How and Why Social Distancing Works

[Announcer] This program is presented by the Centers for Disease Control and Prevention.

[Sarah Gregory] Hello, I'm Sarah Gregory, and today I'm talking with Dr. Laura Matrajt, a research associate at the Fred Hutchinson Cancer Research Center. We'll be discussing how and why social distancing works to help control COVID-19.

Welcome, Dr. Matrajt.

[Laura Matrajt] Thank you for having me.

[Sarah Gregory] Social distancing is really more about physical distancing, right? I see people on Facebook saying they are social distancing and then they post pictures where they are less than 2 feet from each other. What is the best distance to be from someone? And do conditions matter, like weather or air conditioning?

[Laura Matrajt] Yes, so social distancing is all about physical distancing. So, the recommendation is to be at least 6 feet apart from each other. And so, we believe that SARS-CoV…CoV-2—so the virus responsible for COVID-19—spreads the most from person to person. And this transmission mainly occurs when people talk, sneeze, or cough. And so, when somebody sneezes or coughs for example, the person exhales these little drops called droplets that contain virus. And so we believe that this virus…that these droplets can travel less than 6 feet apart, which is why the recommendation is to stay at least 6 feet apart from other people. So the idea is if you are close to someone who is infected and who might or might not know actually if he's—or she's—infected, when that person sneezes or coughs or talks, his or her droplets won't be able to reach you.

And so, in regards to your question about the conditions, in general—so, for other respiratory viruses—it is believed that being in that close space is generally worse than being outside in terms of spread. But weather has not been shown until now to be a determining factor for the spread of SARS-CoV…CoV-2. And so I know from other respiratory viruses, such like influenza, it is believed that there is more transmission in the winter rather than in the spring or summer because people tend to spend much more time indoors during winter but not because the weather itself has a direct effect. Of course, everything is kind of new for…for this particular virus, so this could not…could or could not be true for…for SARS-CoV-2. So, I think people need to realize that social distancing is about being physically distant, but that there are many other ways that you can actually connect with people who you care about that doesn't involve being less than 6 feet apart. So you can see your loved ones on the computer or talk on the phone, or through all of these apps while keeping the 6 feet apart needed.

[Sarah Gregory] What about if people are wearing masks? Do you still need to be 6 feet apart?

[Laura Matrajt] So, I would say I am not an expert about masks, and I think that the research of masks is still ongoing. But I would say it's better to be safe. And so even if you are wearing a mask, I would…I would still encourage people to…to keep 6 feet apart.

[Sarah Gregory] Okay. Yeah, that's what I've been trying to do, but I just wanted to make…make sure.

You used mathematical modeling to estimate how effective social distancing is to slow down the spread of COVID-19. Would you explain to us how mathematical modeling works?

[Laura Matrajt] Yes. So, a mathematical model is a simplification of reality. So basically, a model takes a very complicated physical or biological phenomenon—like the weather or how a rocket ship will orbit in space or an epidemic and translate it…and translates it into a very simple mathematical rules that allow to make predictions. So if you think about how to describe an epidemic in the simplest possible way, you can think of people being mainly in three groups: you can either be currently infected with the virus, or you have not been infected with the virus and you are susceptible to the virus, or you have had the virus and you are currently recovered. And so if you think in those terms, then next you need to think about how infected people infect new people. And so, what needs to happen is that an infected person needs to be in contact with a susceptible person. And so you have to know some basic characteristics of this virus or some parameters, as we like to call it. And so I need to define what a contact is. And so, a contact for this virus means being in close proximity to each other. For other diseases or viruses, like HIV, the definition of contact is rather different. You need to know how transmissible this virus is, how many days people are infectious, etc. And once you have that information, you can create some mathematical equation that will describe the rate that which susceptible people become infected and how those who are currently infected become recovered. And so in that way, you paint a mathematical model that allows you to make predictions about what will happen in the future. And more importantly, it will allow you to evaluate the full range of interventions without having to try them.

[Sarah Gregory] How is it used to predict the effects of social distancing?

[Laura Matrajt] So, we simulated four different strategies where different groups of the population reduced their contact with others by a certain amount. And by contacts, I mean you can think about going to school for example, or going to work, or going to the grocery store. And so, basically we considered groups of people in these particular works. We considered adults over 60, adults under 60, children, or everyone in the population. And then we simulated transmission of the virus under…under particular conditions, say, “Let's have all the adults over 60 reducing their contacts by 95%.” And we simulated this for 6 weeks, because at the time that was the mandate in Washington state, where I live. And then we simulated coming back to normal by setting the contact of everyone in the population back to what they used to be. And so, in this way we can measure the effects of social distancing in the epidemic. And this allowed us to…to measure a bunch of things. First, we thought…we were able to see which interventions are the most useful and to quantify that. So we were able to…to give an estimate of the number of hospitalizations and deaths that can be averted for each of interventions that we modeled. And we can also see how much lower the epidemic goes with each of these strategies. And finally, it also allows us to see what happens if we stop the social distancing intervention.

[Sarah Gregory] So, let's talk a little bit more about social distancing. The main purpose of social distancing is actually to slow things down. It doesn't…it's not really a cure, right?

[Laura Matrajt] Right. It is definitely not a cure, and it will not stop the epidemic to the point that we will be able to go back to normal. The idea is to reduce the rate at which the number of newly infected people is increasing in the population. And, this is actually the only way we currently have to slow down the epidemic and to avoid the collapse of our health system. But it is important to notice that this is not the only purpose of this, because it will also allow us to buy

crucial time to do other things while we are social distancing. So for example, providing more equipment or to prepare our health system to…you know, to set up more beds in hospitals and to develop crucial vaccines or treatments for COVID-19.

[Sarah Gregory] Take us the through the trajectory of the spread of SARS-CoV-2 and how social distancing has helped?

[Laura Matrajt] So, SARS-CoV-2 is a virus that is highly transmissible. It is believed that, on average, one infected person will infect 3 other persons over the time that he or she is infected. So left without an intervention—which will not happen hopefully anywhere in the world—we would expect to see over 60% of the population infected. And so, the epidemic will start to go down when, on average, when one infected person infects less than one other person. So, the big goal of social distancing interventions is to review the number of contacts so that this rate at which the epidemic is growing—and ultimately the number of infections—is reduced. And we achieve this goal of one infected person infecting less than one other person.

[Sarah Gregory] So, we get down to one person not affecting another person. But then we start getting back together. What happens then?

[Laura Matrajt] Well, so that…that is a problem, right? Because then…then people who are infected will start to infect—on average—more than one person. And so the epidemic will grow again. So, unless we do this in a very organized and planned fashion, we are bound to have a big epidemic again.

[Sarah Gregory] Okay. And what's "flattening the curve"? Where did that term come from, and what does it mean?

[Laura Matrajt] So, in 2007 there was this big scare about avian influenza. And there was a lot of thought and preparation that was put in place about how to deal with an influenza pandemic if we were to experience one. And so as far as I can tell, the term "flatten the curve" originated at that time in the CDC, actually. And it was part of a document describing prepandemic planning guidance against pandemic influenza. And that…that figure that everybody saw in the media can be tracked to that document.

Although the idea behind many of these distancing and other interventions that will not stop the spread of the disease, but that rather will slow it down and it slows down the rate at which cases are growing. And by doing so, when will reduce the big number of cases and hence change the big number of hospitalizations and deaths, so that the hospitals and healthcare infrastructure are not overwhelmed. So, the…the basic idea of us flattening the curve is kind of to spread the infection in a longer period of time so that we don't collapse our health system.

[Sarah Gregory] So it works in relation to COVID-19, basically the same way. It's just a by-product of social distancing, right?

[Laura Matrajt] Correct. Again, the idea is to…to slow the curve of at which new cases are emerging. And so, because new cases depend on infected people contacting susceptible people, the only way to slow down this curve is by reducing the number of contact between people.

[Sarah Gregory] Okay, so going back to your mathematical model, what were your results?

[Laura Matrajt] So, our model predicted that social distancing interventions were really very effective in reducing the number of cases of hospitalizations and deaths as long as a big fraction of the population was reducing their contact significantly. Also we found something interesting,

and that's that if you start using interventions early on when there are very few infected people in the population and then you lift that intervention, you will not flatten the curve but you will actually delay the epidemic. And this is important because this intervention will buy you crucial time to prepare your health system—now like I said before, you know, like putting more beds into hospitals, buying more equipment, by inspiring, the epidemic may occur after the chart in the country. But it is important to know that once you lift interventions, you're kind of back where you left. And in contrast, if you were to start your social distancing intervention later on, once you have reached the exponential phase of the epidemic, which is what probably happened in places like Italy or New York City, then you will indeed flatten the curve. And then it depends on when in this exponential phase you start an intervention, you might or might not see a second wave once you lift the restrictions.

[Sarah Gregory] So specifically, what does your model say will happen now if the restrictions are lifted?

[Laura Matrajt] So the model says that for all of the scenarios we tried, we would have a rebound as soon as we…as the restrictions were lifted. But you…you need to remember that in the work that we did, we didn't do partial opening up, right? We just opened up everything and went back to normal immediately. And so this…this rebound— and we're observing all the strategies that we tried—would be a full rebound if we started the intervention early on. And it might be smaller if intervention started later on. And if you think a little bit about it, it is kind of expected. So if you close everything very early on in the epidemic—like say, here where I live in Seattle—very few people actually were infected. And so once you lift intervention, it's like you start…you're starting from zero again with almost everyone in the population susceptible. But as I said before, in a region like Lombardy in Italy where they closed much later and they already had a lot of cases, then there's this significant fraction of the population that was already infected. And so, if you assume that you cannot be reinfected in the short term, and that…that's an assumption that needs to be proven true…then these people who were infected and are now recovered, they kind of serve as a shield for those who are susceptible. And so when the second wave in that region happens, it might be much slower and much smaller.

[Sarah Gregory] That's if it turns out that there's protective antibodies, right?

[Laura Matrajt] Correct. But we don't know that yet. We know that the majority of the people do produce antibodies after being infected with COVID-19, but we don't know yet how much those antibodies last and if they are protective or not.

[Sarah Gregory] What does your study tell us? What really needs to be done to get us past this pandemic?

[Laura Matrajt] This study tells us that to get us past this pandemic, social distancing interventions alone will not make the cut. It also tells us that if we open prematurely, then basically all this gigantic effort that we have all done by staying home for this past many weeks will be absolutely pointless. So in order to reopen the country or a state or a region, we need to be very thoughtful and we need to have like a coordinated exit where we cannot lift all the interventions at once and we cannot just open everything up, but it has to be a slow process in which some sectors are open, you wait and see, another sectors are…more things are open, etc. And there's going to be some trial and error to see how this works. And more importantly, this needs to be done in conjunction with an almost exhaustive mission of testing, finding people who are infected with or without symptoms, isolating them, tracing their contacts, and testing their

contacts. So basically, neither of these things alone will be able to get us past this. We need to work on this with a more holistic approach. And so…and lastly, I think it would be…it would make things far easier, in my opinion, and faster, if the response was more globally coordinated or, you know, as coordinated as possible. Because this virus doesn't know about being, you know, in a state or about local or federal boundaries. And so, if we solve the problem in this region but not in the one that is next to us, then when you open up here and you have new introductions from the region right next to us, we will have new infections. And so, it has to have…it has to happen in a coordinated way.

[Sarah Gregory] Okay, And in the big picture, how does this mathematical model help public health?

[Laura Matrajt] Well, so I think that this model in particular helps in a number of ways. First, we identified that the timing of interventions was crucial for the outcome of interventions. So as I mentioned earlier, if you started the epidemic early, it will delay the epidemic. But if you started late, it flattens the curve. And so starting early buys crucial time and potentially saves many lives that will be lost if you start later on. Second, I also think we were able to quantify this term "flattening the curve." And we were able to show how many cases, hospitalizations, and deaths you could avert with social distancing interventions while keeping them in place. This is very important, because everything that you achieve, you can lose it if you open up these interventions and you have a big wave afterwards. Like, the kind of events that you averted in the first…you know, during the first phase, you will have in the second phase, if that makes sense. And lastly, it showed us pretty early on that interventions could not be lifted without a very thoughtful plan, and that we needed to do this in conjunction with testing, contact tracing, and isolation if we don't want the epidemic to rebound.

[Sarah Gregory] Tell me what you know about COVID-19 immunity and antibodies?

[Laura Matrajt] So, we are very early in this process. And so it's hard to say at this point if antibodies will be protective or not, and how long they will last. But I just saw a review—a really nice review—where people studied the other coronaviruses and the immunity for those coronaviruses. And so what they found is that if you look at the coronaviruses that circulate normally, and that are the ones that give you the common flu, the immunity for those antibodies lasts around a year. But if you look at the coronaviruses that are more closely related to this one—and those are the ones responsible for SARS and for MERS-—those antibodies tend to last much longer. And so now the question is, what is going to happen with this particular virus because it resembles more to SARS, but it is being far more transmissible than SARS. And so, it's going to be important and interesting to see what the immunity or how long immunity will last.

[Sarah Gregory] What do you think the future holds for us right now?

[Laura Matrajt] Well, so I think this is certainly the challenge of our lifetime. And so, it's going to be difficult and we're going to have to be very creative about how…how we go forward. But I am optimistic that a vaccine out of the 100 candidates that are currently undergoing some sort of testing will work. And I am also optimistic that a drug or a combination of drugs will be found to be efficacious against COVID-19. And if that's the case, that would be a game changer. But at least…at least a vaccine will not be here tomorrow, nor in the following weeks or even months. So in the meantime, I think we need to be really creative to find ways to perform certain activities to reopen the economy. But we need to protect those who are at higher risk of COVID-

19. And so, I think…I think it's going to be challenging, but there are ways to do it and we just…we just need to be patient.

[Sarah Gregory] Well, tell us about your job. Where you work, and what you do, and how you are involved in this pandemic.

[Laura Matrajt] So I'm a researcher at Fred Hutchinson Cancer Research Center in Seattle, Washington, where I am part of the Vaccine and Infectious Disease Division. I'm an applied mathematician, and I am passionate about using quantitative tools to understand infectious diseases and to optimize public health interventions. And I got involved in COVID-19 research originally because I was seeing all of these posts in social media where people were not understanding how big the pandemic was. And at the same time, the news and the media were all talking about this "flattening the curve." But I was not seeing a real quantification of what this really meant. And so I thought if people were given actual numbers and they could see how social distancing interventions will affect their own city and how their actions would have a direct impact on the outcome of the pandemic, that that would help them to understand what scientists and the government….you know, and the measures that were imposed on them, were coming from. And so that was my starting point to this…this research. And now I'm involved in investigating the optimal use of a vaccine, so that whenever that vaccine is ready, we are also ready to deploy it in the best possible way.

[Sarah Gregory] Are you working from home? What are you doing to relieve stress?

[Laura Matrajt] Yeah, I am working from home and I have two kids under six, so that's pretty challenging. But I am fortunate to have a job, and I am very much aware of the privilege of having in the current situation. So to relieve stress, I take walks every day. And I try to be gentle with myself and to other people around me. I think we have to understand that life is not business as usual, and this is something that we have never seen and hopefully we will never see in another 100 years or so. And so, our expectations shouldn't be as usual, either.

[Sarah Gregory] Thank you so much for taking the time to talk with me today, Dr. Matrajt.

[Laura Matrajt] Thank you for having me.

[Sarah Gregory] And thanks for joining me out there. You can read the August 2020 article, Evaluating the Effectiveness of Social Distancing Interventions to Delay or Flatten the Epidemic Curve of Coronavirus Disease, online at cdc.gov/eid.

I'm Sarah Gregory for *Emerging Infectious Diseases*.

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