

COVID-19 Response in Taiwan

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

[Sarah Gregory] Hi, I'm Sarah Gregory and today I'm talking with Dr. Jewel Mullen, Associate Dean for Health Equity at the Dell Medical School of the University of Texas. We'll be discussing how Taiwan used internet technology to help make policy decisions for controlling the spread of COVID-19.

Welcome, Dr. Mullen!

[Jewel Mullen] Good day, and thank you for inviting me to this conversation. I'm so happy to have a chance to talk about our collaboration with colleagues in Taiwan.

[Sarah Gregory] So, probably at this point, everyone is familiar with the fact that COVID-19 exists and can be deadly. Would you quickly tell us why this coronavirus is so much worse than others—even the 2003 SARS, which was pretty bad in itself?

[Jewel Mullen] Yes, I'm going to explain a little bit of what we seem to understand at this point about coronavirus-19 and its comparison to SARS. And it's really an important question for us to consider because, back in 2003, there was so much worldwide alert to SARS and the fact that, for those who were infected and sick, over 9% of them died. And here, even with that high death rate, what we have found is a lower death rate with coronavirus-19—COVID-19—but, worldwide spread. So, one...this is what scientists are seeming to think right now. SARS, even though seeming more deadly, perhaps had less of an impact around the world because, for people to be sick, the infection seemed to reside deeper in their respiratory tract, lower in their lungs. And, and that meant that many of the people who were sick landed in the hospital. COVID-19 settles more in people's upper respiratory tract. We hear these warnings about wiping your face, having good hand hygiene, because it's easy to transmit from the mucus membranes or nasal passages. Well, it seems that COVID-19 can live more in the upper respiratory tract and, therefore, it's easier for people to transmit it when they're not as sick. So, it makes it easier for community spread.

[Sarah Gregory] What was the catalyst that caused Taiwan to spring into such quick action when it became aware of the new, unexplained virus?

[Jewel Mullen] As we know, Taiwan and China are very close...they're not that far apart. And, the Taiwan government and Centers for Disease Control pays very close attention—as other countries do, as we all do—to warnings that come out from other places when they're seeing new kinds of infections. So, when China reported that, on New Year's Eve, December 31st, 2019, their first 27 cases of this new virus—of a viral pneumonia—in Wuhan, that quickly got Taiwan's attention. The experience of SARS from back in 2003 also helped people be more concerned, because during SARS there were 346 cases in Taiwan and 37 deaths. So, Taiwan sprung into action very quickly, and then, because of that, took some immediate action. The timing right there, just at the end of December, coming into early January, was also especially important to Taiwan, because January in Taiwan marks a time when there is increased travel between mainland China and Taiwan, for tourism, for the...people would be coming back to Taiwan for its presidential election, and because of the upcoming Lunar New Year, which would be on January 25. So, the concern that, with travel from Wuhan back to Taiwan would potentially also allow for the people coming back and bringing infections with them, caused Taiwan to spring into action, as well.

[Sarah Gregory] What systems did Taiwan have in place that allowed it to fight the new virus so readily?

[Jewel Mullen] Taiwan has a number of systems in place that are really just the, the characteristics of the way its government runs health and public health and has it coordinate with human services and other sectors. Taiwan has a coordinated national public health network that links to its central Centers for Disease Control. It's a country that has comprehensive, universal healthcare, people have access to care, not just for when they're sick, but for preventive services. And that comprehensive universal healthcare system is supported by a very robust information technology system that enables healthcare providers to have a lot of information about people's health and wellbeing that enables them to care for individuals both for prevention and in the course of disease. Taiwan also has its own robust medical research industry and pharmaceutical industry that can work alongside healthcare in response to new outbreaks, such as this.

[Sarah Gregory] So, this is sort of along the same line...While most of the world was enjoying bringing in the New Year, what was Taiwan doing to begin fighting COVID-19?

[Jewel Mullen] So, recognizing that there would be many people traveling back from China, including from Wuhan specifically, Taiwan started very early on screening passengers on airplanes, screening for symptoms. They put together a task force that included infectious disease doctors, public health specialists, and laboratory scientists who collectively would look at the...the ongoing infection and determine how each of their expertise needed to work together to respond to it and develop policies and procedures to support and protect the public, and to hopefully get to the point of detecting cases as quickly as possible so that robust public health measures would be able to contain the spread of infection.

[Sarah Gregory] Okay, and then what were the action steps the country took? Take us through the timeline.

[Jewel Mullen] Okay. So, some of...some of those action steps included understanding the emerging infection in Wuhan, issuing a travel advisory so people would be extra sensitized to understanding the risk of travel there and the potential for people coming back to bring an infection with them. They early on started developing test kits to be able to, as quickly as possible, recognize when someone was infected. And as they continued to track the evolution...or this...the ongoing infections in Wuhan, they identified that this new infection should be considered a severe pneumonia, a communicable disease, that would allow Taiwan to take some other specific steps. And those steps that you were asking me about included making sure that group tours to Wuhan and to China would stop, to...to raise the travel advisory even higher, to understand that the ongoing need for coordinated action would require a more central oversight.

On January 20, they activated their Central Epidemic Command Center, which is the equivalent of our CDC Emergency Operations Center. There were a number of infection control measures that Taiwan stepped up. Those included making sure that, as travelers were coming back through airports and through seaports, they were having temperature checks and having their symptoms checked. They made sure that at hospitals, people entering were screened to make sure that they didn't have temperatures and people were given hand sanitizer. And, if they were sick or had a fever, they were separated and not allowed to enter. And that was a measure that was important to keep people from bringing infections into a healthcare facility. Based on the experience from SARS, where so many people did end up needing to be hospitalized, Taiwan also recognized the

importance of having enough personal protective equipment—masks, gowns, shields—for healthcare workers. So, they increased the stores of those that they had available. They also took steps to identify areas within healthcare facilities that could be used for isolating cases in the event there were a number of hospitalizations. And they took a broad approach to every day make sure they were aware of what the capacity across the hospitals in the country were for intensive care units and for rooms that needed to be used to isolate people, rooms with negative air pressure. Those were the early actions they took.

[Sarah Gregory] Talk to us about the different technologies to track and monitor quarantined people.

[Jewel Mullen] I appreciate being able to talk about the different technologies that are used and combined to contact and quarantine people. But before I get specifically into technology, I also want to add that we combine, and Taiwan combines, using people along with those technologies. The technologies, in and of themselves, do not take the place of the actions that people also need in applying them. Here's what I mean by that. Some of the first steps that were used on border control and entry points also linked to technology that could be used by the disease investigation teams that had to follow people to understand, one, whether or not, if they were sick, who they could have potentially infected—their contacts—and then to also be able to get in touch with those contacts. Here sometimes we talk about disease detectives, so I'm talking about that kind of disease investigation team. That coordination with technology also includes workers in local government administrative offices, local health departments, and in districts.

And the very first simple technology used sometimes is smartphones. So, telephone contacts for those who needed to be quarantined were necessary, one, for monitoring whether or not people were developing symptoms; two, for reinforcing the importance of staying home; and three, checking on them to make sure their social and emotional needs were being met. Those smart phones, as the numbers of cases increased, were also used to employ another technology, GPS, that existed on the phones, or cameras. And those could be used, both the GPS and cameras, to make sure that people were really staying put. So, that technology was an extra measure of helping make sure that people who were potentially infected were not out and about, potentially spreading infection to others. I want to add that for people who did not have those phones, sometimes they were government supplied.

So, building on that technology, then, were the apps that could be used. So, there is a mobile phone app that was interactive, that people could use so that they could ask questions...ask questions about symptoms, ask questions that would help them continue to maintain themselves at home. And not only did that app enable ongoing communication, but it was a way that one could collect data on the kinds of questions and concerns that people were asking. And that's important information to know, because that technology, then, also helped officials know what else they needed to do to best support the public.

One of the other benefits of having this kind of technology is that everything that I'm describing that links to how people are living in the community, also supports the work across other departments. For example, the information that's collected on travelers was linked to the central database that the country has through its national health insurance program. I've mentioned that Taiwan has a single-payer national health insurance program. That program includes a database that holds the records for everyone who is enrolled. What Taiwan was able to do by partnering with its civil and law enforcement departments was take the quarantine and monitoring

information to set up what I will call “queues” or “flags” in people's health records. These were queues or flags that could alert a healthcare provider if someone had traveled to a or from a high-risk area, or if they had been in contact with someone who was sick. That additional level of information served as important reminders for clinicians in seeing patients that someone who was sick could be at higher risk for COVID-19. It also served as an alert for clinicians taking care of people who fall into higher risk categories, such as the elderly or people with a number of underlying conditions, that they could have been potentially exposed. Because, as we know, we want to be extra careful about potential poor outcomes for people with underlying conditions.

Because I'm talking about this linkage to health information, it's really important for me to stress that this information about travel that links to health information, but there were security measures put in place to make sure that people's health information was not shared outside. So, there was some information that could be provided for healthcare, but no protected health information was distributed outside of the health system. As a doctor, I know how important it is for people to hear that.

[Sarah Gregory] Yes, it is important. Many other Asian countries have a population that had already embraced wearing face masks. Was there an uptick in wearing them after this began? And what about shortages like the US has suffered?

[Jewel Mullen] The Taiwanese have, particularly since SARS, customarily used face masks, especially during times like influenza season. The beginning of COVID-19 definitely produced an uptick in the use of masks, and the country was aware of that. The first step that they took then, to prevent a shortage, was to say “Okay, we better preserve the supply.” And at the end of January, they ended export of masks. But at the same time that they did that, they also increased production.

[Sarah Gregory] So, how are these additional masks distributed?

[Jewel Mullen] So, in order to assure that there would be sufficient availability across the country, Taiwan instituted what I would call a “rationing system” to assure that people would be able to get masks. The way they did this, again, was supported by information technology. What they could do was link to the national health insurance cards that every individual has, so that people could use that card to go to health centers and pharmacies to get masks. It's just...that would be a way of making sure they did not take too many, so that there could be enough to accommodate the public. And to make this access even easier, there was a mobile app produced called a “mask finder” that would help people identify the locations close to them, so that people wouldn't have to go around looking and then get someplace and find out there were none available.

[Sarah Gregory] How many masks did each individual get over a period of time or each day, or however they were distributed?

[Jewel Mullen] The system allowed that individuals could receive nine masks for a two-week period with the exception that children under 16 were able to get ten.

[Sarah Gregory] Tell us about the testing and test development that was done. I understand Taiwan was quite proactive and got a test developed quickly, and testing began almost immediately.

[Jewel Mullen] Yes. In early January, the Taiwan Centers for Disease Control laboratory started to develop a method for testing, and they based this method on what they had learned from the

viruses causing SARS and the Middle Eastern respiratory syndrome, MERS, viruses. Being able to build on that technology and those methods, Taiwan first had its full set of...of the genes for this new coronavirus infection identified by January 11th, and the next day, January 12th, their lab team introduced a new 4-hour test kit. So, this...this quick development of a test was really supported by being able to build on all the knowledge and experience and technology developed from SARS and MERS. As they continued to build out this technology, they were able to continue speeding up the testing and the capacity and found that, by the end of February, they could test 2,450 samples a day, using a variety of laboratories.

[Sarah Gregory] How low Taiwan's case numbers are is pretty impressive. Tell us what they are.

[Jewel Mullen] So, as of April 20th, Taiwan has reported 425 cases of COVID-19—425 cases nationwide.

[Sarah Gregory] And this...this is a population of what size for the country?

[Jewel Mullen] This is out of a population of 23.6 million people in 2019.

[Sarah Gregory] That is impressive!

[Jewel Mullen] Yes, it is very impressive. In addition to that, stating that 425 cases, the other thing that I want to point out, since we've talked so much about the steps that were taken early on, a number of those cases—more than 80% of them—are considered to have resulted from people traveling back into the country with the disease rather than contracting it because they were exposed to someone already inside. I...I...I mention that because the methods that we're talking about are a reminder of how important it is to be able to identify travelers, and quarantine them, and support people who are their potential contacts early on, so that when cases are brought back in, or when infection is brought back in, it doesn't have a chance to spread and cause big, widespread epidemic.

[Sarah Gregory] How did the experience of SARS impact people's health and hygiene behavior? It had a positive effect on the pandemic, right?

[Jewel Mullen] There's something to be said about the good news that comes out of a bad situation. I would consider the health behaviors that people made routine as part of that good news. We've talked a little bit about how commonly people use masks, especially during influenza and other outbreaks, and how ready, then, the Taiwanese were to start using masks when hearing about COVID-19. That use of masks is understood, not just to be a measure to protect oneself, but also be a way of protecting those around you, because the Taiwanese also learned that wearing a mask helps the person cut down on their risk of spreading an infection to someone else. Good hand hygiene, as much as we talk about good hand hygiene, is another one of those routine positive behaviors. Not just hand washing, but use of hand sanitizer. And...and behaviors like that were reinforced by having hand sanitizer available for people to use in public venues and people seeing frequency of disinfecting surfaces in public areas.

[Sarah Gregory] I know that Taiwan already had many health policies, but then they additionally implemented more. What positive impact did this have on the spread of COVID-19?

[Jewel Mullen] The policies that, I believe, have really been helpful and had a positive impact on the spread, come in part from an integration of health and human service-type actions, because, we talked about a lot of policies that relate to asking people to stay home and practice good hygiene, and...and to do things that protect themselves and also protect others. I mentioned

health and human services together because when people...when we're asking people to quarantine and stay home, they still have to thrive. And the ability to support people's wellbeing when they're at home, I think helps the public work with you, as opposed to feeling like you're working against them at times like these.

And there were some specific things, then, that made it easier for these policies to be implemented. So, some of...some of those measures I alluded to a little bit by saying that with the daily check-ins, those were also opportunities to ask people how they were doing, to assure their wellbeing, to make sure that they had ways to communicate with...with others, not just through technology and bots, but also through all of those...those local authorities who were checking on them on a daily basis.

It was also important to make sure that people did not suffer...and it has been important to make sure that people don't in suffer...suffer from the economic impact of being asked to stay home. So, the legislature in Taiwan approved emergency funding, making sure that there could be compensation for people who lost wages, especially those who did not have paid sick leave and needed to stay home during quarantine. They also provided compensation that allowed time off for people who had to care for children or...or older family members. Those kinds of incentives made it easier for people to stay home. Some of those kinds of incentives were similar to ones that were implemented during SARS.

[Sarah Gregory] How do you perceive the social norms of Taiwan differing from a country like the United States? In my first early-on podcast on COVID-19, I talked to Dr. Ben Cowling in Hong Kong. At that time, he said that about 95% of the population was wearing face masks and stayed home as they were told to do. I said at that time, if it came to that here, I couldn't imagine people taking it well or even generally complying, which we are sort of finding. What are your thoughts on this?

[Jewel Mullen] I think, in part, when we compare social norms from one place to another, and we can even do that sometimes inside a country, right?—without even having to look from one cross...country across to another. What people start to think of as an accepted behavior and more of what we all do together sometimes comes from a collective experience. So, thinking about Dr. Cowling and...and the Hong Kong experience, for example, we haven't had the SARS experience here in the way that could be the reinforcer for staying home or using masks. So, this could be an interesting question for us to ask ourselves again in a year or two or five, once we have gotten beyond the pandemic, to see what we in the US even consider as social...a social norm now.

The other thing that I would say, though, is...and this is just, you...you asked me my opinion...is the development of a social norm, in my view, requires that the public, that society, feels like they're helping to create it together and that it's not just imposed on them. And here's where we also...we also have an opportunity to think, you know, across communities: how have we already started thinking about things differently? I know where I live right now, for example, I've gone from having people crowding on an elevator a few weeks ago saying, “Oh hey, come on, there's room for one more” to now saying, “Okay, that's alright, there are already two people on it, I'll wait for the next...the next one.”

So we, in part, have not had the realities of certain experience to help us reconsider how we do things in ways that impact us and impact those around us, and given us the chance to show how much we...we want our actions to also have good, and not harmful, effects on others.

[Sarah Gregory] And would you go back through again quickly, just list all the reasons why Taiwan has been so successful in fighting COVID-19. What are the most important takeaways?

[Jewel Mullen] I've already given you a list, that I'm going to help repeat, but there's a word that I don't think I've said yet that I want to start with, because it's important. All of these different measures have been supported by the trust that the public has had for its leaders in their implementing them. Being able to trust that the people who are devising and helping you live within the policies that they set, is really key to keeping the public on board. And in that regard, having people's willingness to participate and provide information with...on the health checks coming back from Wuhan, for providing detailed information on where you've traveled and who you've been in contact with, the willingness to stay home, are all key. Being able to leverage the technology that was necessary to...for quick development of a test and then rolling it out, was extremely, extremely important. Having the kind of awareness of people's needs across the country as the use of masks increases and being able to scale up production and think about the distribution, was very, very key. Putting together a variety of technologies and information systems to serve people and to help the officials protecting them in a way that upholds privacy but also gets real-time information out quickly, has been key. Being able to assure the wellbeing of people that you ask to stay home is also very important.

[Sarah Gregory] What are your thoughts on how we might gain control of the virus in the US, and globally, at this point?

[Jewel Mullen] Every day I'm reading a report from another country, a different continent, about what next measures need to be taken to gain control of COVID. A number of them are very similar, and what I appreciate about the similarity is that everyone is trying to learn the best practices and what has been successful in other places, and then figure out how to adopt those strategies in their own countries. I don't think there's anything that I can add other than to say that for any country, including the US, we're going to have to figure out, one, our capability to do what's been very successful in Taiwan and other places that have gotten this pandemic under control, at the same time that we have to be very realistic about our own resources and ability to adopt those policies now. Because some of what I've talked about, it has existed in systems that have been around for a long time, and those are systems that we cannot build up overnight.

[Sarah Gregory] Social distancing and isolation has had a pretty profound effect on many people. Are there strategies that you think can help people cope and, most importantly, adhere to the guidelines?

[Jewel Mullen] I think it's been really helpful to even sometimes back away after we say the word "social distancing" and remind people that we really are talking about their keeping an actual physical space between themselves and someone else. So that's one, just the notion. And what we're learning is that people are finding ways to still be what I call "socially distant while physically separate." But the other things are, you know, I've talked to some people who have taken social distancing to mean that they don't leave their house at all. And while that might be the best measure for some, I think it's been very important for leaders to remind individuals how they can go outside and get physical activity, be in the fresh air, and do that safely as well. It's really important for us to make sure, when we say "social distancing," we know people understand what that really means. And then I've already talked about the...the sort of...the human services support that people need to be able to stay home.

[Sarah Gregory] Clearly there's a schism between what is best for health at this point and what's best for the economy. Do you have any thoughts on that you'd like to share?

[Jewel Mullen] The health and the economy go together. It's not an either/or. The way that we're going to have to answer that question is going to be through deciding what the best tradeoffs or the best estimates of the tradeoffs will be. Because we understand that the economy impacts health, and health impacts one...one's ability to participate in the economy. So, it's really not an either/or, and I think that we're going to have to keep that in mind as we think about people's wellbeing. I believe people are trying to take that into consideration as they make, are making, these decisions about how best and how most safely to reopen the economy. The last thing I want to say about that is, while some of what has to be done will be estimates and best-guesses that we'll have to adjust our strategies from. We need information on testing, for example, we need to be able to continue measures for containment and mitigation, keeping cases down and keeping them from spreading and overwhelming the health system, to really be able to balance health and the economy for people's wellbeing.

[Sarah Gregory] Dr. Mullen, tell us a bit about yourself. What's your job, what do you enjoy about it, and how are you dealing with social and physical distancing and isolation? Do you have your own mental health practices, like long walks or yoga or meditation or cooking? Cooking is what I've become obsessed with.

[Jewel Mullen] So, what I like to say about myself is that, even though my job is pretty demanding, I like to think about myself as being a big kid, because every day I need to be able to find...where I've found joy in something, where I've found a little bit of fun. I have a job as a doctor and public health specialist working in a medical school where I get to teach, but where in focusing on equity, what I'm really looking for is having health and public health systems that make it possible for everyone to be as healthy as possible. For me, social distancing has meant staying inside for the most part. But I like to exercise, so I still will take a mask or a bandanna and go outside and walk. I keep my distances from other people. And if it's a rainy day, because I like to exercise, sometimes I'll turn on the music in...in my apartment and dance or stretch. But, you know, moving is important to me. I spend time zooming and facetimeing with friends and family members in other parts of the country, and every day or two, I'm online with the team that reports to me so that we can do group check-ins, not just about our work, but to know how everyone is doing. The things I've said I like to do are really good for my mental health. To me, it's the sound...sound mind in a sound body. And I've always tried to live in a place of gratitude, but I also like to pause and just turn off. And, for me, it means go on and stream some...some show that I probably at work would say, "Oh it's not serious, but I needed to watch it." I'll put my mind there. I love to walk, even in the rain. And like you, I love to cook, and I think I'm in the category of people trying new recipes. Even if it's "What new thing can I make with beans or meatless? Or, if it's chicken again, I'm still happy, too.

[Sarah Gregory] Yes, I have a new recipe a day that I...that I tackle.

[Jewel Mullen] Yeah...

[Sarah Gregory] Got a freezer full of food! Well, thank you so much for taking the time to talk with me today, Dr. Mullen.

[Jewel Mullen] Thank you! Thank you so much. I...I appreciate your giving me a chance to...to talk about, you know, what we can learn from our...our partners in Taiwan. And I hope that, as

we hear all the successes and...and the challenges that people in other countries undergo, we can just keep in mind that we all want the best for people to come out on the other side of this. And...and, I mean, that's the goal: fewer people harmed, getting back to a place of wellbeing for all of us, and then learning from this experience so that we're even better prepared and able to cope and thrive when we're challenged again in the future.

[Sarah Gregory] And thanks for joining me out there. You can read the July 2020 article, Policy Decisions and Use of Information Technology to fight 2019 Novel Coronavirus Disease, Taiwan, online at [cdc.gov/eid](https://www.cdc.gov/eid).

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

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