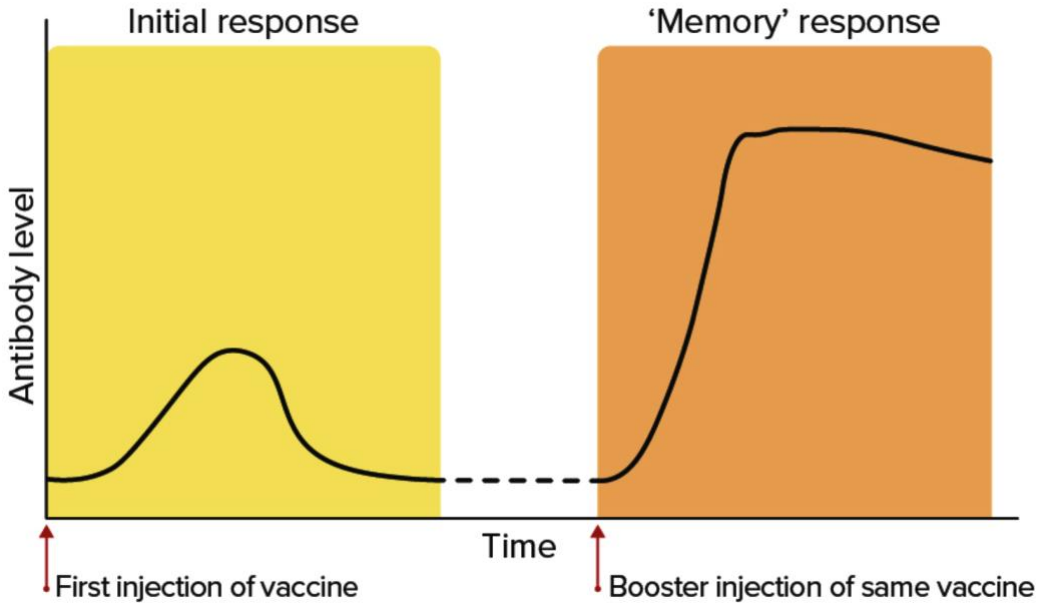
It is difficult not to notice the similarity of this map to maps illustrating patterns of COVID-19 vaccination. Clearly, those communities which shy away from vaccination also transmit the virus more often. As you can see on the map, your childhood home Missouri is almost solidly red. So have no doubt your parents will be wearing face masks indoors. Indeed, St Louis City and St. Louis County have mandated masks. But this is still the Missouri you remember: Our state government has sued in federal court to block these St. Louis mandates!

Booster Shots

What can we do to protect ourselves from the Delta variant? Might booster shots help? Many vaccines fade after a bit, and the COVID-19 mRNA vaccines most widely used in this country (Pfizer and Moderna) are no exception. Israel, over 70% vaccinated and one of the few countries to keep careful data, reports that the effectiveness of the Pfizer vaccine falls off significantly after six months, and has started administering a third "booster" shot to the elderly. Pfizer responds that serious illness requiring hospitalization is not going up in the United States, and so there is no need for booster shots "yet."

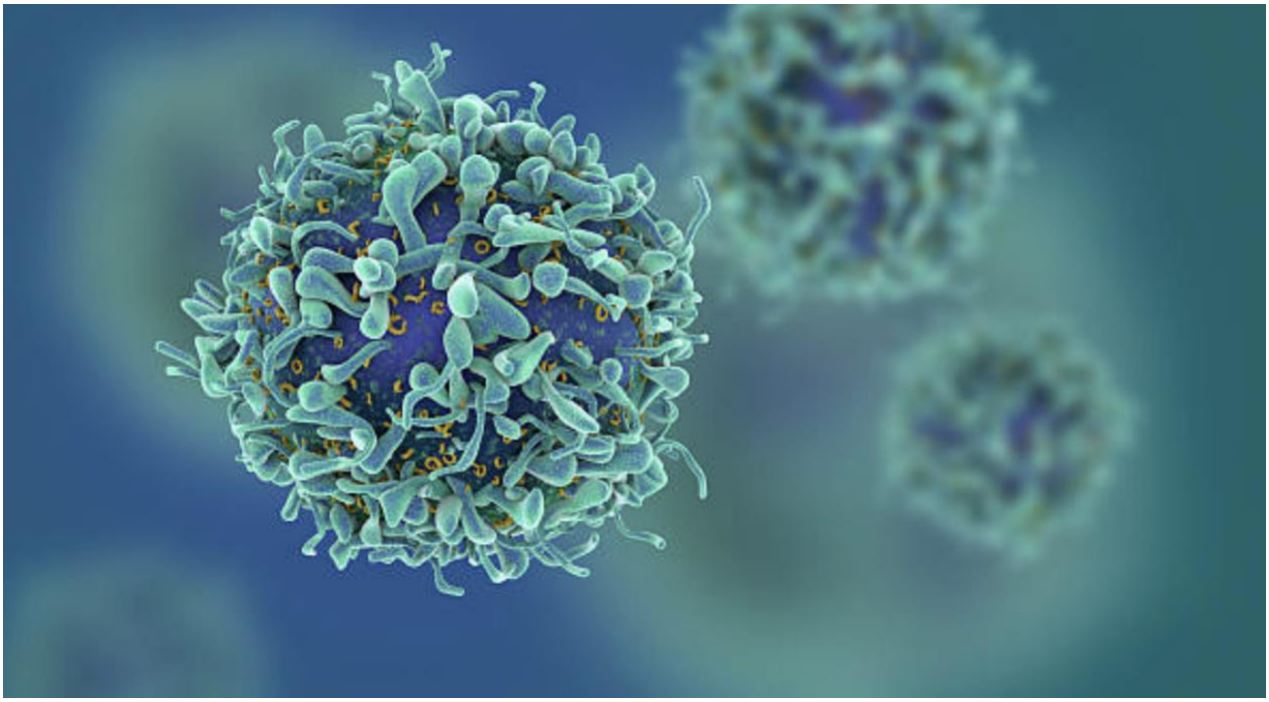
What is a booster shot, and how might it help?

Well, it's a matter of amplifying the number of cells in your body that produce antibodies against the virus. Called B cells. The initial shot of the Pfizer vaccine activates a small number of B cells that produce the desired antibodies to multiply, each giving rise to hundreds. The second shot induces many of these B cells to multiply in turn, leading to hundreds of hundreds. A booster shot causes many of these newly-generated B cells to go through a third round of multiplication. The result is steep rise in your body's antibody production, often a hundred times more:



Should you get a booster shot if and when they become available? Sure. Do you NEED to get a booster to protect yourself from the Delta variant? Probably not.

To explain why not, I will oversimplify a complex process in a way to make a professional immunologist cringe. Unvaccinated individuals have no protection from either Alpha or Delta variants of COVID-19, and so often become quite ill. The antibodies produced by COVID-19 vaccination protect an individual from Alpha variant infection but not Delta Variant infection. The reason these breakthrough Delta variant infections don't often make individuals seriously ill is that vaccination also kick-starts your body's second line of immune defense, its T cells. The pretty fellow you see here is a T cell:



T cells look to identify and destroy not the virus (that's what B cells do), but rather cells that have been successfully infected by viruses. T cells slide along the surface of your body cells, patrolling. If a T cell encounters a bit of virus protein on the surface of a body cell, it kills that cell.

The bad news about the Delta variant is its ability to overcome our body's B cell defenses. Hence so many vaccinated people contracting the virus

The good news about the Delta variant is its inability to overcome our body's T cell defenses. Very few fully vaccinated people, when infected with the delta variant, become seriously ill.

The big thing, as we live through this dangerous summer re-emergence of the pandemic, is to stay safe. We are going to outdoor theater (the MUNY performed *Smokey Joe's Café* last Sunday) but wearing a face mask. We get together with friends, but only those fully vaccinated. No bars, restaurants, movies or indoor theater. We wear a face mask everywhere.

Most importantly, we will support, donate to, believe in, and vote for no public official who denies the need to do so.

Stay safe.

Dad