How do we know when the pandemic is over? And what will 'normal' be like?

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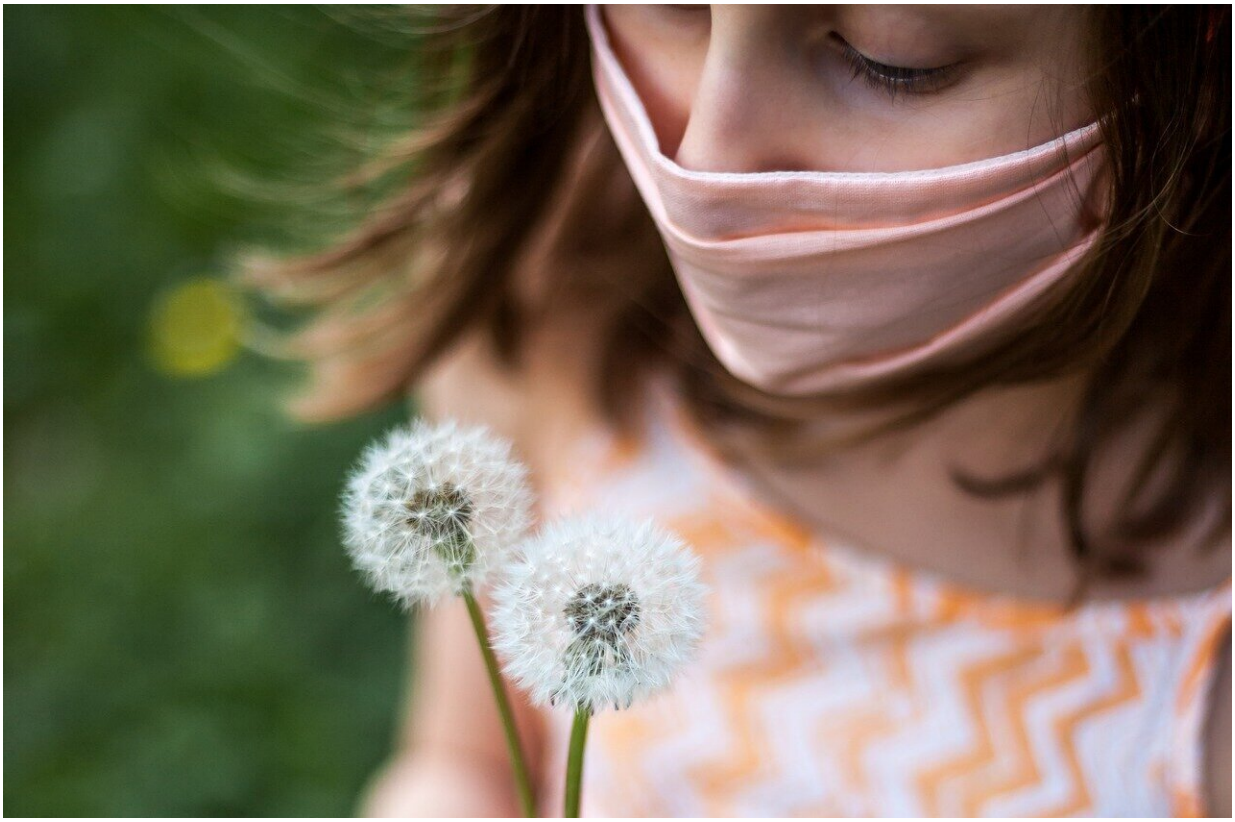

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The COVID-19 pandemic has been going on for more than two years. How will we know when it's over? Who decides that? And what will our new "normal" look like?

To learn more, we talked with Julie Swann and Matt Koci. Swann is a systems engineer with expertise in public health and issues related to contagious disease. She currently leads a group of researchers selected by the Centers for Disease Control and Prevention (CDC) and the Council of State and Territorial Epidemiologists to do projections and analysis of the COVID-19 pandemic. Swann is the department head and A. Doug Allison Distinguished Professor of the Fitts Department of Industrial and Systems Engineering at NC State. Koci is a virologist and immunologist whose work focuses on host-microbe interactions in birds; he is a professor in NC State's Prestage Department of Poultry Science.

This post is part of a series of Q&As with The Abstract research blog in which NC State experts address questions about COVID-19.

The Abstract: How will we know when the pandemic is over? And who gets to make that decision?

Julie Swann: Do you mean officially? I mean, a pandemic is when a disease is spreading across multiple countries globally, where resources are needed to avoid bad outcomes. So, we may never get rid of it in that sense.

There are a couple of important signals. In January 2020, the World Health Organization made a formal declaration of a "public health emergency of international concern." The declaration is regularly reviewed and can be ended. This tells countries they need to invest resources to reduce the spread of a disease that is spreading internationally. So one signal would be if the WHO ended that declaration. However, I do not expect this for a while given the current spread worldwide and ongoing risk.

I am also watching for a declaration by the U.S. Secretary of Health and

Human Services that the formal Public Health Emergency has ended. This has been extended multiple times and currently is in effect until at least mid-April. This type of official declaration also has implications for telehealth, waivers and flexibility for a number of stakeholders in the overall health system. If you define a pandemic as a disease that is prevalent across the entire world, with significant drains on health systems, then it may be a long time before we are truly past that stage, although the experience in some local areas may be different.

Matt Koci: There's the technical definition and then there's what we're all experiencing. Don't get me wrong, when we get to a point where the WHO says COVID isn't a major issue in some parts of the world, that will be a good sign and one of the first steps towards everyone being able to put the worst part of COVID-19 behind us. However, we need to be careful and not over-interpret that news as the end of the struggle.

As Julie said, pandemic means an epidemic is happening everywhere on earth. At some point in the future (hopefully sooner rather than later) large regions of a continent will no longer have COVID epidemic conditions, which will mean COVID doesn't meet the pandemic definition. But that doesn't mean things are better everywhere. A lot of people will still have a long way to go.

So the practical question, the selfish question, is: how will we know when our little corner of the world is controlling the epidemic? Unfortunately, there isn't a clear, definitive answer to this. What constitutes an epidemic is a little subjective, and it can be different for different diseases.

Epidemics are generally defined as an increase in the numbers of cases, in a given area, above some expected baseline. In some areas of the world that baseline might be zero, in other areas it could be hundreds of cases a month. Think of a disease like malaria. If we saw five cases in

N.C. in a week, which couldn't be linked to recent travel, that would be alarming and could be a sign of the start of an epidemic. But in other parts of the world, five cases wouldn't be unusual.

With that in mind, an epidemic is "over" when the number of new cases returns to whatever the normal baseline is for that disease in that area. In the case of COVID, the original baseline was zero for the whole world, but at this point I don't know anyone who thinks we're going to completely eliminate SARS-CoV-2 anytime soon. Since it's a new disease, we don't know what the baseline is. I think most are hoping that it will end up being something similar to seasonal flu, and it probably will, eventually. But how long that takes, no one knows.

What I think most people want to see, or would at least find an acceptable baseline, would be conditions where we have test positivity rates below 3%, infection rates below 0.7 [meaning the effective reproductive rate], and a 7-day average for new daily cases below 1 per 100,000. That will tell us we have it largely under control, but that doesn't mean we're done with it forever. If other states, or other countries, still have high numbers of cases it can always come back if we're not careful. This isn't really over anywhere until it's over everywhere. And by over, I don't mean gone forever, but rather just a seasonal virus akin to the flu.

Right now, we're actually pretty close in N.C. We're in the best shape we've been since June of last year. We're on the right side of the line for test positivity rates, and we're close on infection rates. The third, the 7-day average for new daily cases, is falling. Hopefully it keeps falling. We came close in late June of 2021. We got as close as 2.7 new cases per 100,000 in N.C., but then behaviors changed, and Delta, and cases went up again. In fact, if we fall below 1 new case per 100,000 it will be the first time since March 27, 2020.

Swann: Great point about infections and numbers! I also look at hospitalizations. These were added by the CDC to metrics of transmission in communities. That is a great measure of the acute stress on the healthcare system, while the number of cases is important both for transmission and for risk of longer-term disease sometimes called "Long COVID." For the current metrics, low transmission in a particular community is fewer than 10 new COVID-19 admissions per 100,000 people and less than 10% of inpatient beds occupied by people with COVID-19.

TA: What will "normal" look like when the pandemic winds down? How will things be different than they were before the pandemic?

Swann: I don't think we should think of our status as being "in a pandemic" or "out of a pandemic." I think of times that are between major surges, or even along a scale that has multiple levels. Sometimes there will be hardly anyone wearing a mask, while other times people at higher risk will wear masks in congested environments. We could have another surge, when infection wanes or a variant arises, and we should be ready to adapt for a period of time. This will not be the last pandemic that we see in our lifetimes. I think we will all be more aware of disease transmission and supply chains, and perhaps for a time we will be even more grateful for the small pleasures in life that we have been missing.

At a system level, I hope that we continue to modernize the data systems that enable targeted response, and that we reduce the inequities in health outcomes that make a pandemic even worse for people who have underlying health conditions. We should learn from the innovations that occurred in science and technology that saved lives while continuing to improve across every element.

On a practical level, I think we will see some continued use of masks, especially in high-risk settings or by people who are at greater risk of severe outcomes. I hope that we continue to improve our ability to rapidly diagnose disease, through at-home testing, testing in facilities, and even wastewater surveillance. This will allow us to not only respond to the next surge but also to prepare for Disease X, or one of the many that could underlie a future pandemic. I expect that we may continue to be thoughtful about making sure the air we breathe is clean, and we are likely to experience continued disruptions to supply chains for a while. In a few years we will probably find the vaccine to reduce COVID-19 will be widely accepted, as it is credited with saving one million or more lives in the U.S. and preventing countless more hospitalizations.

Koci: I agree with Julie. I think it is still too soon to know, and I think the mindset that says "if we just get through this wave we can go back to normal" has been part of the problem. Politicians and pundits on TV have found it more expedient to talk about things as short-term sacrifices. Short-term sacrifices that have been daisy-chained together into what now seems like a never-ending cycle of moving goal posts. We're in a marathon, maybe even an ultra-marathon, but we've been told it's a sprint. Most of the public has paced themselves for a sprint, but when they got to the end of the 200 meters, they were told to keep sprinting. Now we're at mile marker 5, so of course we're all frustrated and tired.

I think some of the new CDC COVID guidelines are an attempt to change that approach. But like many things the CDC has done over the past two years, it's been poorly communicated. For the foreseeable future we need to stop waiting for when it will be safe to go about "normal" life, like it's still 2019. Instead, we should figure out how to modify important aspects of our lives to make them less risky, given the levels of virus around at any specific time.

Think of it like how you might modify your plans in the summer on bad ozone days—checking the COVID numbers in your area and adjusting your behavior accordingly. For example, if cases have gone from low risk to moderate risk, you might decide to go ahead and host a birthday party, but you move the party outside and skip the tradition of having the guest of honor blow out the candles.

TA: When might we need another booster? And how will we know?

Koci: Whether it's a booster shot of the vaccine we already received, or a shot of a different variant, we'll know we really need it when we start to see the rate of hospitalizations due to COVID go up among the vaccinated and recovered.

Swann: The timing of a needed booster may differ by subpopulation. For example, adults 65 and over or who otherwise have lower immunity will need a booster sooner than a healthy younger adult. We have seen so far in the pandemic that Israel, the U.K. and some other locations have data that has been useful in informing these decisions for the U.S. In addition, I expect that new recommendations when they are needed will come from the FDA, the CDC or similar governmental entities. The scientific analysis will also help inform whether a booster of the same vaccines will be effective or whether the vaccines will need to be adjusted to new variants, which can take some time. New information will be rolled out in multiple ways, including in the mainstream media, through pharmacies, through the vast network of healthcare providers across the U.S., and possibly even through workplaces or schools.

TA: Have our experiences with COVID improved our ability to deal with other diseases, such as influenza?

Swann: I sure hope so! We have seen how much disease can be prevented through a variety of individual and community measures, such as wearing masks on airplanes, telecommuting, washing hands, quarantining or isolating ourselves or our households, and more. The pandemic has further demonstrated the value of disease surveillance through testing asymptomatic populations or even wastewater surveillance, and we have seen greater roll-out of testing across the country even into our own homes. I expect there to be a rethinking about what levels of hospitalizations and deaths we are willing to accept for preventable disease, including among children, pregnant women, older adults, and more, where the response can include individual decisions, community approaches, and public-private partnerships. It will also be imperative that we do so, as I expect the shortages of medical personnel to be ongoing. Our experiences can also help prepare us for future pandemics, just as SARS-1 helped many countries in Asia prepare for COVID-19.

Koci: All the things that Julie mentioned absolutely can and should be transferred to other diseases, but we need to think bigger too. After World War 2, U.S. decision-makers of the era looked at all the death and destruction from the war and said the best way to protect Americans from future wars was to invest in national defense. This approach came to be called the "two wars doctrine." Today, that doctrine is seen in direct military spending that is more than the next 11 countries combined. But in the 1950s, 60s, and 70s, the doctrine also manifested itself in investments in civil infrastructure—investments that had all kinds of other economic and societal benefits we take for granted today. The best example of this is the "Dwight D. Eisenhower National System of Interstate and Defense Highways."

As Allied commander in Europe, Eisenhower saw the strategic advantage Germany's national roads system provided its military. He became a fierce champion of the postwar highway project in the U.S. He

recognized the economic value in peacetime as well as the strategic value during national emergencies. Now two years into a pandemic, with more than twice as many U.S. dead as were caused by WW2, we need to see a doctrine focused on making strategic investment in our defenses against Mother Nature.

What are large-scale investments in our health care infrastructure or systems that would make us better prepared to deal with pandemics, but also improve the health and resiliency of the country during normal years? What are the things that we don't think of as part of our health care infrastructure but should?

For me, a prime example is testing. Fast, reliable, ubiquitous testing is essential to any outbreak response—that lesson has been reinforced over the past two years. Our current system consists of hundreds of testing programs created from scratch by various states, counties and even campuses. These programs have been essential to our ability to help protect public health during the pandemic. But this approach could also be transformative for how we fight diseases like seasonal flu, the common cold and respiratory syncytial virus (RSV).

Because of our COVID testing programs we now know more about how COVID spreads and mutates than just about any other disease. We have the ability to use antiviral therapies and monoclonal antibody therapies against COVID to far greater effect than any of the therapies we have for other viruses, because of our testing.

The fact that the funding for these life-saving programs is already being pulled back, before the pandemic is even over, is not a good sign. Throughout the pandemic people have been comparing COVID to the flu. People are essentially saying that we should accept the idea of there being 30,000-50,000 deaths a year due to COVID. But why settle for this many deaths for either COVID or the flu? If we had a national disease

surveillance system that monitored for all viruses, we'd be able to use antiviral therapies to greater effect and better protect the most vulnerable.

I know there's going to be a contingent saying, "that sounds good and all, but who's going to pay for it?" Here's the deal: we're already paying for it. The annual losses in the U.S. to just the seasonal flu, RSV, and the common cold is estimated to be over $60 billion. The economic losses due to COVID, just from the deaths (not including those who got sick and recovered or who have long-COVID) is estimated to be more than $8 trillion. Do we want to pay the cost in lost productivity across the whole economy? Or do we want to spend money on stimulating the growth of new markets, save lives every year and make our population more resistant to future pandemics?

TA: What about future pandemic diseases? Has the COVID pandemic taught us anything that will make it easier for us to respond to those when they arise?

Swann: You got it. We have a generation of children growing up who know the value of in-person learning and know many ways to prevent disease transmission. Far more Americans now know diseases can transmit through the air or over surfaces, and many saw that having a bubble of close contacts can help protect the most vulnerable among us. We have seen how crucial medical personnel are, and we know the importance of many other front-line workers. Our systems developed rapid innovations, for testing, treatment, software, data, public-private partnerships, and more.

We will name these learnings and document them, hopefully putting many changes in place that allow us to be more agile and adaptable in response to a new threat, to be more aligned across multiple entities in

our health system, and to be more resilient in our supply chains.

That said, change is difficult, and it can be expensive. Having sufficient capacity or supply to respond to an emergency with significantly higher demand is expensive, and it is difficult in the U.S. to create systems that will be sustainable both in emergencies and during quiet periods. I will not be surprised if a new variant arises in a few months, perhaps in time for schools to restart, and we again find ourselves short of tests or hospital personnel.

Koci: I sure hope so [responding to question], but I have to be honest, the past two years don't leave me with a lot of confidence. Don't get me wrong, the world's scientists, physicians and engineers will be picking through the bones of this pandemic for the next 100 years to learn all we can to be better next time, just like we've been doing since 1918.

Honestly, the research community really did remarkable work during this pandemic. We went from initial reports of a new disease in China in December 2019, to having the full genomic sequence of the virus within a month, preclinical vaccine trials started weeks after that, and the first human volunteers injected with what would become the Moderna vaccine just 63 days after getting the genomic sequence of the virus. Not to mention all of the diagnostic tests, the massive effort to run millions of tests a day around the world, manufacture and distribute all the supplies to support all that testing. All of it created in a matter of weeks. In many ways we were lucky to have this happen at a time in human history where we had the fundamental knowledge of viruses and immunology, we had the technology to do things in real time and at scale, and we had the ability to communicate and collaborate around the world. Watching it happen was inspiring. Thinking back on all of it now makes me think of the Arthur C. Clarke quote that "any sufficiently advanced technology is indistinguishable from magic."

But, at least in this country, people's willingness to refuse proven treatments has made me question our ability to make evidence-based decisions and cooperate for the greater good. The number of people willing to take just about everything in the pharmacy except the things we know work has been too high, and that has made things worse for the rest of us.

There are surveys that suggest as many as 30% of Americans still think ivermectin is as effective or better than the vaccines at fighting COVID. I can't find any data on what that number is for urine, but the mere fact this sentence is not a joke should bother people. But, to be fair, we should have seen this coming.

Accounts from the 1918 pandemic suggest that similar issues were a problem. We've made great strides in the physical and life sciences and modern medicine, and additional research in those areas will help us prepare for the next pandemic. But we may get more mileage out of research into social sciences that help us understand human behavior and decision making. In a pandemic, scientific advancements and modern medicine don't matter if people won't take it.

Provided by North Carolina State University

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