Going Viral

Los Alamos National Lab scientists discuss coronavirus modeling, data and prevention

Los Alamos National Laboratory scientists Jeanne Fair (left) and Sara Del Valle (right) study epidemiology and computer modeling, respectively, as part of their work on infectious diseases such as the coronavirus. | Courtesy Los Alamos National Laboratory

Santa Fe Reporter, By Julia Goldberg

Over the weekend, Italy locked down 10 cities as five known cases of the new respiratory coronavirus rapidly became more than 200. South Korea and Iran also experienced spikes. Overall, as of this writing, more than 79,000 people worldwide—primarily in China—have contracted the disease; there have been at least 2,600 deaths.

As explained by the Centers for Disease Control, coronaviruses are a large family of viruses that occur in many species, including camels, cattle, cats and bats. Rarely, animal coronaviruses can infect people and then spread between people such as with Middle East Respiratory Syndrome (MERS), Severe Acute Respiratory Syndrome (SARS) and now "coronavirus disease 2019," aka COVID-19.

The number of US cases has been small (35) and New Mexico has not had any (the New Mexico Department of Health says seasonal flu is a more significant concern).

As governments grapple with responses to the new coronavirus, scientists continue modeling its outbreak and determining its cause. Two such scientists from Los Alamos National Laboratory spoke with me recently about their work.

Sara Del Valle, the deputy group leader for LANL's Information Systems and Modeling Group, develops mathematical and computational models for infectious diseases. She has developed epidemiological models for smallpox, anthrax, HIV, Ebola, influenza, among others. She has also worked on investigating the role of internet data streams on monitoring emergent behavior during outbreaks and forecasting infectious diseases. LANL Deputy Group Leader for Biosecurity & Public Health Jeanne Fair focuses on epidemiology and animal disease ecology, and was the principle investigator for a 24-year research project on the impacts of environmental stress on avian populations and infectious diseases.

This interview has been edited for style, clarity and concision.

I was recently in the Atlanta airport and felt like an extra in Contagion. It seemed like everyone else was wearing a face mask. Are they effective?

Sara Del Valle: I've done several studies on the effectiveness of face masks, and one of the reasons I recommend wearing face masks is we tend to touch our faces so often. And the way we get infected with airborne particles is through our hands because we touch infected surfaces and then we put our hands in our mouth or our nose. The other reason I think they are effective is they create a kind of bubble around you. People, especially in the West, try to avoid people that wear face masks. During a big outbreak, if you keep people from contacting others, you can prevent the spread of infectious diseases.

It's my understanding LANL was the most accurate in forecasting the flu season for 2018/2019. How does that work play into your work with the coronavirus?

SDV: It's a very different model we have for the flu…we can't just use exactly the same model. We have been trying to see if we can develop a new model, completely from scratch, that follows the same dynamics but, because we've had the flu forever, we have historical data. This is a newly emerging disease [so] it has to be modeled very differently because we don't have historical information.

How does the data you study—such as satellite imagery and internet data—help predict the spread of an infectious disease?

SDV: Most of the studies where we apply those types of data are mosquito-borne diseases [such as malaria and dengue] and [we] use satellite imagery to measure vegetation, and also measure water content …we also use climate because temperature is very important for mosquito survival… we're using social media to monitor behavior and also track how much people are looking for everyday information. For flu, we look for hygiene, face masks, travel cancellations.

What's a super-spreading event?

JF: it's a really interesting phenomena, something I've studied in animals, is that if you have 100 animals…you basically find this pattern where 20 percent of them will be …transmitting 80 percent of the cases, so a super spreader, or super shedder, is one of those 20 percent that has that for whatever reason. That's a big scientific question right now is to understand what makes these super spreaders; that's the biological.

SDV: Then there's a behavioral component. There are some people who have very different behaviors than the rest of the population. With HIV, there were people who had a lot of partners

and were able to infect a lot of people. With SARS, you have someone who's a frequent traveler, so you can become a super spreader in comparison to the rest of the population.

What are the most misunderstood aspects of infectious diseases like coronavirus you wish you could correct for the public?

SDV: There's a lot of speculation and assumptions about what it is, and until we have more information, we develop models that require data from clinics and what's happening on the ground. We're not able to get all the data in real time; people just need to be careful of the models. They are supposed to be representative of the real world, but they're not the true reality of what's going on.

JF: I would just add to that understanding, from my perspective, why these emerge in the first place: What is it about these changing environments and wild and agricultural animals and human interactions and how can we mitigate that in the future? I will say if we look back to 1993, when we had the hantavirus first emerge in New Mexico, we've come so far. It is pretty phenomenal to look around with this current epidemic and see the thousands of scientists coming together in all the different ways. That's a really positive thing that we really can respond quickly than we would have 30 or 40 years ago.

What else should people know?

SDV: People need to get vaccinated [for the flu]. I know the vaccine isn't as good a match for this year, but we're still recommending people getting vaccinated: It can reduce your probability of being hospitalized. Another thing we recommend is people staying home sick from work or school. In the US we tend to be workaholics, but if people can stay home and avoid exposing others, we can significantly reduce disease spread.

JF: Just really wash your hands throughout the day.

Santa Fe Reporter, February 26, 2020