The Our American States podcast—produced by the National Conference of State Legislatures—is where you hear compelling conversations that tell the story of America's state legislatures, the people in them, and the policies, process and politics that shape them.

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COVID-19: Coronavirus Modeling and Reopening the Economy | May 11, 2020 | Episode 94

Hello and welcome to "Our American States," a podcast from the National Conference of State Legislatures. On this podcast, we're all about legislatures: the people in them, the policies, process and politics that shape them. I'm your host, Ed Smith. Thanks for joining us.

This podcast is one in a series NCSL is producing to focus on how states are taking action in response to the corona virus pandemic. You can find links to these podcasts and a wide variety of other resources at www.ncsl.org/coronavirus.

Today we're talking with Dr. Nirav Shah, a senior scholar at Stanford University's Clinical Excellence Research Center, and former commissioner for the New York State Department of Health. Dr. Shah discussed the myriad COVID-19 models, how to understand them, and how they can be used as state leaders look at reopening the economy in their states.

Dr. Shah, welcome to "Our American States."

Dr. S: It's a pleasure to be here. Thank you for having me.

Time Marker (TM): 01:11

Ed: Dr. Shah, could you talk about all the different models for COVID-19 out there and why and how to use them? For many of us, it's gotten rather confusing.

Dr. S: You're right. You're not the only one who is confused. Models are simply reflections of reality. They're trying to simplify something that's complex. They take data from many different sources and they help reveal, but not necessarily resolve some of the uncertainties in our decision making.

What we try to use models for is just another tool. Rather than relying on your gut instinct on a given question, maybe we can use some of the data that exists to inform our opinion, and that's the point of most models.

Now, there are a lot of models out there and that's why part of the confusion stems from: What does Model A say versus what does Model B say on a given question? And, unfortunately, you

have to dive deep into the various models to really understand where their strengths or weaknesses are.

Think of models as a mirror like one of those carnival mirrors – they reflect reality, but with some distortion. And you have to understand where is that distortion that leads to uncertainty relative to where is the mirror relatively pretty good.

What we found with some models is that without understanding that, you can come to false conclusions. The example, I'll give you the IHME model that many people have heard a lot about and that has been talked about probably most broadly.

Ed: Yes.

Dr. S: The IHME model is a great model, but it has a very different set of characteristics and assumptions than just about every other model used by epidemiologists today. Most models today use a very specific way of modeling: the number of susceptible individuals, the number of infected individuals, and the number of recovered individuals – SEIR: susceptible, exposed, infected and resolved.

Those SEIR models are probably 90% of the models out there. Now, the IHME model is doing something different. It's averaging the observed trends from wherever we have data. So, for example, early on in the epidemic, the only data we had for greater than six weeks was from China. And so, the IHME model showed the curve declining like China did, which was much more steep because China had a Wuhan-style lockdown.

So, if anything, IHME probably did a very good job early on in indicating the trends in the next week or two, but if you looked further out, then it would underestimate the number of cases, talk about a recovery much too fast because no one has a Wuhan-style lockdown except Wuhan. And so, they repeatedly revised their numbers down over and over and over again.

And so, that's an example of something where if you don't know where the model's strengths and weaknesses are, how it's being used, what it's looking at, and what are the assumptions about the underlying data it's making, you can make false conclusions.

TM: 04:29

Ed: Dr. Shah, as state leaders look at what steps to follow to responsibly reopen their states, are there models of specific states that can provide some guidance to them?

Dr. S: Yeah, so this is a really tough question that's facing every state today, and there are big states like New York and California that have entire modeling teams that are averaging the five models out there, and then there are many other states like Nevada who are relying on groups such as covidactnow.org to do much of the modeling for them.

And it's not that one is better than the other. It's about what capacity you have to do and how transparent are folks around the different assumptions that we talked about earlier.

When states are thinking about opening up, first and foremost is certainly: Does our health system have capacity to meet existing needs? That's kind of a gate you don't cross. Right? If your hospitals are already overwhelmed today and it looks like it's not going to change, you're not going to start opening up the restrictions on the economy.

So, certainly there are gates to pass when a state is considering opening up, and health system capacity is probably one of the earliest gates that every system considering opening up is going to consider as number one or number two on their list.

But that's just one of many things that states need to consider. A lot of folks have heard now about Rt or R naught – how much is spread happening in a given location. And what that does is that R naught is essentially a quantification, a summation of how much is the disease spreading. If it's a number greater than 1, you're multiplying cases, right; let's say it's 1.1 – that means tomorrow there will be 1.1 times more what we have today.

If the value of R naught is less than 1, then it's shrinking, and that means that tomorrow you'll have like say .9 of the cases that you have today.

So that R naught or Rt or R effectiveness, it's called many different things, is one of the most important things that states need to look at after looking at health system capacity. Are they actually increasing, are they stable, or are they decreasing the number of cases in their community?

Another important point on why models make a difference here – many models rely on deaths. When you're relying on deaths from COVID, that's a very precise signal in many ways, but it's also very much of a lagging indicator. Someone gets COVID; it's two/three weeks before they die of COVID in most instances. And the more we're learning about COVID-related deaths, we seem to have a vast undercounting of deaths where many people are dying at home, sometimes two or three times the number of people attributed to dying of COVID dying in the home.

So, models that rely only on deaths are going to be lagging indicators and they're probably going to undercount cases.

So, moving upstream, some of the models are looking at hospitalizations. Unfortunately, only about half of the states are reporting daily hospitalization rates, but hospitalization for COVID is a very good signal. And when you can look at that, it's more of a leading indicator than a lagging indicator like COVID deaths.

When all of these models look at the exponential growth and when you're hitting an exponential curve, whether you're relying on death, whether you're relying on cases that are hospitalized, or whether you're relying on cases in the community, which would be the best signal, something earlier before people show up in the hospital, all of those look the same and they average out pretty much the same when you're in the exponential phases.

So, I would encourage people to understand what are the data sources they're looking at to come up with ultimate assumptions and decision points around how is our community doing. That Rt, it's boiled down to R naught or Rt, is that indicator where they're boiling it all up to.

I'll talk about one more thing folks should be looking at when you're thinking about reopening safely. There are two types of tests that are broadly in use and that's an overgeneralization. There's the PCR testing, that is those nasal swabs people are using to look for active infections and there's these blood tests called serology tests, and those are looking for antibodies to COVID-19. So, basically have you been exposed, have you recovered, do you have perhaps even immunity.

So, when you think about testing, PCR and serology testing play complementary roles. PCR testing, early on, shows if you're testing widely enough in the community. Are you actually getting your PCR rate down far enough to show that you actually have the capacity in the system, over time, to catch all the cases?

Today, most places are not testing broadly enough. When your positive rates from PCR tests are 10, 15, 20% as they are in New York City right now that means that 15% of the people who are getting the tests are actively infected with COVID and could be spreading the disease. Only when you add on people who do not have symptoms, add people at random and test just about everybody do you start to get the rates of the PCR tests down to less than 3%. All of the countries that have successfully opened up their economies have maintained a less than 3% positive test rate for at least two weeks.

If you're much higher than 3% but still under 10% you're at a big risk of backsliding, you may not have enough tracing capacity. And so that PCR positivity rate is something you should be tracking closely and you can see that data also at covidactnow.org at most county levels.

Now, the other type of test I've talked about is the serology test. That test is going to tell us if we have herd immunity. Once we have 60 or 70% of the population that have antibodies, in theory, even a positive case or two walking around in the community is going to bounce off of people who have those antibodies, who are immune to COVID and thereby not spread the disease.

So, both tests—the PCR test and the serology test—are needed. And that complementary approach, once you have sufficient PCR testing, and then you show you're doing serology to see who's recovered or are immune, those are the two in combination

So, to summarize, before you open up you need to make sure you're looking at all three of those metrics: Are you testing broadly enough, have you hit a positive PCR rate of less than 3%, what is your hospital capacity like , are you making sure that less than half the patients at any given time in your hospital have COVID and do you have the capacity for surging given the cases that are going through the pipeline. And third, what is that Rt or R effective , the average number of people who get infected by an infectious person. Keeping an eye on all three of those metrics is going to matter.

TM: 11:17

Ed: Speaking of testing and its crucial role in making these decisions, what's your expectation that we will have adequate testing?

Dr. S: Well, as of today, there is inadequate testing everywhere in America. Our hope is that in the coming weeks we ramp up testing. The reality is that what testing is today is a hodgepodge of different solutions, different tests developed locally for the most part with different characteristics.

You saw the studies that came out of Stanford where there were a lot of errors in false positives. That means it's telling people that they have been exposed to COVID when, in fact, the real truth is they haven't, just because the test is not as good as it should be. Those kinds of issues are going to undermine our testing strategy unless we address them head-on.

Our hope is that as we get adequate testing and high-quality testing, we can start to look at testing along the lines of what they've done successfully in Germany, in South Korea, in Taiwan. Other countries that have robust testing programs, which is one of the first things you really need in place to open up, test people multiple times, they test wide swaths of the population, they test people who have no symptoms or reasons to be tested otherwise, unlike how we're testing here.

Today at Stanford when I'm testing patients, I'm testing only those highest-risk patients still. We're not testing broadly in the community. And until we test every person who has got even a potential risk of COVID, and we follow that up with contract tracing for every positive case where 10/20/30/300 people like Taiwan is doing, 300 contacts are traced for each positive case, until we do that we can't have business as usual.
Now, it's important to understand this. Broad testing and tracing are what will allow our economy to be normal again. In Taiwan, they didn't even close schools. Because they had such a broad testing and tracing program, they were able to, except for one school for one week, keep all schools open with the exception of one or two classrooms when a classroom shut down or not.

So, I'm optimistic that as we have these tests and tracing programs built up, as we have these programs built up, we will be able to open up the economy. But until then, we have a large risk of backsliding.

TM: 13:54

Ed: In an earlier presentation, you mentioned this national web-connected thermometer project. Can you explain that project and how it can provide an early warning?

Dr. S: So, today, we have no early warning system for the United States. How do we know whether COVID is in a given community? We're relying on people showing up in the hospital as our first signal of COVID in the community, and that's way too late.

We know that with up to 50% of people being asymptomatic carriers, with most of cases actually being transmitted in the community from one family member to another before they show up in healthcare, that we need a very different, fundamentally different approach toward early warning of COVID in the community.

Kinsa is a company that, for the last eight years, has been distributing smart thermometers, which are basically normal thermometers that are connected by Bluetooth to your phone and

upload the data and give you smart decision support. So, the first time you feel sick, what do you do? You go to the medicine cabinet, you take out a thermometer and you put it in Johnny's mouth, and based on that temperature, the smart app tells you what to do.

Now, if you had such a smart thermometer across a million homes, you could get real-time signals of fever clusters in the community. Tie that with predictive modeling of what normal flu should look like. If you know what normal flu should look like in a given community, you have a fingerprint of a city and its flu pattern, you can subtract out all of what's expected and what's unexpected. Left over is actually COVID today.

It could be other colds and flus, it could be other things that cause fevers, but for the most part it's been COVID. And, in fact, it's been validated in 85% of states now where this has been shown to be COVID, with about a two- to four-week leading indicator before cases appear in the community.

I was on the phone with them with a former head of the FDA and a gentleman who helped lead Taiwan's public health response, and when we first saw that healthweather.us map, we said: that's wrong; it can't be right; there's nothing going on in Florida or Texas. And lo and behold, two weeks later, the first cases were reported in both Florida and Texas.

So, we know that this is a leading indicator; it's COVID in the community; it's the early warning system that we all need, and they have made their data available for public health using an API for states and countries already.

TM: 16:31

Ed: So, with all these models, how do you decide which ones to trust?

Dr. S: So, how do you know which model you should trust? Well, there are a few things that every model should have available for you to help judge whether it's valid or not. First and foremost is: Does that model reflect reality at a high level? Are the numbers on the order of magnitude correct? Is the model moving in the right direction? Is it matching other countries ahead of us in the pandemic?

Second: Is the model robust? Does the model rely on singular risk assumptions? What decisions will the model lead us to? What would happen to our decision if this model were off by 10%, 50% or 90%? Is the model transparent? Can you review it? Is how it works easily explained or understood?

For the SEIR models, which are the vast majority out there that have been used for decades, that's pretty easy. Can you connect with a team and ask them questions?

Next is: Are they clear about the unknowns and limitations of the models? Do the modelers openly admit what they don't know? Do they articulate what the model is and isn't good for? And are they open about the fact that it will change?

Finally: Has the model been vetted? Have outside experts reviewed and endorsed that model?

So, those are the five things I would focus on. Does it reflect reality at a high level? Is it robust? Is it transparent? Are they clear about limitations? And has the model been vetted?

TM: 18:02

Ed: Dr. Shah, we've all been talking about and practicing social distancing for months. How well does it work?

Dr. S: Well, today social distancing is the only tool we have. We call it the hammer. And as a hammer, it ignores every other problem other than the nail. So, it does a very good job in making sure that we tamp down the number of cases, the spread in the community, that R naught or R effective that I talked to you about earlier.

But it ignores the other problems. It ignores what we're doing to people who are in nursing homes. It ignores vulnerable children who are missing school for three months. It ignores all of those small businesses that are shutting down. Today, over half of Americans who work for small businesses are shuttered. It ignores the restaurants where 15% will be open in six months and everyone else will be shut because they only have two weeks of cash on hand.

So, while we've used this because we've thought about COVID as a health issue, we have to also think about COVID as a social issue, as a political issue, and as an economic issue, and thereby address all of these.

It's because we failed on containment that we have had to go to mitigation, mitigation meaning the nonpharmacologic interventions, the travel restrictions, the social distancing. And what we need to do now is to figure out how to get back beyond mitigation and start to open up our economy.

This has been one of the most difficult choices that leaders have to make, and I think it's a false choice between lives and livelihoods. We have to optimize both. We have to think about people's lives and about what they're going to do and how they get back to work as soon as possible.

TM: 19:47

Ed: As you know, our audience is largely legislators and legislative staff. Before we wrap up, is there anything else you'd like to share with them?

Dr. S: Well, leadership is never more apparent than when it's missing, and so I know that the folks on the phone and listening to this podcast are stepping up in many ways to serve their communities. I want to remind folks that we are as strong as our weakest neighbor when it comes to COVID-19. Just because we're doing the right thing doesn't mean that we've solved the problem for our constituents.

That travel restriction being lifted in the neighborhood next door or across the state line has direct and meaningful implications for what COVID looks like for ourselves across the border.

Finally, the virus has been holding up a mirror to all of our society's failings, from overstretched supply chains and underinsurance, overcrowded prisons and understaffed nursing homes. And so we have an opportunity here to not just fix COVID and fix society on one small, narrow slice, but we have the opportunity to take all the best of what we've learned and keep those in place going forward and help our most vulnerable as a result.

Ed: Dr. Shah, thank you so much for taking the time to talk about these issues. Stay safe.

And that concludes this edition of our podcast. We encourage you to review and rate our episodes on iTunes, Google Play or Spotify. You may also go to Google Play, iTunes or Spotify to have these episodes downloaded directly to your mobile device when a new episode is ready. For the National Conference of State Legislatures, this is Ed Smith. Thanks for listening and being part of "Our American States."

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