

Underpromise, overdeliver

The majority of crises that most of us have lived through have not looked to science for immediate answers. In many cases, much of the scientific analysis came after the fact—the effects of climate change on extreme weather events; the causes of nuclear accidents; and the virology of outbreaks that were contained such as severe acute respiratory syndrome (SARS) in 2002–2003 or Middle East respiratory syndrome (MERS) in 2012. Now, science is being asked to provide a rapid solution to a problem that is not completely described.

I am worried that science may end up overpromising on what can be delivered in response to coronavirus disease 2019 (COVID-19). This isn't because I think the scientific community has bad intentions or will purposefully overhype anything, but because of what science can report in real time. It is difficult to share progress with adequate caveats about how long things might take or whether they will work at all. The scientific method is a very deliberate process that has been honed over time: Basic research, which describes the problem, is followed by applied research that builds on that understanding. Now, scientists are trying to do both at the same time. This is not just fixing a plane while it's flying—it's fixing a plane that's flying while its blueprints are still being drawn.

On the testing side, polymerase chain reaction (PCR) technology is allowing folks to know quickly whether they are infected with SARS coronavirus 2 (SARS-CoV-2), the cause of COVID-19. However, a negative PCR test result may lead a person to erroneously conclude that they're in the clear, which is a danger to controlling the spread. We urgently need serology tests that show whether someone has had the infection and recovered. And we must be able to identify individuals who have some immunity to SARS-CoV-2 because understanding their biology may contribute to helping the world recover.

When it comes to drug trials, we've now seen the first negative result on the lopinavir-ritonavir combination, which performed no better than placebo. Efforts are underway to identify other possible drugs—

remdesivir, novel antivirals, and numerous antibodies. These are exciting possibilities, but also extremely speculative. Political overhype of such approaches is extremely dangerous—it risks creating false expectations and depleting drugs needed to treat diseases for which they are approved. And it sets science up to overpromise and underdeliver.

As for vaccines, we know so little about SARS-CoV-2. Developing a vaccine could take at least a year and a half—as many experts have suggested—or maybe won't happen at all. Fortunately, a clinical trial for a vaccine is already underway in the United States, but the public must be told that these early vaccines may not work or be safe—that this vaccine is only being tested for safety, not efficacy, at this point.

Scientists involved in COVID-19 research know these caveats. But the general public—who are agonizing over how long this pandemic will last, how it will affect the economy, and whether they and their loved ones will be safe—are looking for hope wherever they can find it. If science can deliver answers, public trust in science could increase substantially (the high point for trust in science in the United States was at the end of World War II). But if the scientific community contributes to building up hope in the fight against COVID-19, but then doesn't deliver, the consequences for science could

be dire, especially if politicians continue to amplify the false hope irresponsibly.

When science addressed the HIV/AIDS crisis, it took years of careful virology, drug development, and epidemiology. The global scientific assault on COVID-19 is faster, and as I see the research that comes to *Science* and that appears on preprint servers, I am hopeful that science will deliver on this challenge, too. But I worry that engendering false hope will cause complacency that will deprive us of the time needed to find a lasting solution. And I worry about lasting damage if science overpromises.

Let's underpromise. Let's overdeliver

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Science

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