COVID-19: Amid the Rising Caseload in the United States, the Country Braces Itself

Christopher Cirino

Key Points Addressed in this Article

1. What does "flatten the curve mean"
2. How is a virus like a natural disaster?
3. What are the features of social distancing?
4. What does a PCR mean and how sensitive is it?
5. What are the benefits of Scaling up Tests?
6. What other tests can be used?

I am an infectious diseases specialist and public health physician. My career has been a series of opportunities to assist in the care of patients and collaborate with my colleagues. I trained during the SARS outbreak and the anthrax scare, prepared for a possible ebola outbreak in the United States, and witnessed the innovation of scientists in discovering effective treatments for HIV and cures for Hepatitis C.

With the Coronavirus outbreak, it was almost other-worldly to see how significant the surge had impacted China. I held onto a hope that cases would be appropriately protected from coming into the United States, and that the outbreak in other parts of the country would "fizzle out". The SARS-2-CoV was no SARS. Although it is less severe, it is more easily transmitted. We try to fit the virus into the categories of other zoonotic viruses, such as influenza virus, in which we were more experienced - and I did the same. After all, who can be a novel coronavirus expert?

As I watch this pandemic unfolding in the United States, I realize that this is truly an unprecedented time. Through the past few months, I have had the opportunity to be a resource for local KGW news, various newspapers such as Salem Reporter and the Sandy Post, and other sites such as the DO and Adventist Health website. My general goal was to answer the questions with "facts not fear".

Now that we are in the brink of a widespread epidemic in the United States, I have hope that we will persevere. But we can be sure that it isn't just going to pass through without making an impact.

A virus is a force similar to a natural event. When a storm forms in the ocean, it ultimately will weaken after some time. Though we can at least visualize a storm as it forms and moves. With a virus, a person who is ill becomes an appendage of the virus, its vessel that can deliver it to others unknowingly. As our bodies are defined by natural forces, so too is a virus. Its presence is only as invisible as the capabilities of our technology to track its movement or the people that are spreading it.

When an infection emerges as an outbreak, there are no blueprints for how to address a mysterious disease as it spreads, while healthcare workers evaluate the initial patients in the clinics and hospitals - and inadvertently become infected and spread it; as epidemiologists and lab scientists collect data to analyze it and determine its cause; as other scientists discover an accurate test to use to diagnose it and get it approved; as industries manufacture it and distribute; while investigators work on vaccine and treatment options - all in live action.

Many people will succumb to this virus. Though many more will recover completely. Even as I realize that the impact of death from this virus will likely be less than the amount of deaths
attributed YEARLY to influenza, I am not consoled completely. Systems will be tested. The societal support system will buckle. The economy will be hit hard, as we have watched the stock market dive. We will also continue to see decreases in growth, production, jobs, as we have watched events get canceled, flights and cruises get canceled or unfilled. Those in the margins, such as the homeless, unemployed and chronically ill, will suffer a greater loss. People will die.

Society is like a living entity. Its efforts have turned toward self-preservation and buffering the impact of this growing pandemic. We shift toward producing masks and ensuring that our healthcare workers are protected. We try to disrupt the chain reaction of this natural event through social distancing to "flatten the curve" as if removing the kindling away from a forest fire, lest one of us ignites and spreads the fire further. At this time the collective consciousness is centered on one thing COVID-19. It fuels our thoughts and fears, it fuels our actions, and it fuels our plans.

What will the future bring? We are now living in an experience which is encapsulated by the course of this pandemic. Moment by moment, we measure our actions, we speculate on the time left for it to pass, and we attempt to understand this epidemic any way we can. The news outlets flood the public with exceptional cases - a women who is otherwise healthy in her 30's developed respiratory distress because of COVID-19. ER physicians on the frontline now in critical condition from the viral infection. These are true, unfortunate, and very sad to hear. People will die. Though most people will recover.

We all brace ourselves in the meantime. When will the caseload crest? We await the next few weeks but realize that it will take longer than that. The case load is steadily increasing throughout the world, with the United States now in the cross-hairs. At the time of writing this, almost half of the 68,000 cases and counting in the US are from New York State (33,000). The streets of the financial capital of the United States are barren. We hear about the taxing effects it is having on the healthcare system there, but we also hear of the valiant efforts to organize assistance at this time of need. Meanwhile the caseload in every state is gradually increasing, some of it outside of our vision - that which we have through testing.

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Social Distancing

We speak of this concept of social distancing, which inherently makes sense to us. In a viral infection, where hundreds of thousands to millions of particles are being expelled with each forceful cough, it becomes practically impossible to avoid getting infected without these measures. Add to that the fact that the average person touches their face 25 times an hour. Essentially, if you stay away from an infected person, then you don't get the infection.

The concept of social distancing refers to the fact that a respiratory virus is incapable of surviving outside a host for more than a few days. The history of social distancing goes back thousands of years, when people with physically stigmatizing illnesses like Hansen's disease (leprosy) were isolated from the rest of societies in leper colonies. More recently, in diseases such as tuberculosis and pandemic influenza (1918 influenza pandemic), it became increasingly understood that separating, essentially quarantining, those with infection could reduce the spread of illnesses.

The concept of social distancing is extended further out to social gatherings and is closer to a containment strategy. Droplet-borne communicable illnesses like respiratory viruses spread mainly
by coughing and sneezing. These droplets usually have a radius of spread of about 6 feet. If an infection were left to spread without any measure taken, up to three people can be infected on average by everyone infected person. Those three people go on to infect nine people; those nine people go on to infect twenty-seven people and so forth. This is known as basic reproductive number, or R naught (R subscript 0).

Exponential growth leads to a significant surge of cases. Even if only a small amount of people have severe disease, there could still be enough influx of those severely ill from the infection to exhaust our health systems. This very thing happened in Wuhan, China, with the original outbreak surge and then again in northern Italy. Social distancing attempts to lower this reproductive number, thereby reducing, even if only a delay, of the growth, allowing for a slower development of cases. Social distancing also protects those at highest risk for acquiring the illness (healthcare workers) and those at highest risk for severe disease (the elderly, those with chronic conditions and immunocompromised), by removing yet another person with mild disease who can go on to infect others, eventually getting to those higher risk populations. What happened in Kirkland Lifecare Center was a disaster with 81 elderly infected and 34 deaths from COVID-19.

Social distancing requires sweeping recommendations that include the following:

- No gatherings of up to 10 people or greater
- No sit-down meals in restaurants
- Cancellation of events, music, speaking and religious services
- Increased vigilance if someone were to have cold symptoms (during the flu and respiratory virus season)
- That they would avoid close contact with others, sneeze or cough into their arm sleeve not their hands and
- Wash hands regularly
- All should remember to wash hands, sneeze or cough in the arm sleeve or a tissue and wash hands after
- Wash hands before preparing a meal or before coming into the house.
- Cancel all international travel has also been suggested

There is no restriction on going outside, such as taking a walk in the park or going to the supermarket for provisions. In fact, this might be helpful to provide a buffer from stress, anxiety or depression, as otherwise our lives have essentially been put on hold. This is advised.

Outdoors, there would be little risk of acquiring any illness while in the park and social distancing of 6 feet can easily be addressed on a hike. At a time of greater vigilance, it is with hopes that someone who is infected will also be mindful not to sneeze or cough without covering it. Interesting greetings have come in the name of social distancing including the COVID-19 elbow bump and ankle hit.

Though, asking people to stop interacting with other and distance themselves is a difficult expectation. This means that those that already made plans like a spring break trip would have to cancel. Unfortunately, social distancing didn't hold many college students back from traveling and reveling in groups.

Though, what if social distancing didn't need to be applied? What if testing capabilities would be accurate, available, and rapid enough to test people as they gather. Would a country need to jeopardize its economy and shut down its business sector? There are a few examples from this outbreaks where the countries didn't have to enforce mass containment strategies. If you think about it, we are shutting down our entire society for something, instead of targeted quarantine to
those that are infected.

The Benefits of Scaling Up Testing

Stopping a virus requires testing. If a virus is able to be seen, it can be controlled. We can start with the fact that the number of confirmed cases is likely a small fraction of the actual cases. Yes, this means that the virus is not as fatal as we feared initially. A country like South Korea is the closest example of the importance of testing in identifying those who are infected with COVID-19, akin to "viral night vision goggles." South Korea, coming from the experience of a MERS outbreak in 2015, organized a massive campaign of testing of over 270,000 tests, most of it in drive-through fashion. All of this was done without locking down the country.

However, a real time PCR test is not going to be positive in all patients with disease, so clinical suspicion should still guide recommendations. The PCR has a variable sensitivity, depending on the source of the sample. From an article recently published on Wuhan data of 1070 samples from 205 patients with COVID-19, 19% of whom had severe illness, a sample from the lower respiratory tract had the highest positive rate (14/15, 93% sensitivity). Next in sensitivity was sputum (72 of 104; 72%), nasal swabs (5 of 8; 63%), fibrobronchoscope brush biopsy (6 of 13; 46%), pharyngeal swabs (126 of 398; 32%), feces (44 of 153; 29%), and blood (3 of 307; 1%).

If a patient is presenting with symptoms, a COVID-19 PCR can be ordered to confirm someone who may be infected. If it is positive or the clinical suspicion is high, that person can be told to quarantine themselves for 14 days. This could be used as targeted containment. They do not spread the disease to other people, and, consequently, those at highest risk for death are protected by breaking this link. Now that home tests are becoming available, a person who believes that they are infected can get an order from a physician through a telemedicine consult and use this test to determine their status and respond accordingly. The virus is a catalyst to a chain reaction that requires humans to spread. Testing removes a way to continue the reaction, arresting the process.

A second way to test someone is with serologic testing. For some diseases, this can be used to make a diagnosis, but has largely been supplanted by more sensitive and specific (and more costly) methods like PCR. Though there are some important differences. For instance, take someone who had a recent viral syndrome that was mild and s/he didn't get tested. The PCR tests for the presence of viral, bacterial or fungal or parasitic nucleic acid fragments. In the case of someone with a resolved infection, they will have a negative PCR. A serologic test measures the presence of antibodies that are made by our bodies after they come into contact with a pathogen. If someone had COVID-19 and resolved, their PCR may be negative, but their serologies (immunoglobulin e.g. IgM, IgG antibodies) will remain positive. Therefore, it can be a way to detect immunity. A positive antibody could be used to remove any restrictions on someone who either had confirmed disease or who was relatively asymptomatic with minor disease.

The United States has significantly ramped up testing from the beginning of March (less than 10,000 tests) to 103,945 tests up to March 19th, 2020. South Korea did 10,000 tests a day and still leads the pack. As we gain a greater understanding of this epidemic and look back like Monday Morning quarterbacks, one of our conclusions will be that testing can shape the epidemic and the mortality rate. As we look at Germany's COVID-19 outbreak and see the significantly lower case fatality rate compared to other countries (CFR 0.29), it is no coincidence that they are second on the list for total tests performed. Testing visualizes the virus and bolsters social distancing strategies.
In this last week of March, we are beginning to see the impact of this virus. The caseloads of virus, the amount of hospitalizations and the amount of deaths are expanding. We have gained much insight while we prepare ourselves for what will unfold. Some of it is still in our control, such as the testing and social distancing practices. Some of it has already been shaped by the preceding weeks, and we just don't know about it yet.

One of the most underwhelming things of controlling an outbreak is that it will act like a "dud," when measures work. We can't rely on positive feedback after reducing the impact of an outbreak. The natural force dissipates with less cases and less deaths. Invariably it gets looked at as unnecessarily sounding an alarm or as overly drastic measures.

We hope that the measures that have been imposed will effectively flatten the curve cases. We hope that scaling up our tests to anyone symptomatic - in the near future - will improve our ability to stop or mitigate the harm caused by this automaton - this natural event. By what is occurring in New York City already, we fear that we may have already been too late. Most people will recover completely, but there will be deaths.

**Future directions**

Imagine that we develop a global epidemic surveillance and tracking system that can be immediately activated to mount a response to any outbreak. Scientists can determine the viral genome within a day of sounding an alarm of an outbreak. All countries can respond with assistance in various fields. A streamline way for making tests can ensure a test is developed and mass produced in the matter of days. These tests can be immediately employed to determine cases, which can then be effectively
quarantined or treated. The outbreak dissipates as we gain the upper hand in controlling this force.

In many ways, we have the technology already. Sometimes, people can get in the way of best intentions. There are structures already in place which inhibit rapid upscaling. There is money and time needed to shift attention toward one effort. There are egos and communication gaps. Maybe after this outbreak, we can begin to realize that more effort and global collaboration up front would protect the entire world's societal fabric, its economy and more importantly its people. When an outbreak occurs in one part of the world, it is as if a local infection occurs on our body. We have to believe that any outbreak could expand. We must act proactively to prevent that from occurring, even if the only assurance is knowing that it could have been worse - and has been before.

Thank you for reading this article. Please share it if you found it helpful. Stay tuned for articles to come on viral and host interactions that cause disease, ways in which we can bolster our immune system to protect us from severe disease, and ways to keep balanced in this time of social distancing.

Below are some of the recent coronavirus-related media appearances that Dr. Cirino has had on television news, online news, and podcasts for infectious diseases issues:

**Title with Link:** Can you get Coronavirus from packages sent in the mail

Source: Finder

Author: Cheryl Wagemann

Type of Assistance: Written Format for HARO

Date: March 23, 2020

**Title with Link:** COVID-19 updates: The U.S. socially isolates as pandemic spreads

Source: The DO

Author: Andy Brown

Type of Assistance: Telephone interview for internet article

Date: March 18, 2020

**Title with Link:** Salem-area health officials say local coronavirus cases likely a matter of when, not if
Source: Salem Reporter
Author: Rachel Alexander and Saphara Harrell
Type of Assistance: In-person Interview for news article
Date: March 3, 2020

Title with Link: Gresham medical, school, senior center officials address COVID-19 concerns
Author: Christopher Keizur and Teresa Carson
Source: Sandy Post
Type of Assistance: Interview
Date: March 2, 2020

Title with Link: What should I do if I'm sick? Are children more at risk? Doctor answers your coronavirus questions
Reporter: Brenda Braxton
Source: KGW News
Type of Assistance: Question and Answer Session
Date: March 2, 2020

Title with Link: What are coronavirus symptoms? How are they different from the flu? Your questions answered
Reporter: Morgan Romero
Source: KGW News
Type of Assistance: Interview excerpts
Date: February 26, 2020

Title with Link: Adventist Doctor explains dangers of coronavirus
Reporter: Ashley Khorslien
Source: KGW News
Type of Assistance: In studio Interview
Date: February 18, 2020

Title with Link: Coronavirus: News vs. Reality
Source: Adventist Health Website
Type of Assistance: Contributed Writing, excerpts
Date: February 2, 2020