ASK AN EXPERT

March 16 – June 6, 2020

Bard

Introduction

On March 15 of last year, members of the Bard community turned to each other through the college Listserv with a mixture of anxiety, frustration, anger, and urgency: a global pandemic had been declared by the World Health Organization on March 11, 2020, the day of the last in-person faculty meeting on campus.

Both SUNY/CUNY had transitioned to distance learning on March 11 for the remainder of the semester and on March 16, Governor Andrew Cuomo was to sign an executive order closing all schools statewide.

March 15 was a Sunday: students, faculty, and staff were struggling to understand the unfolding crisis. People couldn't be tested; illness was reported but undiagnosed. Understanding transmission of COVID-19 was partial, at best, and communication challenging. Colleagues called upon one another to share information, to assist with risk assessment, and to help shape Bard's emergency planning. The Response Team came together early on in the crisis, remaining a steady, calm, and authoritative source of truth for students and employees to consult as they adapted to life in the time of coronavirus. Various working groups were formed to build out policy and communication even as everyone navigated a disrupted, disorienting spring semester.

In that moment in the middle of March, a series of emails brought together a wide range of Bardians to share what they knew—or were learning—about COVID-19. In what became "Ask an Expert," a suite of essays was posted, nearly daily, between March 16 and June 6, 2020.

The collection serves as a time capsule of sorts, three months' worth of conversation at the beginning of what would turn into a very "long haul" indeed. Reading these entries now, a full year later, we can recollect acute confusion over masks, testing, and therapies. And we can measure the magnitude of hardship and loss—felt so unevenly and inequitably as we were soon to discover—by Bard people and their families, friends, neighbors over this past year.

I want to thank Felicia Keesing for starting this series and to acknowledge the generosity of so many experts (many of whom challenged us to be skeptical of expertise) who took the time to share their own questions, knowledge, insight, and humanity with Bardians near and far.

Deirdre d'Albertis
March 2021

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ESSAYS

No. 1

Exponential Growth

Felicia Keesing

Hi Everyone,

I'm a biologist who studies the transmission of infectious diseases. My update focuses on the present—what I think you should be doing now, this week.

My recommendations for today center around one basic fact:

The virus is spreading exponentially. In simple terms, the number of cases is doubling about every six days. Based on the current known number of cases, and at the current rate of growth, there will be more than 100,000,000 cases in the United States by July. That's a conservative estimate. More on the math of covid-19 spread. For reference, that's about one third of the US population.

This is a daunting number. You might infer that you can't do anything about it, but that's not true. Just as the number grows quickly from a small starting value, little changes made early have a huge effect over time. For example, if we reduced transmission by 10 percent, starting right now, the number of US cases in July would be about 25 million people infected instead of 100 million. If we reduced transmission by 20 percent, that number would be four million.

Based on this information, here are some recommendations:

1. **Practice social distancing immediately**. This is a critical week. Many of you are already doing this, and the rest of you need to start right away. If you're not sure what is included in social distancing, read this. In short, avoid in-person contact with other people unless it's absolutely necessary. There is much you can still do, but think phones and walks, not restaurants and playdates.

2. **Thank the staff**. The College staff has been heroic in getting the population of people on campus down to the lowest numbers possible, and they've done it incredibly quickly. Everyone who can is already working remotely, and the members of staff who remain on campus are doing critical work for the benefit of us all. We should be deeply grateful that they have accomplished so much so quickly. Personally, I want to thank Erin Cannan, my dear friend, who has been ahead of me on what needs to be done at every step.

3. **Call your people**. Around the world, there is incredible variation in how seriously members of the public are taking this situation. I'm going to stick to the numeric argument here, since that's my theme. Please call your family and friends, wherever they are, and encourage them to move to social distancing immediately, if they haven't already. Ask them, too, to spread the word. Everyone who does, is saving lives, possibly their own.

4. **Help however you can**. It's natural for us all to focus on our own challenges, like how to move the richness of our classes online or whether Hannaford's is out of pasta. But there are people around us dealing with far more serious challenges. Earlier this morning, Bonnie Goad and the Center for Civic Engagement circulated a form that captures how each of us can help.

If you'd like more to read on exponential growth, or pointers to a few of what I think are the best articles about the underlying biology, please let me know. Scientific journals are just now beginning to publish peer-reviewed papers about the outbreak, which is increasing the rigor of what we know.

Stay safe and protect others,
Felicia

No. 2

Scientific Predictions

Felicia Keesing

Hi Everyone,

I'm focusing today on how scientists make *science-based* predictions. (Scientists make silly and nonscientific predictions, too, like that the Boston Celtics would have won the 2020 NBA playoffs.) Over the coming weeks, you're going to be hearing a lot of science-based predictions, so I'm going to offer some basic science literacy about them (which we teach our students in Citizen Science).

To make predictions, scientists use models. A model is just a simplification of reality. That might sound abstract, but actually you use models all the time. A map, for example, is just a model of what a road network looks like. The roads aren't actually red or green, and your route isn't actually bright blue! But the simplification of roads into that bird's-eye view, with just the essential information in it, is very useful if you're trying to get from one place to another. And that's why scientists use models—because they can be incredibly useful.

You are already familiar with lots of scientific models, actually. When the forecast is for rain or snow, those forecasts are based on models. And that should help you recognize another essential feature of models—they're always, technically, wrong. They're wrong because they are, by definition, simplifications of reality—so they'll never be exactly the same as reality. Weather models are incredibly complex, but they still have to simplify some things. Just because they're wrong, sometimes more wrong than others, doesn't mean they're not useful.

Here's the key insight that may help you in the coming weeks. Scientists simplify reality by making *simplifying assumptions*. They make active choices about what complexity to keep in a model and what to leave out. So a good way to think about a model, particularly a new one that hasn't shown its usefulness already, is to ask a few questions about its assumptions.

Here are a few key consequences of all this:

1. **Models are essential**. On Monday, I shared projections about how many people in the United States would likely get sick based on choices we make today. Those predictions were based on an incredibly simple mathematical model with heaps of simplifying assumptions. But it gave very useful and quick predictions. That's what it was for. Always remember the core value of a model, even though you know it's technically wrong.

2. **Models typically get better**. In the model I made on Monday, I assumed that the current number of cases in the United States was 3,774. I knew that was too low (because of the absence of good testing), which is one reason I said the estimates from my model were conservative. In general, as we get more accurate information, model projections get better.

3. **Models have simplifying assumptions**. As you hear new predictions from models, practice asking what key assumptions underlie them.* For example, here are two critical pieces of information that will improve models of the spread of the virus in the coming weeks: whether people who recover from infection are immune from reinfection, and how much transmission is coming from people with symptoms versus those without. I'll write more about both of these issues in the next few days.

Models have never played a bigger role in civic life than they are playing right now. I encourage you to value them and not to let their inherent limitations undermine your ability to use them for what they're for—making useful predictions.

Be safe and protect others,
Felicia

* If you're still reading, I'll give you a bit more. If you are healthy, you are practicing social distancing right now (please!), because models of spread include the underlying assumption that asymptomatic people can transmit. We know that they can transmit, but how much they transmit, and whether that transmission is the same for all age groups, is still being determined. There are a lot of other questions around this issue, and again, more on this in the next few days.

No. 4

COVID-19 and Anxiety

Justin Dainer-Best, Assistant Professor of Psychology

Friends and Colleagues,

We are living in frightening times for most of us. Into that insecurity, the current news cycle of "all COVID-19, all the time" is distressing and anxiety-provoking for everyone, healthy or not. Clearly, many are worried.

As the students in my abnormal psychology course can attest, one important question to ask about any worry, from the perspective of clinical psychology, is whether worries are **irrational** or **distressing**. But what do we do when thoughts are both extremely distressing and possibly rational? Do compulsive urges to wash hands begin to look more reasonable?

The answer to the second question is a qualified no—you should be following the Centers for Disease Control guidelines on handwashing and wearing a mask, but when you are in your own home for an extended period, handwashing due to fearful thoughts is not a useful action. Washing your hands for 60 seconds doesn't make you safer, nor does wearing a mask in a space where you are alone.

Everyone's responses to anxiety are likely to be heightened. Many are experiencing anticipatory anxiety ("what will happen if or when I get COVID-19?") and health anxiety ("do these symptoms indicate that I have it?"). Especially if you are someone who tends to be anxious in more ordinary times, you may find that your anxiety is higher or more persistent than usual. This is okay!

Similarly, many folks are experiencing worries about the basic aspects of their lives (finances, employment, health), and we're likely to all experience stress based on staying in one place and only interacting with the same people. Intrusive thoughts that come unbidden to the mind are likely, but we can learn to accept them and not allow them to control our actions.

Some recommendations in dealing with this stress and anxiety:

Take newsbreaks. Yes, read the news, especially the local news—but don't spend all day following it. Don't read every update. When information about the coronavirus is so *salient* and *available*, it can come easily to mind. Don't give it primacy above all else.

It is okay to be anxious. We often think of anxiety as a human "alarm" response—it's currently going off. But we can also distinguish between when that alarm is useful (leading to your avoiding handshakes, canceling travel plans, etc.) vs. unproductive (worrying about the possibilities to the expense of necessary activities).

Get exercise. Whether this means doing yoga in your hallway or going for a walk, meditation and exercise help us manage stress. Many yoga studios offer online or free classes, and you can always give the 7-minute Workout a try. Meditation apps may also be available for free or low costs.

Eat well. Think about your eating habits, and how they'll be changing over the next period of relative stasis. Many of us—me included—are enjoying the opportunity to bake more. Do so with recognition of the fact that we often overeat when stressed. (Freeze half of what you bake!)

Take work breaks. Especially as we come to a new normal, do not treat this as a time to work all day. As Emily McLaughlin put it in her email from the Center for Faculty and Curricula Development, "it's ok for you to slow down." This may be a time to get some things off of your to-do list, but do so while also taking plenty of time for yourself—don't burn out in week one.

Reach out. Take the time to [re]connect with family and friends (on phone calls, video chats, or even just via an email or text message), especially those who may be socially isolated. Make an effort to talk about things *other* than the coronavirus. What great old movie is on your favorite streaming service? Better yet, what book did you discover for free on Project Gutenberg, or which new book did you buy an e-book of to support the author?

Work to experience good things. Incorporate kindness into your life, while also validating your other emotions. Feelings of isolation, fear, or sadness are normal. But you can also intentionally experience positive emotions. Research, including my own, shows that positive emotion helps to combat depression. Cultivate those positive emotions, especially in these times. For example: express love to others, watch streams of concerts, play with pets (or watch videos of cute animals), or take the time to look through old photo albums.

Don't stress every physical sensation. Some of the symptoms associated with a panic attack are similar to the symptoms of COVID-19. If, while feeling anxious, you experience tightness in your chest without fever or other symptoms, recognize that it may actually be related to the anxiety itself.

Reach out if you need help. Many folks are reporting experiencing increases in anxiety behaviors or compulsions, including addictive behaviors. If you are—or know people who might be—reach out for help. Similarly, if despite using these and other tools, your anxiety feels hard to manage or interferes in your daily life, ask for help.

The Crisis Text Line is reporting increased mentions of the coronavirus, and has access to resources. Many therapists (find one on *Psychology Today*'s website) are transitioning to seeing patients through teletherapy (often videoconference), and may be happy to take a new patient. And many recovery meetings are taking place online (see link roundup here).

Beyond all of these ideas, the Centers for Disease Control (CDC) and health organizations like the Anxiety and Depression Association of America (ADAA) have begun to make some recommendations for coping with stress and anxiety in this time. (Links: Manage anxiety and stress from the CDC; a list of resources on managing COVID-19 Anxiety from the ADAA, including resources for parents and specific mental illnesses.)

We all deal with anxiety in different ways—but I hope some of the above coping skills are helpful to you.

From a safe social distance, wishing everyone well,
Justin Dainer-Best

No. 5

Immunity

Felicia Keesing

Hi Everyone,

One of the biggest open questions in the science of the coronavirus is whether people who have recovered from an infection are immune to reinfection. (Everyone should hope that they are, because it would help us slow or stop the pandemic, and make it more likely that a vaccine will be effective, among other benefits.) Unfortunately, the question of whether people can acquire immunity to the virus is actually difficult to answer definitively because, like many of the most important applied questions in science, we can't do the one experiment that would give us the best answer. Here's why we can't.

To figure out **whether infected people are immune to reinfection**—using classic experimental design—we'd have to find a large number of uninfected human volunteers. Let's say 1,000. We'd then randomly assign half of them to be deliberately infected, and the other half to be controls. We'd let the infected ones become sick, keep the uninfected ones from becoming sick, and then, after some period of time, try to infect both groups with the virus. If the ones who were previously infected never got the second infection, but the controls did, that would strongly suggest that acquired immunity occurs. We could also test whether infected people developed antibodies. There would still be questions after this big experiment. Does the immunity last? Does it protect against slightly different strains of the virus? Is immunity different for people in different age groups? The results of this experiment would tell us a lot. I hope you realize that we can't do it, though. It would be unethical to deliberately infect human patients with such a deadly virus—and no one is suggesting that we should, especially me!

Fortunately, scientists are used to working around the challenge of experiments that we can't do. We have lots of other ways of answering important questions. But those ways are typically less definitive than a single big experiment, so we debate our interpretations of the results. Let me illustrate that by describing some evidence that informs our understanding of immunity to coronavirus. Here are some things that we know:

- **We know what happens with some other coronaviruses**, **particularly seasonal ones that cause colds.** People can develop antibodies that protect them for a while, but these don't seem to last forever. (Note that scientists *have* experimentally infected volunteers with these milder seasonal coronaviruses.) For more serious coronaviruses, like those that cause SARS and MERS, there isn't much evidence. Some people with SARS had antibodies long after infection, but others did not. There's less evidence about MERS. More from NPR on all this here.

- **Multiple people have reportedly developed symptoms and tested positive for the virus after having previously recovered from infection**. Were these reinfections real, or had these people actually maintained a prolonged

infection that wasn't detected for some reason? If the reinfections were real, did the reinfected people have underlying health conditions that made them particularly susceptible to reinfection? More on this from the *New York Times* here.

- **Four macaques (a kind of primate) were tested for the ability to acquire immunity.** In the study, which has not been peer-reviewed, **four monkeys were deliberately infected with the coronavirus**. One of the monkeys was euthanized so that the researchers could see where the virus was in the animal's body. Two of the remaining three monkeys were exposed to the virus again to see if they could be reinfected. Neither appears to have developed a second infection. So, what does all this mean? First, that is too few monkeys to draw any definitive conclusions, even about monkeys. Second, monkeys aren't people. In fact, they're a model organism, which means that they're a kind of model, just like the models I described in my previous post. In the case of model organisms like macaques, we make a simplifying assumption that monkeys are like people. Why? Because of the species we have decided it's ethical to experiment on, macaques are the one most closely related to humans. But what if the assumption that macaques are good models for people is wrong here? What if monkeys don't respond to infection the way people do? In sum, it's just too soon to know if this result is meaningful. More here, but this article overstates the evidence in my opinion.

- **We don't know enough about who has already been infected**. The tests that are currently available test for active infection; and in the United States, they are still generally being used for only the more serious cases. If we had a better idea of who had been infected, including people with mild or asymptomatic infections, we'd be able to get a better idea of acquired immunity. It would also be really helpful to be able to measure antibodies to the virus, which would establish whether people had already had it. Fortunately, a new test for antibodies has been developed and could be widely available soon.

The bottom line? Nobody yet knows if people who have recovered from infection are completely, or perhaps partially, immune to reinfection. The evidence will become clearer in the coming weeks and months with incredibly important consequences for us all.

Stay safe and protect others,
Felicia

PS This kind of thinking is the focus of the new Citizen Science curriculum. Little did we realize just how timely it would be.

No. 6

Physical Isolation, Social Connection

Kristin Lane

Professors Keesing and Epstein shared excellent overviews of the mathematics underlying the COVID-19 crisis, and the benefits (and limits) of social distancing for slowing the rate of transmission and reducing the strain on health care resources. Professor Keesing urges us to "call our people" to get them to social distance. But changing behavior is hard—what do we say when we make those calls?

One might be more than a million. The potential numbers of lives lost are almost unfathomable to our minds. I mean that literally—we're not great, as a species, at thinking about large numbers. As quantities of an outcome (such as the number of projected deaths) increase, our psychological experience doesn't follow linearly. (The difference between losing $100 and $200 feels a lot bigger than the difference between losing $1,000,100 and $1,000,200). Exponential growth is a tricky concept to understand. So, perhaps it is not surprising that it is difficult to get people to understand the enormity of the stakes. People have trouble seeing their role in collective action, especially when the outcome in question is abstract.

Despite knowing these facts, I tried to use data to convince my father to take coronavirus seriously. I failed. He ignored the situation until Tom Hanks was diagnosed with COVID-19. What does one single Tom Hanks have that all of my data, about millions of people, do not? Several things—he's concrete, salient, draws on prior knowledge, and elicits (for many people) a warm, emotional connection. While we're not always great at conceptualizing abstract numbers, we are absolutely terrific at being compelled by narrative and having compassion for specific individuals—one picture of a dead Syrian toddler increased donations to group supporting refugees. Capitalize on these tendencies and use individual stories in conjunction with data to persuade your people.[1]

Peer pressure works. If you've ever gone to a religious service that was outside of your faith tradition, you probably looked to other people to see what they were doing, and followed suit. In uncertain or ambiguous situations, like our current moment, we look to others for guidance on how to act. We also change our behavior to fit prevailing social norms. This tendency is why your electric bill might tell you how many people used less electricity than you in a month (perhaps with a frown or a smiley face), in the hopes of nudging you closer to the typical electricity user. Present social distancing as something *everyone* is doing. That idea doesn't only work on teenagers.

You've got your people to practice social distancing. How do we take care of them—and ourselves?

First, I'd argue that social distancing is completely the wrong term for what we want to be practicing. We're innately social creatures, and our social supports are crucial for getting us through hard times. Loneliness impairs physical health. Being alone with ourselves, without much to do is hard—we might choose to receive electric shocks rather

than to sit idly, alone. So, while we aim for *physical* distancing, we should also aim for *social* stitching—to try to knit ourselves into our support structures even more deeply than before.

Here are several suggestions for maintaining psychological well-being and social connectedness during periods of isolation.

Viruses aren't the only contagious things. Our capacities for empathy and compassion go hand in hand with our tendency to mimic each other. Without realizing it, people take on the emotions and behaviors of those around them—even when those emotions are expressed over social networks. Be mindful of what media you are consuming, and what you are putting out into the virtual world—small emotions add up.

Stay connected. As we practice physical distancing, we can take steps to tighten important social bonds. Images of residents of Sienna, Italy, jointly singing from their balconies, illustrate the drive toward creating community even in the face of physical separation. Connect with those close to you, perhaps by taking virtual walks, or, as a friend of mine in Hong Kong has done for the last several months, hosting Zoom cocktail parties. Think of ways to foster connectedness in your classes and among students in your programs in your remote pedagogy.

Do good, feel better. Those of us with the privilege to practice isolation and maintain our relative security should be intentional about thanking and helping those who are out in front keeping our campus running, our students safe, our health stable, and our grocery stores stocked. It's the right thing to do, and it fosters that important sense of community. The Center for Civic Engagement can get you connected. But there's another benefit when you do good—practicing prosocial behaviors fosters our own happiness, feelings of connection, and overall well-being.

Be gentle. Lots of things are going to go wrong in the next few weeks or months—our Zoom connection will fade, or you'll see a friend posting about their night out when they should have been isolating at home. Go easy on yourself—practicing selfcompassion relates to overall well-being and the ability to withstand adversity. Similarly, go easy on others—we are quick to attribute others' behavior to their character ("That person cut me off because they're a jerk!") and our own to the situations in which we find ourselves ("I cut someone off because I had an emergency!"). Stop, take a breath, and think about how the shared, dire situation in which we live might have contributed to people's behavior. In short, be kind—to yourself and to others.

With best wishes for good health and safety for us all,
Kristin Lane

1. For more, visit Arithmetic of Compassion. I'll be reading End Times: A Brief Guide to the End of the World by Bryan Walsh over spring break.

No. 7

How Does SARS-CoV2/COVID-19 Coronavirus Testing Work?

Brooke Jude

How Does SARS-CoV2/COVID-19 Coronavirus Testing Work?

You've undoubtedly heard information on the news over the past few weeks regarding the tests available for coronavirus, SARS-CoV2/COVID-19. These discussions have focused on the number of tests available, who's making them, who's processing them, and how long it takes to get the results (not to mention the time to get in line to have a test, for that matter!).

Here, I will describe how tests work, how they differ from each other, and how new ones may be able to let you know if you've been infected and recovered. This is different from conversations about possibly antiviral drugs or therapeutics, or the development of a SARS-CoV2/COVID-19 vaccine, but they all contribute and are important to the conversation of getting a handle on this pandemic, and how best to control it.

The key to all infectious disease diagnostic tests is measuring the **presence of the virus**. Some of the SARS-CoV2/COVID-19 tests look for actual pieces or fragments of the virus, letting you know a patient is harboring, or actively producing infectious viruses (that could be infecting others). This is the most common test that is currently out there being deployed (e.g. RT-PCR, see figure). Other tests that are now coming on the market after being approved, look for telltale signs that a patient's cells are actively engaged in fighting the virus—a sort of second-hand reporting (e.g. ELISA, Lateral flow assays, see figure). For all of these diagnostic tests, a number of factors are considered during the product design, and there are pros and cons for all—there is no perfect solution, a true "wicked problem."

Some of the questions to consider when developing and deploying a test are:

1. Is the test specific?
Does it detect the agent of COVID-19, not another coronavirus that causes colds, or other, not-as- dangerous infections?

2. Is the test sensitive?
Can the test detect if there is only a small amount of virus present?

3. Is the test reliable?
Do you get many false positives, or false negatives, or inconclusive results if you repeat the test many times?

4. Is the test safe and easy to execute?
Is it dangerous for health care workers to collect the sample and transport it to the testing site? Do you put the patient in any danger when collecting the sample?

5. Does the test require many steps or technical expertise?
To make the test work, is the equipment needed rare, expensive, or in short supply? Can only trained lab technicians or biomedical lab staff do the test?

6. Is the test able to be produced and distributed for all to use (to get a reliable answer)?
Are manufacturing facilities able to make the kit components to get the test shipped out to all labs that need it?

7. Has the test been approved by the FDA for widespread use?
Have all of the proper controls been done, so you are sure of the accuracy of the results? Many tests are under development and are in various stages of this regulatory process. Although it has been accelerated during the demand of this pandemic, this step is important to be sure that the results patients and their care providers receive, provide the very best guidance for care.

2. Tests Types: Viral Detection and Antibody Detection

Viral detection

Viral detection tests currently represent the bulk of tests being administered at this time. They all are based on a sample gathered from a swab (usually taken from the back of the nose or throat), which is taken by a medical health professional (at an office, or drive-through testing facility), and sent back to the hospital lab or testing facility. Once the samples have arrived, they are run. This involves using a kit to isolate the virus's genome (in this case, made up of RNA), also known as nucleic acid. The patient's sample, which may or may not have coronavirus nucleic acid (if the patient is infected or not), is then subjected to a test called an **RT-PCR**. Simply, it uses lab-generated pieces of viral nucleic acid specific for the coronavirus (SARS-CoV2/COVID-19), and matches them up to any patient viral nucleic acid that might be there. The more that is present, the more virus is in the patient.

Tools used:
Swabs, RNA isolation kits, RT-PCR reagents, RT-PCR machine (thermocycler)

Pros:
- Very sensitive—can detect very small numbers of virus particles in a sample
- Very specific—designed to ONLY look for SARS-CoV2/COVID-19 and not any of its close relatives
- Well researched and reviewed—a common type test that can be quickly moved through the FDA approval process

Cons:
- Can be expensive in both time and resources to get samples ready for analysis
- Although getting to a test site can be difficult, new test from home kits, where samples can be sent in from home sites, are being pioneered in Washington State, some funded by the Bill & Melinda Gates Foundation. (See article in resources!)**

- Takes many steps to get samples ready (nucleic acid isolation, setting up RT-PCR run, controls)
- Has to be done in a lab, by trained personnel
- Can be slower in getting results back
- Can only be used on a patient who has virus present—will not likely work, or will be negative on someone who had the viral infection some time ago, and has effectively cleared all virus from their system

Antibody Detection

A second type of test, focused on antibody detection, looks for the presence of SARS-CoV2/COVID-19 in a type of second-hand fashion. It does this by examining if a patient is currently having (or has had!) an immune response specific to infection by this virus. In all pathogen infections, one of the steps the body has in fighting infection is the production of precise antibodies that recognize features of the virus. These antibodies help orchestrate the shut down and eventual elimination of the virus from the body. (Complete aside—if this interests you, an amazing book called *An Elegant Defense*, by Matt Richtel, explains these details and many more. (amazon.com/Elegant-Defense-Extraordinary-Science-Immune-ebook/dp/B07C66KJ C1)

In many/most cases, the cells left behind in the body after an infection remember this specific infection and can come racing back to the front line of defense, should someone encounter the same virus a second time. (**This is still TBD for SARS-CoV2/COVID-19—can you get infected a second time? Possibly. RNA viruses are especially evasive and changeable—time will tell if an immune response will be long lived, as it is for something like mononucleosis, or if it will need constant intervention and vigilance, like measles boosters or annual influenza vaccines.)

Tests are being developed that look for whether a patient has any SARS-CoV2/COVID-19 antibodies in their system. These tests may take longer to develop in the lab, as they need to use samples from known cases as their positive controls, and for other technical reasons. These types of antibody tests have two major categories. One assay, called an **ELISA**, must be carried out in a lab by lab personnel. This test can be run on any type of sample where antibodies might be found, including nasal and oral swabs used in RT-PCR, but also in blood. In an ELISA, (pronounced eee-lie-zah), the bottom of a small tube is coated with a lab-generated protein, one that closely mimics the protein found on the outer shell/coating of the SARS-CoV2/COVID-19 virus. Scientists then add the patient sample to this tube, and if the antibodies to this virus are present in the sample, they will stick tightly to these proteins. All material that is not bound is washed away. Researchers can then add some chemicals that allow them to visualize (usually by the test liquid changing color) if there are antibodies present in the sample (and therefore the patient), and measure (by the vibrancy of the color change) how many there are!

A second type of antibody test is also in development, and has a few added features that may make it popular in coming months. This test, called a **lateral flow assay,** uses many of the biological principles that the ELISA uses, a specific viral protein being bound by antibodies if they are present in a patient sample. Lateral flow assays, though, have the huge benefit of being something called point of care (POC), meaning it can be completed at the patient bedside, without further technology needed for running test or interpreting test. These assays work on a principle similar to that used in rapid strep tests or home pregnancy tests. The test itself has the viral protein embedded on the test strip, usually made of a type of absorbent paper/material (see figure). The patient sample is added to the end of the strip, and as the sample wicks up the paper/material, if there are antibodies present in the blood or swab, they

will stick to the test proteins, and usually turn a color (visualized by a line, usually!). These tests can be useful in areas where facilities are difficult to access, or results are needed rapidly.

Tools Used:
ELISA: Samples (swabs/blood), viral protein, microtiter plates to do the assay in, detection reagents (antibodies, color production), device to measure color production (spectrophotometer) Lateral Flow Assay: Sample (swabs/blood), Test device (pre-manufactured)

Pros:
Can be used to see if a patient has OR HAD a viral infection. Some are point of care and can be done outside of a lab

Cons:
Require specific development of an assay, and may require technical support and expertise. Not as sensitive. Could give more false negative results. May not work if the virus mutates and no longer binds to the test protein.

There is no perfect test out there. We heard a lot of news reports at the beginning about the tests not working, or working well. We are currently running out of swabs and viral nucleic acid isolation kits in some hospital/testing settings, making the collection of samples difficult. And there is the added issue that this virus may shift and evolve, making the constant vigilance in test development necessary. But, identifying who is infected, who has been infected, and how best to isolate and treat patients will be crucial in getting through this critical time of the pandemic.

Resources:

CDC RT-PCR Test details: cdc.gov/coronavirus/2019-ncov/lab/index.html?CDC_AA_refVal=https%3A%2F%2F cdc.gov%2Fcoronavirus%2F2019-ncov%2Flab%2Frt-pcr-detection-instructions.html

CDC RT-PCR Fact Sheet for Patients: cdc.gov/coronavirus/2019-ncov/downloads/Factsheet-for-Patients-2019-nCoV.pdf

Details on LabCorp (private company) development of test: ir.labcorp.com/news-releases/news-release-details/labcorp-launches-test-coronavirus-disease-2019-covid-19
labcorp.com/information-labcorp-about-coronavirus-disease-2019-covid-19

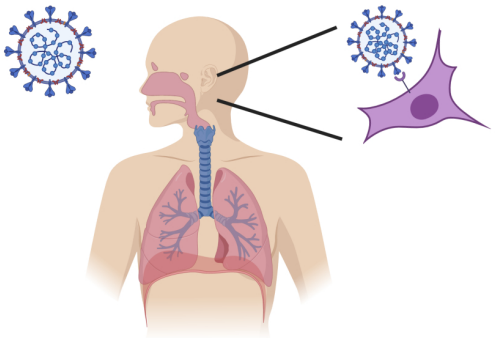
Home testing kits: seattletimes.com/seattle-news/health/gates-funded-program-will-soon-offer-home-testing-kits-for-new-coronavirus/_

Article about ELISA blood test: sciencemag.org/news/2020/03/new-blood-tests-antibodies-could-show-true-scale-coronavirus-pandemic_

Rapid Lateral Flow Test: raybiotech.com/covid-19-igm-igg-rapid-test-kit/

Infection by SARS-CoV2 virus

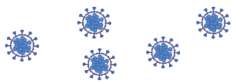
1. Virus enters (nose/upper airway) cells



2. Viral genome (RNA, nucleic acid) is released

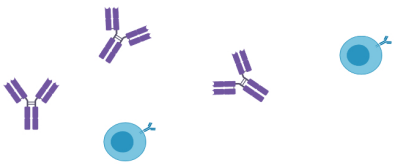
3. Viral proteins and genome are produced

4. Mature virus is packaged and released



AND

5. Body mounts an immune response (antibiodies)

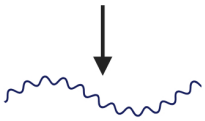


Tests for SARS-CoV2 virus

1. Look for virus

Sample Needed:

swab



isolate RNA/ nucleic acid

Test Type:

RT-PCR Nucleic Acid Detection

Amplify and detect if RNA/NA is present!

2. Look for antibodies

Sample Needed:

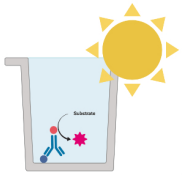
swab

or

blood

Test Type:

ELISA



or

Lateral Flow Assay

Detect if antibodies are present!

No. 8

On the Influenza Pandemic of 1918: The View from North America

Myra Young Armstead

The Covid-19 pandemic invites comparisons with a similar 20th–century worldwide plague. Just over one hundred years ago, the influenza epidemic of 1918 was a global scourge, killing approximately 50 million people in a one-year period. Actually, the number of fatalities can only be estimated and range from 20 to 100 million, because no one kept official records. Still, these figures are staggering. Most scholars agree that there were three waves of the disease (perhaps caused by different strains of the virus)—spring 1918, fall 1918, and winter 1919—but some add a fourth that touched even previously unaffected Scandinavia in 1920.[1] The first was relatively mild and limited in geographical reach, while the middle two were far more virulent and global in their deadly results. The question of origins is still a puzzle for historians of science, but almost certainly conditions in World War I facilitated the spread of descendants of flu strains present throughout the world from earlier, less brutal influenza pandemics in 1847 and 1889, and the outbreak may have been linked to avian and swine flu, which was unknown to scientists in 1918. The history of this pandemic allows us to reflect on public perceptions of disease, factors contributing to the spread of disease, and which populations are hardest hit by epidemics despite their undiscriminating expanse.

Contrary to what we are witnessing with the current Covid-19 pandemic, the first wave of the 1918 influenza epidemic seemed to begin in America's heartland, concentrated especially in army camps, rather than its coastal cities and the press was relatively sluggish in picking up on the story. In late March of 1918, for instance, using federal sources, the *Grand Forks [ND] Herald* noted a rise in pneumonia and influenza cases, but headlined that "epidemic sicknesses are declining."[2] Similarly, the *Oregonian* announced in a most matter-of-fact way, "Mumps and influenza prevail in many National Army camps and some measles and meningitis are reported."[3] In retrospect, newspapers were relatively more concerned with an increase in cases of influenza in horses in early March.[4]

But by early April, reports appeared of a "mysterious epidemic" affecting 300 schoolchildren in Mexico, Missouri; 30 inmates and 10 guards in the Wayne County, Michigan, jail; Wayne County clerks and court attachés working in the county government building; and Ford factory workers in the Detroit area.[5] Journalists revealed that a "nuplerious malady" "hits Duluth hard," confining hundreds to their beds and crippling businesses. Clearly, influenza thrived among large groups of people. Although the "flurry of influenza" at Camp Custer in Battle Creek, Michigan, was simplistically attributed to dust, remedied by sprinkling the roads with water, authorities soon realized that the disease was spreading at an usually rapid pace and that the airborne germs carrying it could not be so easily stopped.[6] By the summer, however, new cases of the "three-day fever" dropped precipitously and the trouble seemed over in the United States.

Canada had scarcely been touched that spring. As World War I progressed though, poor, rural Chinese workers recruited by Britain as part of the Chinese Labour Corps (CLC) (noncombatants who served in France repairing damaged rails, building roads, digging trenches, unloading ships, and the like), traveled eastward across the Pacific into Canada to Halifax in crowded railcars on the Canadian Pacific Railway beginning in 1917. Canadian doctors dismissed the fact that 3,000 of 25,000 of the CLC employees required medical quarantine from a respiratory illness in July of 1918, and instead blamed their sickness on "Chinese laziness." Such racial stereotyping meant that many of the sick went undiagnosed, unquarantined, and traveled onto Europe where they died and the disease, already present there, spread even more swiftly in the wartime incubator.[7]

Things were hardly over in North America, though. In the fall of 1918 and into the following winter, influenza returned with a ruthless vengeance—a byproduct of the movement of troops serving in World War I. Identified first in late August in the Boston area among sailors and soldiers docked and stationed there, the contagion quickly reached civilians. The new strain was far more virulent than the earlier one. One doctor treating patients at Camp Devens, outside of Boston, explained how this particular flu, starting with familiar symptoms of chills, muscle aches, and headache, progressed to a deadlier form: "[Victims] rapidly develop the most viscous form of Pneumonia that has ever been seen. Two hours after admission, they have the Mahogany spots over the cheek bones and a few hours later you can begin to see the Cyanosis extending from the ears and spreading all over the face, until it is hard to distinguish the colored man from the white. It is only a matter of a few hours until death comes and it is simply a struggle for air until they suffocate. It is horrible."[8] On October 2 alone, the surgeon general reports 14,000 new cases within 24 hours, with a concentration in army camps like Camp Meade, Maryland; Camp Pike, Arkansas; Camp Hancock, Georgia; and Camp Funston, Kansas. By the time the pandemic ended, roughly 25 percent of Americans suffered from the epidemic. Influenza claimed the lives of approximately 675,000 people in the United States and 50,000 in Canada—6.5 percent and 6.1 percent of the total populations of those countries. Because soldiers lived in close quarters, they were highly vulnerable to the disease and contributed to the young age of those dying.[9] In stark contrast, today, the elderly are the most susceptible to Covid-19.

Then, as now, medical advice warned about the extreme contagiousness of the disease and stressed social distancing. People were warned to avoid shaking hands, to cover their mouths with masks, to remain indoors, to avoid touching library books, and not to spit in public. Large assemblies were stopped in affected army camps, and schools and theaters closed. Then as now, in the absence of a cure, scammers rushed to fill a desperate public's need by advertising and selling bogus, unscientific remedies.

In Dutchess County, the *Poughkeepsie Eagle-News* carried stories about a local pastor who contracted influenza while accompanying a contingent of local army volunteers by train to Camp Wheeler in Georgia, and about local defiance of the order from Beacon's commissioner of public safety to close all that city's saloons. There were complaints of boredom about the closing of theaters, none about the closing of churches. The paper carried appeals to county residents to join the local Red Cross is making mouth masks for the army camps. The newspaper also provided ostensibly expert explanations of the disease and treatments as well as ads for questionable "Influenza Preventatives." There were, of course, many items on individuals struck by the disease—those who died and those in recovery—but admirably, there were also reassuring articles reminding citizens that despite its pervasiveness, the pandemic offered "No Occasion For Panic." [10]

A few weeks before the 1918 pandemic gained wide notice in this country, the "Keep Well" column of the *Wilkes-Barre Times Leader*, a regular feature of that paper, offered a helpful, dispassionate, clinical description of influenza (known then also as "the grippe"): "Influenza may be regarded as a mild disease, the complications constituting the real danger, especially among elderly people and those who are physically 'rundown.' Of the complications the most important and dangerous are the lobar and [broncho] pneumonia. There can be no question but that there exists in all cities a certain number of carriers of the influenza germ." Offering further historical perspective, the writer explained, "Ancient records show that influenza epidemics were quite common. This spread always followed the lines of human travel and commerce and covers widely separated countries with such rapidity as to have produced the superstition that its onset is due to a malign 'influence;' hence its name. It is known now that there is no mysterious influence and that infection is due to [a] micro-organism."[11] We would do well in 2020 to absorb this now 100-year-old observation by practicing not only social distancing, but also mental distancing from any prejudicial, uninformed thinking on the current public health crisis.

1. Two good articles available through the library's JSTOR database are Niall P. A. S. Johnson and Juergen Mueller, "Updating the Accounts: Global Mortality of the 1918-1920 'Spanish' Influenza Pandemic," *Bulletin of the History of Medicine*, Vol. 76, No. 1 (Spring 2002), pp. 105-117 and K. David Patterson and Gerald F. Pyle, "The Geography and Mortality of the 1918 Influenza Pandemic," *Bulletin of the History of Medicine*, Vol. 65, No. 1 (Spring 1991), pp. 4- 21. See also John M. Barry, *The Great Influenza: The Epic Story of the Deadliest Plague in History* (New York: Viking, 2004); Carol R. Byerly, *Fever of War: The Influenza Epidemic in the U.S. Army During World War I* (New York: New York University Press, 2005); Alfred W. Crosby, *America's Forgotten Pandemic: Influenza of 1918*, 2nd edition (Cambridge: Cambridge University Press, 2003); and Jeffery K. Taubenberger and David M. Morens, "1918 Influenza: The Mother of all Pandemics," *Emerging Infectious Diseases*, Vol. 12, No. 1 (January 2006), pp. 15-22.
2. *Grand Forks Herald*, March 29, 1918
3. The *Oregonian*, March 29, 1918
4. The *Emporia Gazette*, March 4, 1918; The *[Ann Arbor] Daily Times*, March 6, 1918
5. *Kansas City Times*, April 3, 1918; *Detroit News*, April 3, 1918
6. *Duluth News Tribune*, April 3, 1918; *Daily Times News*, April 2, 1918
7. Mark Humphries, *The Last Plague: Spanish Influenza and the Politics of Public Health in Canada* (Toronto: University of Toronto Press, 2013), pp. 71-72
8. Letter from "Roy" to a friend in Detroit, September 1918, cited in Gina Kolata, *Flu: The Story of the Great Influenza Pandemic of 1918 and the Search for the Virus that Caused It* (New York: Touchstone, 2001), pp. 13-14 9. *Lexington Herald*, October 2, 1918; *Macon Daily Telegraph*, October 2, 1918; *Kansas City Star*, October 2, 1918; Johnson and Mueller, "Updating the Accounts"
10. *Poughkeepsie Eagle-News*, October 31, 1918; *Poughkeepsie Eagle-News*, October 23, 1918; *Poughkeepsie Eagle-News*, October 14, 1918; *Poughkeepsie Eagle-News*, October 24, 1918; *Poughkeepsie Eagle-News*, October 12, 1918
11. *Wilkes-Barre Times Leader*, March 1, 1918

No. 9

Asymptomatic versus Symptomatic Transmission

Felicia Keesing

Hi Everyone,

Today, I'm writing about symptomatic versus asymptomatic transmission of the virus that causes COVID-19. This is a critical issue, as you've probably realized from trying to make decisions about your own daily life and that of your loved ones.

There are two critical questions:

1. What percentage of people who are infected with the virus never develop symptoms?
2. Do asymptomatic people transmit the virus to others?

Ideally, to answer both questions, we'd test a large, random sample of people, regardless of whether they were experiencing symptoms or not. We'd test them repeatedly, assess their symptoms, and measure how much virus they were shedding. But that ideal research study doesn't appear to be about to happen very soon.

So what have we got? Let's start with the first question: **What percentage of people have no symptoms despite having the virus?** To estimate this, it's important to use an appropriate sample of people. For example, a study based on China's outbreak suggested that only one percent of infected people were asymptomatic, but this is almost certainly low because the testing approach in China focused on people who were symptomatic. (We're doing the same thing in the United States right now.) A study in Seattle is now testing a much better sample of people and this should provide a more accurate estimate of the percentage of infected people who develop no symptoms. While we await those results, here are some bits of evidence from elsewhere.

- Of 13 Japanese citizens evacuated from Wuhan, China, four (31 percent) did not develop symptoms despite testing positive for the virus. More here.

- Of people from the Diamond Princess cruise ship, 18 percent who tested positive did not develop any symptoms. The nature of testing on the ship makes it possible that this is an underestimate. More here.

- A study in Science magazine estimates (using a model—see my earlier post on models) that 86 percent of infections in China in January were undocumented and that undocumented infectious people were the source of infection for 79 percent of documented cases. *However*, an undocumented case is not the same as an asymptomatic case. I would recommend being cautious about this study's conclusions.

- What do we conclude from all of this? **A substantial percentage of people—for now let's estimate 20-30 percent—appear to develop no symptoms despite being infected with the virus**.

- And finally, asymptomatic individuals, by definition, have no symptoms at all. There is another (large?) percentage of people who have only mild symptoms, which might be hard to distinguish from a cold or seasonal allergies.

Now for the second question. **Do people without symptoms still transmit the virus?** Keep in mind that this involves two categories of people—those who will never develop symptoms and those who will develop them, but don't currently have them. Let's look at some evidence, which is still surprisingly scarce.

- In a study that has not yet been peer-reviewed, scientists investigated the infectiousness of people in China with moderate to severe illness. They estimated that peak infectiousness was reached zero to two days before symptoms appeared, and that about half of transmission events occurred during this time.

- In another study that has also not yet been through peer review, scientists in Germany measured viral concentrations from patients over the course of their infections, with the investigation starting at the time their symptoms were first beginning and quite mild. Viral concentrations from their throat swabs were very high in initial samples, which suggests that their viral loads were probably high before their symptoms were first detected.

- There are multiple reports of children with no symptoms who have high viral loads in their upper respiratory areas (mouth, nose, throat). Here's an example.

- There are also clinical reports of asymptomatic people who were the likely source of an infection among household members, based on contact tracing. Here's an example of that.

- A lot of new information is coming out as papers make their way through peer review, so expect the details on all of this to become much clearer in the coming weeks and months. **For now, it is clear that infected people are contagious before they experience even mild symptoms**, and some infectious people will never experience symptoms.

Together, these are two of the best reasons why everyone should be practicing social distancing right now. There's a reasonable chance that we could be infected and shedding virus while not aware of it, and the people around us could be, too. The safest thing to do is to assume that we are, and so are the people around us. In other words, we should be in as little physical contact with others as our lives and living situations permit.

Stay safe and protect others,
Felicia

PS If you are aware of other relevant studies, please let me know. Things are coming out at quite a pace right now.

No. 10

Data Literacy, Public Health, and COVID-19

Joshua Bardfield ’01

Disclaimer: What we know today about COVID-19 is based on data that are still being collected, that analyses and interpretations are based on incomplete data sets, and that our understanding of the virus is evolving almost daily as more data and more robust analysis is conducted. What we know today may be different from what we know tomorrow.

Data are a critical component of almost any thoughtful scientific analysis, business decision, evaluation of demographic trends, patterns, habits, etc. Carefully collected, analyzed, and visualized data facilitate sound decision-making; separating what we think we know from what can be verified or proven. Importantly, the field is not limited to the pursuit of data quantity, data quality is equally relevant, as well as the appropriateness of its analysis and the usefulness of its visualization or graphic representation.

In the field of public health considered broadly, data are critical, and yet—in my years of global health work, data literacy emerged as an area of profound weakness among all manner of public health professionals—practitioners, nurses, clinicians, and among administrators and governments.

This collective need to improve processes for data collection, analysis/interpretation, synthesis and visualization becomes increasingly evident in times of crisis, when the urgency for information accelerates and the public’s need to know becomes more profound.

What does this mean for those who rely on data to develop programs or design policies to address pressing public health problems or emergencies? How does it influence public opinion when amplified across a 24-hour news cycle that sidelines or overlooks the methodologies, caveats and/or context of a particular piece of data, trend, or analysis?

When we think about data, as articulated by the National Academy of Medicine in *Public Health 3.0*[1], it must be “timely, reliable, granular [sub-county, regional, local], and actionable.” It must also be accessible to the communities that need it—whether locally or nationally—to illustrate the problem, to inform evidence-based decision-making (whether for program or policy), and to track program effectiveness or failure. Ideally, data should be accessible in real-time, and disaggregated by age, sex, and relevant behavioral and subpopulation characteristics, which allow us to target actions and resources where they are needed most. It must also be analyzed, synthesized and disseminated in formats that are audience-specific and designed to produce useful, actionable information for communities.

Deficits in data use and analysis do not only lead to poor decision-making, but when they spill over into communication with the public, they may lead to unnecessary fear, anxiety, and/or confusion. This is particularly

problematic when layered upon the proliferation of social media, which enables the rapid and nearly incalculable spread of (unproven) anecdote.

Poorly or hastily communicated 'data' can lead to confusion and even death, as we've seen with the irresponsible push of anecdotal information about the use of chloroquine or hydroxychloroquine[2,3] to treat COVID-19—a claim that was instigated by word-of-mouth, not based on sound science, and not tested or verified in a way that makes it safe or efficacious.

As we read in Professor Keesing's well-articulated piece about COVID-19 and patients that are asymptomatic, here too, as she notes, the data are preliminary, some anecdotal. We must remain vigilant in how we interpret data that has yet to be rigorously tested using proven scientific methods to produce both valid and reliable results. Yet another example relates to how long COVID-19 can survive on surfaces. As of a few days ago, much of these assertions were based on a *New England Journal of Medicine* article[4] describing viral durability or "surface stability" under experimental conditions, e.g. in a laboratory setting. While the authors' results may yet prove to be reliable, this information was extracted and disseminated to the broader public without the benefit of needed context—chiefly that laboratory conditions are not a mirror of real-world settings, that we need to tread cautiously, but also not abandon what we know to be most effective at limiting transmission: proper handwashing and social distancing.

Finally, we now see models, projections, and recommendations on a daily basis. Many of these data are shocking. And while they may be quantitatively true based on the specific design and interpretation of the assumptions on which they are based (which are always up for debate), they need to be interpreted and digested with careful consideration for the information on which they are constructed and the context that they assume—information that is often not provided or readily available at the point of dissemination. Therefore, how do we ask the right questions to expand our understanding? For example, what is the denominator? How are the measures or indicators defined? Is a change a trend or an anomaly? How should we interpret variation?[5]

Over the next weeks and months, as the true picture of this crisis comes into focus, public health practitioners, clinicians, statisticians, and others will have ample opportunity to collect more data and to conduct further analysis to achieve more robust statistical power to reach well-informed conclusions that, one hopes, will help us better prepare for the next major crisis.

1. nam.edu/public-health-3-0-call-action-public-health-meet-challenges-21st-century/
2. sciencemag.org/news/2020/03/insane-many-scientists-lament-trump-s-embrace-risky-malaria-drugs- coronavirus#
3. cnn.com/2020/03/23/health/arizona-coronavirus-chloroquine-death/index.html
4. nejm.org/doi/full/10.1056/NEJMc2004973
5. ihi.org/resources/Pages/ImprovementStories/UnderstandVariationinData.aspx

No. 11

What a COVID-19 Test Will and Won't Tell You

Matthew Deady

Given the level of coverage about medical testing for Covid-19, I was reminded of how difficult it is for all of us to interpret what tests do and don't tell us, and how we should interpret results. As it turns out, this is a question that I have dealt with a lot as I have taught courses that cover statistics and their interpretation, both for science students in Physics and Biology, as well as in courses more generally aimed at non-scientists, such as our Citizen Science course.

I was prompted to write this by reading a very well-constructed article in the *Washington Post*, for which I have given a link below, and I will be quoting from. You might want to just read the article, but in case you want more, here is how I have covered these matters in class.

Having the Virus *vs.* Testing for It

A test is an attempt to ascertain the status of a situation, it is not the status itself. We know that abstractly, but keeping it in mind is difficult in the heat of the moment. To take an intentionally silly example, suppose you want to know the percentage of green M&M's in a big jar. You pull out 20 of them, count out 4 green and 16 non-green M&M's, and use that to give your estimate as $P(G) = 4/20 = 5\%$. There actually is a true answer of what percentage of the M&M's in the jar is green ones (maybe it is 5%, maybe not), and you did a test to try to find that percentage. The test could give a better or worse answer, for a variety of reasons:

- 20 might be too small a sample to be accurate,
- They might not be well mixed and you took an unrepresentative sample,
- Green M&M's are heavier, and more likely to sink to the bottom of the jar . . . . The message here is: the test result is an *estimate* of the situation, not the *truth.* A test for the Covid-19 virus might give the right result or not, for reasons that I will explain.

How Many People Have the Virus?

The question we really might want to know is how many people are infected with Covid-19. How many in the U.S.? How many in Dutchess County? How many at Bard? The truth is, we usually don't know the answer to that question for any disease until long after the fact, when we can tally how many people became ill. But we can often develop a test that we use to try to tell us whether a given person has a disease or not.

But beyond one individual, knowing the overall presence of a disease in a population is crucial in knowing how to interpret the results of a test. To take a ridiculously simplified example, with the numbers rounded off to make them easier to digest, suppose we had a "90% accurate test" for Lyme disease. Look at how the prevalence of the disease affects test interpretation:

- If 20% of the population has Lyme, then for 100 people, 20 have Lyme, and 18 of them (90% of 20) would test positive. But, of the 80 that don't have Lyme, 8 would also test positive (10% of 80). 26 people test positive, but only 18/26 = 69% actually have Lyme.
- If 2% of the population has Lyme, then for 100 people, 2 have Lyme, assume both of them (90% of 2) would test positive. But, of the 98 that don't have Lyme, 10 would test positive (10% of 98). 12 people test positive, but only 2/12 = 17% actually have Lyme.

How prevalent the disease is in the test population is clearly a major factor we need consider.

How the Covid-19 Tests Work

There are a variety of tests being used now, but they mostly follow one of two procedures.

Blood Test for Antibodies: Your immune system attacks invaders by producing specific antibodies that attach to the virus or microbe in attempt to neutralize or kill it. A laboratory can test your blood for the presence of specific antibodies specific to this coronavirus.

Swab Test for Virus Particles: In this case, a nasal or throat swab is taken and then sent to the lab to look for patterns in the nucleic acids that are characteristic of the virus's genome. Corona viruses have 30,000 nucleotides, and these tests look for sequences specific to Covid-19. One such test looks for two such 100-nucleotide Covid-19 nucleotide sequences. If both/one/none of these sequences is found, a result of positive/inconclusive/negative is returned, respectively.

This blood serum test might be more accurate in determining if a person has had the virus, because it can detect antibodies even if a patient has recovered. But it would be less accurate if done too early, before the person's body has produced antibodies against the virus. The swab test looks for the virus itself, even if the immune system has not attacked it yet.

Why Might a Test Be Inaccurate?

Lab tests are not always correct. For instance, the virus or antibodies could be present in too low of a concentration to register, or there could be similar viruses present that make the test give a positive result even though the Covid-19 virus is not present. Even more variability is introduced by the way in which the sample is collected. The swab may not sample the best region of the throat, or the swab becomes contaminated at some stage in the process of taking it or transporting it. All of these are why test results *suggest* the best course of action, but cannot absolutely confirm whether or not a patient has the virus. But, we can give some sense of how accurate the test is. And this is where we need to be careful in how we interpret what is said.

Since tests are not always correct, I will define my variables specifically, with abbreviations to indicate each possible value.

Virus Presence:
Either a person has the Covid-19 virus, or they do not.
I will use **V** to indicate the virus is present, and **A** to indicate it is absent.

Test Result:
Either a person tests either positive or negative for the virus.
I will use + to indicate a positive test, and - to indicate a negative test.

These do not always match up. Given a disease and a test, there are four possibilities,

- True positive: A person with the disease is correctly identified as sick by the test,
- False positive: A person without the disease is incorrectly identified as sick by the test,
- False negative: A person with the disease is incorrectly identified as healthy by the test.
- True negative: A person without the disease is correctly identified as healthy by the test,

When we ask about the accuracy of the test, we are concerned about these four types of results

Test Accuracy: Sensitivity and Specificity

To quote from the *Washington Post* article,

> *Any medical test has two important qualities: sensitivity and specificity. The tests are proven to be "sensitive" in laboratory conditions — in this case, a technical measure of the smallest amount of virus they can detect. The tests must also be "specific" — for example, ensuring they do not mistake other pathogens, such as the common cold coronaviruses, for the new SARS-CoV-2*

Let me unpack these two terms:

Sensitivity: This is the percentage of *true positive* tests. Given all the samples that have the virus present, this is the percentage that will test positive. *e.g.*, if the test is 75% *sensitive*, that means that a sample with the virus will test positive 75% of the time, and a sample with the virus will test negative 25% of the time.

Specificity: This is the percentage of rate of *true negative* tests. Given all the samples that do not contain the virus, this is the percentage that will test negative. *e.g.*, if the test is 95% *specific*, that means that a sample that does not have the virus present will test negative 95% of the time, and a sample that does not have the virus will test positive 5% of the time.

In the mathematical language of conditional probabilities, for those of you who know it,

Sensitivity is the probability that the test is positive, given that the virus is present in the sample,
$P (+ \mid V) = P (+ .\mathit{and}. V) / P (V)$.
Specificity is the probability that the test is negative, given that the virus is absent in the sample,
$P (- \mid A) = P (- .\mathit{and}. A) / P (A)$.

Notice that both of these depend on the presence or absence of the disease, P (V) and P (A). Again, quoting the *Washington Post* article, you see all of the factors we have discussed,

> *The genetic tests being used are typically very sensitive and specific under lab conditions, but in the real world, how the swab was done and the stage of illness the person was in can make a big difference. To complicate the situation, there isn't one test — many different tests are now being used by commercial laboratories, hospital labs, and the Centers for Disease Control and Prevention. And the interpretation of the results will depend on not just the test, but other external factors, such as how widely the disease has already spread and laboratory practices.*

So, what is the accuracy of the Covid-19 tests being done? I won't pretend to be able to unravel the swab-collection factors, but will just talk about the lab test accuracy,

Based on tests developed for similar corona viruses, such as SARS and various cold viruses, the figures that I have seen put out by health agencies are these:

Sensitivity: 75% – 95%
Specificity: 60% – 75%

I will calculate my answers based on those ranges.

How to Interpret a Test Result

The tables on the last page give the probabilities you would use to answer the question:

Given a certain test result, what is the likelihood that the virus is present or absent?
As you can see, the prevalence of the disease in the sample population matters a lot.

As a specific situation, if the disease has infected 5% of the overall population, you get one set of numbers. But if you just look at a group of people exhibiting typical respiratory symptoms (cough, fever, fatigue, breathing problems), or a group that definitely got exposed to the virus, the probability of the disease being present in that group is much higher, giving different numbers. This, along with not wanting to do a lot of unnecessary tests, is why they want you to only get tested if you have a good reason to suspect you have Covid-19.

Sample Calculation
Imagine that only 10% of the samples have the virus present, P (V) = 0.10 and P (A) = 0.90 , and in the best case of the ranges given, a test that has Sensitivity = 95% and Specificity = 75%.

Sensitivity = 95% means that if the virus is present, then 95% of the time it will test positive, and 5% of the time it will test negative. P (+ | V) = 0.95 and P (- | V) = 0.05 .

Specificity = 75% means that if the virus is not present, then 75% of the time it will test negative, and 25% of the time it will test positive. P (- | A) = 0.75 and P (+ | A) = 0.25 .

Out of all the positive test results, I want to know what fraction are samples with the virus, that is, I want P (V | +) = P (V .and. +) / P (+).

The numerator is: P (V .and. +) = P (+ | V) · P (V) = 0.95 · 0.10 = 0.095
The denominator is: P (+) = P (+ .and. V) + P (+ .and. A)
= P (+ | V) · P (V) + P (+ | A) · P (A)
= 0.95 · 0.10 + 0.25 · 0.90 = 0.320
So, P (V | +) = (0.095) / (0.320) = 0.297. Only 30% of positive tests have the virus.

If instead, the sample come from a group with a 90% chance of the virus being present:

The numerator is: P (V .and. +) = P (+ | V) · P (V) = 0.95 · 0.90 = 0.855
The denominator is: P (+) = P (+ .and. V) + P (+ .and. A)
= P (+ | V) · P (V) + P (+ | A) · P (A)
= 0.95 · 0.90 + 0.25 · 0.10 = 0.880
So, P (V | +) = (0.855) / (0.880) = 0.972. Now, 97% of positive tests have the virus.

The tables below show other cases. I have also included a PDF called Disease Test Math that shows the relevant formulas, if you have use of them.

A 'negative' coronavirus test result doesn't always mean you aren't infected
by Carolyn Y. Johnson, March 26, 2020 *Washington Post*, Science Section https://www.washingtonpost.com/science/2020/03/26/negative-coronavirus-test-result-doesnt-always-mean-you-arent-infected/

Using the Best Test Accuracies

Interpreting a Positive Test Result **Selectivity = 95%** **Specificity = 75%**	
Prevalence of Covid in Group	**Probability of Virus**
1%	3.7%
2%	7.2%
5%	16.7%
10%	29.7%
20%	48.7%
40%	71.7%
60%	85.1%
80%	93.8%
90%	97.2%

Interpreting a Negative Test Result **Selectivity = 95%** **Specificity = 75%**	
Prevalence of Covid in Group	**Probability of No Virus given a negative test**
1%	99.9%
10%	99.3%
20%	98.4%
40%	95.7%
50%	93.8%
60%	90.9%
70%	86.5%
80%	78.9%
90%	62.5%

Using the Worst Test Accuracies

Interpreting a Positive Test Result Selectivity = 75% Specificity = 60%	
Prevalence of Covid in Group	**Probability of Virus given a positive test**
1%	1.9%
2%	3.7%
5%	9.0%
10%	17.2%
20%	31.9%
40%	55.6%
60%	73.8%
80%	88.2%
90%	94.4%

Interpreting a Negative Test Result Selectivity = 75% Specificity = 60%	
Prevalence of Covid in Group	**Probability of No Virus given a negative test**
1%	99.6%
10%	95.6%
20%	90.6%
40%	78.3%
50%	70.6%
60%	61.5%
70%	50.7%
80%	37.5%
90%	21.1%

No. 12

Hydroxychloroquine as a Treatment

Kristin Lane
Felicia Keesing

You have likely heard of several potential treatments for COVID-19. Today we explore the rationale for using hydroxychloroquine, and the evidence for its efficacy.

What is hydroxychloroquine?
Chloroquine has been used to treat malaria since the 1950s. Hydroxychloroquine is a safer derivative of this drug, which has also been widely used to treat malaria. Scientists don't know exactly why hydroxychloroquine is an effective malaria treatment. The compound is thought to diffuse into the cells of the parasite that causes malaria, where it causes a toxic buildup of a component of human blood, leading to the death of the parasite. Since the 1950s, hydroxychloroquine has also been a primary treatment for several autoimmune diseases, including rheumatoid arthritis and lupus. Its mechanism for treating autoimmune disorders is not well-understood.

What is the evidence for using hydroxychloroquine to treat COVID-19?
In February 2020, scientists reported that chloroquine reduced the ability of SARS-CoV-2 virus particles to kill cells grown in petri dishes. Earlier this month, they reported that hydroxychloroquine was also effective. Promising drug treatments are often first identified by testing their effectiveness with cells grown in a laboratory, but this is just the first step and many promising treatments are not effective past this stage.

The strongest evidence for the effectiveness of a treatment in humans would be a randomized, double-blind study in which human participants were treated exactly the same except for the medication they received. With such a study, we could conclude that any differences in outcomes between the groups were due to the treatment.

The best evidence for the effectiveness of hydroxychloroquine against SARS-CoV-2 in humans stems from a study conducted in France and published in *International Journal of Antimicrobial Agents*. Here we describe that study.

Who participated? Forty-two patients diagnosed with COVID-19 began the study (26 in the hydroxychloroquine condition and 16 in the control condition). Six patients—all in the hydroxychloroquine condition—did not complete the study because they were transferred to the ICU (three patients), died (one patient), were released from the hospital (one patient), or ceased treatment due to side effects (one patient). The results for these six patients were not included in the study, so the final sample consisted of 20 hydroxychloroquine patients and 16 control patients. Patients in the hydroxychloroquine group (*Mean* = 51.2 years) were, on average, older than those in the control group (*Mean* = 37.3 years).

Patients in the hydroxychloroquine group were treated at a single hospital and chose to receive the experimental treatment. Patients from that hospital who chose not to receive the treatment, as well as patients at several other hospitals, comprised the control group.

What was done in the study? Patients in the hydroxychloroquine condition received 200 mg of hydroxychloroquine three times per day for 10 days. Six of those patients also received the antibiotic azithromycin. Every day for two weeks, medical staff conducted a standardized exam on each patient, and took a nasopharyngeal sample to measure the amount of virus present.

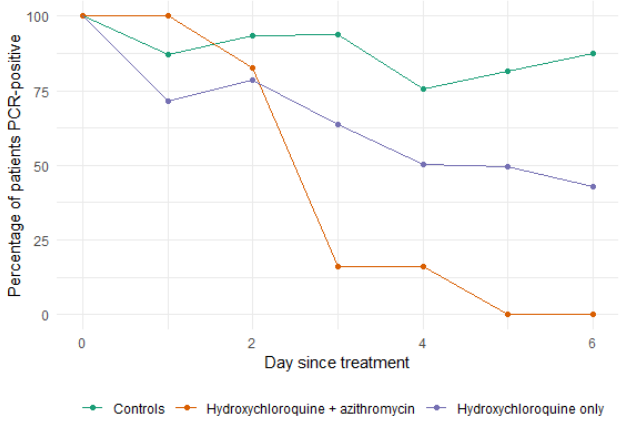


Figure redrawn from data in Gautret, P. et al. *International Journal of Antimicrobial Agents*, 105949. 20 March 2020, doi:10.1016/j.ijantimicag.2020.105949 using WebPlotDigitizer and R.

What did they find? The study's main outcome was the percent of patients with detectable coronavirus after six days of treatment. As seen in the graph at right, all patients were positive upon enrollment in the study. After six days, 12.5% of control patients were "virologically cured," whereas 57.1% of patients who only received hydroxychloroquine, and all patients who received hydroxychloroquine and azithromycin were "virologically cured."

Reactions to the study

These data generated substantial enthusiasm. Certainly, the reduction of viral load is promising. At the same time, researchers caution against overinterpreting the study on several critical grounds. First, six of 26 patients taking hydroxychloroquine didn't complete the study, and several of these had *worse* outcomes than control patients. None of these outcomes were included in the analysis. Second, the patients in the study chose which treatment they were willing to undertake, which is why it's not considered a randomized study. This means that there could have been underlying differences between the participants that unintentionally biased the results, including the known difference in their average ages. Patients also underwent treatment at different hospitals, which might have unintentionally introduced other undetected variation in treatment or care. Finally, the study didn't report any differences in clinical outcomes, such as severity of illness, measurement of symptoms, or time to recovery. Since that study was published, another study of 30 patients who were randomly assigned to take hydroxychloroquine or standard treatment has reported no differences in viral load or clinical outcomes. (This study used a different dosage schedule than the original study.)

What have you got to lose?

Given the dire situation, and the lack of effective treatments for COVID-19, one might ask—as President Trump did—"What have you got to lose?" And indeed, many hospitals include it as an option to be considered in their treatment protocols. Anthony Fauci is measured in his assessment, stating "The information that you're referring to [about the potential benefits of hydroxychloroquine] specifically is anecdotal. It was not done in a controlled clinical trial, so you really can't make any definitive statement about it." Widespread use of hydroxychloroquine could harm people's health for several reasons. First, chloroquine and hydroxychlorine are toxic. Even carefully monitored use of these compounds can result in serious side effects, and self-treatment can be fatal. Second, the rush to buy up these

drugs has led to shortages for patients with autoimmune conditions (one provider has notified patients with lupus that it will not fill hydroxychloroquine prescriptions, and thanked them for their "sacrifice"). Clinical trials in the United States and elsewhere are underway or getting started, and before long we will have the kind of information that could be used to make sound medical decisions about treatment.

What's next?

If hydroxychloroquine actually turns out to be an effective treatment, either alone or in combination with another drug, it will be an amazing discovery and one from which we will all benefit. If it does not, other drugs will be found to be effective at killing the virus in cells grown in petri dishes. Let's hope that we all become more aware of the steps that need to be taken to determine the value of such a potential treatment so that we can handle this more responsibly the next time.

Kristin Lane and Felicia Keesing

No. 13

The Spread of the 1918 Influenza Pandemic to Europe and Beyond

Sean McMeekin

The First World War's western front in France and Belgium, with soldiers from five continents rubbing shoulders in tight barracks and trenches, even as doctors and nurses tended huge numbers of wounded and ill men in packed military hospitals, provided a perfect human petri dish for the spread of the novel influenza virus in spring 1918. American soldiers, arriving in Europe in ever-increasing numbers that spring after the U.S. had entered the war in 1917, seem to have brought the virus with them to France, with the first reports of flu-like symptoms—still relatively benign, mostly a mild fever accompanied by coughing—appearing in the vicinity of Bordeaux in mid-April 1918. Before long, similar outbreaks were observed in the French and British armies, among colonial troops (in particular those from French Indochina), and even on the other side of the front, among German troops in Belgium. This first wave of the virus, which reached tens of thousands of soldiers, was still relatively mild, with very low mortality rates. Were it not for the more lethal wave that hit in the fall, it might not be remembered at all—especially in view of military censorship. Indeed, the reason the influenza outbreak of 1918 came to be known as the "Spanish flu" is that Spain was neutral in the war, with a freer press, and so the first reports of influenza deaths appeared there, with 276 influenza deaths reported in Madrid in May and June.[1]

It was the second influenza wave, which coursed through Europe and ultimately most of the world in fall 1918, which merits the label pandemic. Here, too, the first reports occurred in neutral Spain in mid-September, which helped to popularize the "Spanish flu" label. The most dramatic spread took place in the front and rear areas of the western front in October and November 1918, just as the morale in the German armies began to crumble and the Central Powers sued for peace. In a cruel accident of timing, the cessation of hostilities after the Compiègne armistice of November 11, 1918, allowed millions of soldiers to return home, with many bringing the virus with them to almost every corner of the globe. One aspect of the "Spanish flu" pandemic that bears some resemblance to the Corona Virus outbreak of 2019–20 is that thousands of nurses and doctors fell ill, especially those tending to wounded soldiers in crowded field hospitals. Unlike with Corona, however, which seems to disproportionately hit the elderly, the influenza strain of 1918–19 struck down millions of young men and women in the prime of life, especially soldiers, with nearly half of deaths occurring in the 20- to 40-age group. Pregnant women were especially hard hit, suffering appalling mortality rates as high as 25 to 50%, as against a global rate somewhere around 3-5%.

Not all countries suffered equally. China and Japan, still relatively isolated from the main outbreak in western Europe even though Japan was a belligerent in the war, saw mortality rates well below 1%, although in the case of China, wracked by civil unrest and with a weak central government, we must be extremely cautious with reported figures. The same caution applies even more dramatically in Russia, where the influenza pandemic of 1918–19 occurred against the backdrop of the Russian Civil War, which produced chaos and misery on such a grand scale as to make it

nearly impossible to know how many million victims died from the flu, as opposed to those falling in battle, executed, from wounds and complications, from malnutrition and starvation, or from other illnesses such as tuberculosis. As few as 450,000, or as many as 2 or 3 million, Russians and other peoples of the former Tsarist empire may have died from the pandemic. As with the global estimates of influenza deaths in 1918–19, which have ranged widely over the years from 20 to 50 million, the Russian case reminds us to be humble with our claims. There is much we do not know, even a hundred years later.

1. Several articles published at the time did source the 1918 influenza indirectly to Spain, arguing that it may have originated in Spain's north African colonies and then spread to the United States by boat, via Boston, before returning to Europe in the U.S. army. There is evidence that different regional flu strains may have mixed and mutated in 1918, both in Camp Funston in Kansas, among Chinese workers who seemed especially susceptible to the virus, and in France, where there were signs of a pneumonia-like outbreak among soldiers of southeast Asian origin. We are far from understanding the precise origin of the lethal strain that killed so many people worldwide from fall to winter 1918–19. Nonetheless, it seems safe to say that the reason "Spanish flu" emerged in shorthand owes to the lack of censorship, which meant that the first real press reports occurred in Spain.

No. 14

Pandemic Strategy Development in the Federal Government

Malia Du Mont '95

How does the US government engage in long-term planning and strategy development? "Badly" some might say. Nonetheless, a system does exist for the federal government to develop public policy to address a wide variety of future challenges, including the possibility of a pandemic. Here I briefly outline the basic structure and intended operations of that system.

The first question that long-term policy planners must confront is: planning for WHAT? How do legislators and executive-branch decisionmakers know what the country's long-term needs will be, and what issues are likely to need government attention in the future? And what does the word "future" mean in a federal government context—how far away is the future the government must be prepared to address? Legislators have repeatedly answered the latter question by incorporating a 20-year time frame into laws requiring some federal departments to develop long-term strategies. For example, the National Defense Authorization Act (NDAA)—the enormous and complicated annually renewed law that provides the Department of Defense (DoD) with its budget—requires DoD to produce a national defense strategy at least once every four years.[1] The NDAA was the first (and for a long time the only) US law to require a federal department to produce a strategy document, and past NDAAs have specified that DoD must take a 20-year timeframe into consideration when producing the strategy. There is now a similar law for the Department of Homeland Security (DHS) to produce a homeland security strategy. The required 20-year timeframe is, essentially, the acquisition cycle: if DoD determines, for example, that an additional aircraft carrier needs to be built or a new variety of satellite should be launched, it takes about 20 years for these large and complex acquisition needs to be identified, designed, approved, produced, and deployed. Therefore, in order to make sure the federal government has the capabilities it needs in 20 years, Congress requires federal departments to plan now for 20 years from now.

But how is it possible to know what will be needed in 20 years? This is where the academic field of foresight makes important contributions to strategy development, by helping policymakers define what those in government circles call the "future security environment." Foresight is not prediction; it does not pretend to offer a crystal ball. Instead of predicting specific outcomes, foresight practitioners aim to help decisionmakers identify the range of possible and potential futures, in order to inform long-term planners about the types of challenges and opportunities they are likely to confront. Through a variety of analytical methods including trend extrapolation, scenario development, simulation modeling, and technology assessment and forecasting, foresight experts attempt to identify and characterize the key forces that will shape the future world. Foresight practitioners, who are also sometimes called futurists, are increasingly common in the private sector, where they often work as consultants to corporate strategists, helping them understand how markets and economies are likely to evolve. With the advent of the legislative

requirement to produce strategy documents with a 20-year timeframe, futurists are now found in federal government as well.

The most important foresight document published by the US government is a regular analytical report called Global Trends. This unclassified, publicly available volume has been produced every few years since 1997, with the specific intent of assessing "how key trends and uncertainties might shape the world over the next 20 years, to help senior US leaders think and plan for the longer term." The team that produces Global Trends is a dedicated office of the National Intelligence Council known as the Strategic Futures Group and falls under the purview of the Director of National Intelligence. Strategists across the federal government use the Global Trends report as a starting point when trying to understand the world they are planning for.

The most recent edition of Global Trends, published in 2018, outlines a potential long-term scenario in which the rise of wealth inequality, spread of artificial intelligence and automation, shifting trade patterns, a more inward-focused US and Europe, changing climate conditions, and "the global pandemic of 2023" combine to create a very challenging long-term economic environment.[2] It identifies East/Southeast Asia as a likely hotspot for an emerging pandemic in the 2018–23 timeframe.[3]

Given this scenario, why is the US not better prepared for the global pandemic we are currently experiencing? Keep in mind that Global Trends does not say, and of course nobody in 2018 knew with certainty, that a global pandemic would definitely happen in the next 5 years. The possibility of a pandemic was included in just one of three potential long-term scenarios in the report. The Global Trends report, like all foresight documents, is not a prescription for action but a description of potential context. Federal departments must take the next step to interpret and translate the Global Trends assessments into relevant scenarios and planning exercises that inform their policymaking within their respective areas of authority.

In 2019, the Department of Health and Human Services (HHS) ran a series of exercises that imagined an influenza pandemic caused by a respiratory virus that led to 7.7 million Americans hospitalized and over half a million deaths.[4] It was the latest of several federal interagency pandemic exercises in the past decade. As a result of these exercises, federal health policy officials had a wealth of information about interagency coordination challenges, equipment shortfalls, and other problems they would potentially face if a pandemic occurred. Yet, across the federal government, not all "lessons learned" from such exercises are turned into policy priorities that require strategies and funding. There are not enough resources—in terms of personnel and funding—to translate every potential shortfall into a policy priority. Policy choices must be made, that are informed in part by the exercises and scenarios.

Unlike DoD and DHS, HHS is not required by law to develop a national strategy document. Nonetheless, in 2019 it produced a National Health Security Strategy, which is a high-level overview of strategic health priorities across the federal government and whose #1 objective is to "prepare, mobilize, and coordinate a whole-of-government approach." HHS also produces a more detailed Strategic Plan for the department, the most recent of which was published in 2018.[5] This Plan articulates five strategic goals, including to "Protect the Health of Americans Where They Live, Learn, Work, and Play." Of the four objectives associated with this strategic goal, two ("Prevent, treat, and control communicable diseases and chronic conditions" and "Prepare for and respond to public health emergencies") are directly relevant to the current crisis, with "pandemic influenza" specifically mentioned in the Plan in relation to

each.[6] For each objective, there are in turn multiple strategies and quantifiable performance metrics. The strategies that support the "public health emergency" objective are striking in their detail, summarized here:

> The Department promotes emergency preparedness and improves response capacity [by providing expertise and tools to coordinating organizations and government bodies; developing "data-driven approaches" to maximize preparedness; investing in new systems to support rapid risk assessment, decision-making, and resource coordination; maximizing effective use of medical countermeasures].
>
> The Department supports timely, coordinated, and effective response and recovery activities [by responding rapidly to limit the impact of incidents; executing response operations; ensuring the needs of at-risk populations are met through integrated preparedness, response, and recovery; providing tools and guidance to improve planning].
>
> The Department is working to improve collaboration, communication, and coordination with partners including hospitals and schools [by providing accurate public health communications; building healthcare coalitions; jointly developing, exercising, and maintaining response and recovery plans; formalizing partnerships to ensure effective use of medical countermeasures].
>
> The Department is strengthening and protecting the emergency preparedness and response workforce [by reducing illness/injury due to hazardous exposures in first responders; training; increasing capacity of organizations to address the needs of at-risk individuals].
>
> The Department is working to advance global health security as a national priority [by responding rapidly to limit the impacts of incidents by sharing information, coordinating communications, and conducting response operations and research; collaborating with international programs to strengthen global preparedness; developing, exercising, and updating plans for responding to global health threats].

A reader could be forgiven for feeling shocked upon reading this section of the Strategic Plan, which seems to articulate—two years before the current outbreak—a clear list of measures the US federal government is now being criticized in many quarters for not taking. So where is the disconnect; with a clear National Health Security Strategy and detailed Strategic Plan, why has the US seemed so unprepared for the pandemic?[7]

Because my government experience was in the Pentagon and not HHS, I can provide some thoughts but not a definitive answer to that question. Policy failures are attributable to either bad planning or bad implementation, and it is likely that we are seeing a bit of both. It is possible that the health policy documents as written did not sufficiently address the coordination and communication problems that are now preventing a more effective US government response. It is also possible that the government gave insufficient resources to HHS, rendering the Plan impossible to enact as envisioned.

In any case, the process of determining policy priorities involves a complex discussion of risks and trade-offs, since resources are both finite and fungible. Whether as the result of a deliberate risk/trade-off decision or policy de-prioritization in the face of resource limitations, it is now clear that federal pandemic preparedness planning was not sufficient for our current reality—and that is not because the possibility of a pandemic and its attendant government

shortfalls was a surprise. I therefore disagree with some newspaper articles and journal essays calling the US coronavirus response the result of an "intelligence failure." Instead, I recommend a recent op-ed in the *Washington Post* that correctly points out that what we are currently facing is a problem we have seen coming for a long time and nonetheless did little to prevent.[8]

You may wish to consult these additional foresight sources that inform the strategic planning of their respective organizations:

- UNHCR's Global Trends report
- Government of the UK "Foresight Projects"
- Government of Singapore Centre for Strategic Futures*
- Government Foresight Group of Finland*
- "Living in the Futures" Harvard Business Review *article about how foresight and scenario planning in the '70s radically changed Shell Oil's approach to corporate strategy*

* *Singapore and Finland are widely known in the futurist community for having the most highly developed and integrated government foresight functions in the world.*

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1. The first NDAA-required national defense strategy, known as the Quadrennial Defense Review, was published in 1996. The most recent national defense strategy was a requirement of the NDAA for FY17, and was released in 2018. All except the most recent one are unclassified and available on the DoD website.
2. https://www.dni.gov/index.php/global-trends/three-scenarios
3. "In public health, several countries in the region are considered hotspots for the emergence of influenza virus of pandemic potential. The highly pathogenic avian virus H5N1 is endemic in poultry in China, Indonesia, and Vietnam, and has a high mortality rate in humans. The highly pathogenic virus H7N9 is also circulating in Chinese poultry, and an increased number of human cases have been seen since 2013." https://www.dni.gov/index.php/the- next-five-years/east-and-southeast-asia Interestingly, despite the 2003 SARS outbreak and the 2010 swine flu pandemic, neither of the previous two Global Trends reports, published in 2010 and 2015 respectively, posited the possibility of a future global pandemic.
4. https://www.nytimes.com/2020/03/19/us/politics/trump-coronavirus-outbreak.html
5. https://www.hhs.gov/about/strategic-plan/index.html
6. https://www.hhs.gov/about/strategic-plan/strategic-goal-2/index.html#obj_2_2
7. It is worth noting that the 2018 HHS Strategic Plan is clearer and better organized than its 2014 predecessor, but its approach to pandemic preparedness is very similar, with almost identical wording used in several places.
8. https://www.washingtonpost.com/opinions/2020/03/27/tragedy-is-that-we-knew-this-was-coming/

No. 15

Schedules and the Rhythm of Family Life during COVID-19

Carol Garboden Murray

Many people have been saying that the stay-at-home directives have suddenly turned us all into homeschoolers. But, as my homeschool friends have reminded me, quarantine schooling is **not** homeschooling. Homeschool children are intimately connected to their communities. They join art classes, take music lessons, and share cooperative learning circles in living rooms. Quarantine schooling is like nothing *any* of us have ever experienced before. I start on that note because I want to acknowledge the frontier we are all embarking upon. There is no map, and the most essential message we need now, is about care. How can we be gentler and kinder with ourselves and our children as we all pioneer this new terrain?

We've all heard about the need to establish a schedule, but the traditional notion we hold about schedules is that they are rigid and fixed. The school schedule we've been following all year is not natural in many ways. It has not been designed around our individual internal needs and rhythms but has been put together for a 40-hour work week. Perhaps as we move forth into the next weeks, rather than grasping for a schedule, we can shift our perspective in search of our family's unique rhythm. Rhythm is something that can't be dictated. It is something that will emerge, and that we will create with our partners and children.

Part of being an early childhood educator and caregiver includes designing a daily flow. We think of the flow as a framework that breathes in and out and gives children guidance and personal control. Here's a few things early childhood teachers talk about when designing a schedule that offers both conformity and freedom and provides both predictability and surprise:

Partnership and Balance: Creating a community with kids requires partnership. As adults we need to be leaders, but we also want to know our children well and design a day that fits their needs. As adults we strive to be strong and reliable, while also being responsive and receptive. We are seeking the middle ground. When it comes to schedules, if we are too strict and rigid children will feel that they lack autonomy and that they are being told what to do all day. If we are too loose, children will feel they have no security or predictability. Finding balance means we hold expectations for our shared family/group life, while also encouraging independence and self-expression.

Choices: Giving children choices throughout the day shows children that we are not just directing, we are also listening. For example, make a list of the chores you hope to accomplish during the day and rather than telling your child what to do, let her pick three jobs to cross off the list. If you haven't had time to make a list—just offer two choices, "Hey I need some help getting chores done today, would you rather rake the yard or walk the dog?" We can encourage children to make their own lists of goals for the day or the week as well. Offering choices can provide children with possibilities and new ways of moving through the day. For example, if a child is having difficulty with

school work we could offer choices, such as, "Maybe it would help to do your work on the porch in the sun, or take a break and listen to some music for 10 minutes. What would be most helpful to you right now?" Including the children in meal and activity planning can be as elaborate or as simple as fits your style. Even building small choices into a meal, like, "Do you want a banana or apple with breakfast?" will help children feel a sense of agency in their own life during this unusual time. Too many choices, on the other hand, can cause children to feel aimless and lack security.

Respect Different Rhythms: Humans move through the day at different paces. Some children eat quickly while others enjoy a slow leisurely lunch. If you discover that you and your child have alternating rhythms, find a way to talk about it and negotiate. If your child wakes up early and you'd rather stay in bed an extra hour, perhaps you can plan a simple breakfast the night before and teach your child how to pour their own cereal and milk before you get up. Use it as an opportunity to let your child be independent and trustworthy. On the other hand, if your child likes to sleep in and you are an early riser—think about how you can take care of yourself in the quiet morning hours. Rather than filling up your solitary time with chores and work, be sure to take time for yourself to do something you enjoy.

Transitions: Before shifting gears or asking someone else to change their direction, give some warning. In nursery school we've learned the miracle of the five-more-minute-song and the clean-up-song. Giving others a little bit of time to prepare for a change is respectful, and it will go a long way in promoting cooperation. In my house I usually call out "10 minutes until dinner" and my teenagers know they need to respond with some sort of acknowledgement that they have heard me (grunt!). When they come into the kitchen, they know they can help by setting the table or pouring the drinks for everyone. These simple patterns become part of our daily rhythm.

Care Rituals: Care rituals are the anchors that provide predictability and safety for children (and for adults). The foundation for a daily rhythm is built upon our physical needs at meal time, bath time, and bed time. As we approach another week at home, let's think of ways that our care rituals support our connection with one another. Don't treat care as drudgery. Honor meal time, bath time and bed time as the most valuable part of the day. Society has taught us to categorize time as "quantity time" or "quality time" and I believe we should toss those categorizations aside. What I've noticed is that the idea of quality time causes parents to feel a lot of pressure and a good deal of guilt. We've come to associate quality time as something extra—like enrichment or entertainment—such as building a tree house or going to a puppet show together. I believe that the truest quality time is built little by little, day by day, through our responsive care. When we honor care, we learn to see that it is through the everyday mundane caring rituals, that we build trust in one another, find our belonging in the world, and learn what love is.

No. 16

Food and the COVID-19 Pandemic

Gabriel G. Perron

As a Microbiologist who works with food, the question I get most often from friends and family (over the phone of course!) is: how am I going to get food during the pandemic? While more than 37 million people live in households with food insecurity in America, most people living in this country buy apples or asparagus all year round at their local grocery store without thinking twice about these crops' short seasonality. For others, getting food means picking up the phone and ordering their favorite dumplings or curry from a local takeout menu. The current COVID-19 pandemic has changed all that. If you are among the lucky people who have the chance to stay home and practice social distancing, getting food and other basic supplies is most likely your main, if not your only, point of physical contact with society: the one activity when you have to break away from your otherwise safe social/physical distancing practices. Without a good understanding of where and how the virus propagates, your food adventures out of the house can easily feel like eating a bowl of sketchy raw oysters with your bare hands during a job interview—awkward and scary. Here, I will attempt to answer a few of the most frequent questions I encountered over the past few days using the information we have at the moment. Our understanding of the COVID-19 pandemic is increasing every day and some guidelines may change. And some questions will only be answered years from now.

Will there be food when I go to the grocery store? *The short answer: yes.* According to most food suppliers and retailers, "there is plenty of food in the country". The only reason why you see empty shelves in your local grocery store at the moment is that the distribution of food is no match for the unusually high demand of most food products. And the surge in demand is putting pressure on both individual grocery stores that are struggling to restock shelves every hour or so as well as on the distribution centers that had optimized their output over years of studying our typical customer behavior. While certain individuals (like acclaimed movie director Ridley Scott) go as far as suggesting we bring back World War II–era ration books, all we really need to do is trust that the current food system will provide plenty of sustenance if given time. I encourage you to buy only what you need to live comfortably for a week at the time. In other words, there is no need to buy all 30 boxes of your favorite pasta next time you go to the grocery store. Also, even if like me you have a favorite brand for everything, be ready to show some flexibility when it comes to brand choice. As different brands have different distributors, it is likely that you will see shelves stocked with only a few brands at the time while the distribution centers figure out how to deal with our new compulsive buying habits. Moreover, if you are lucky enough to live in the country, this is the perfect time to get familiar with all the amazing local farms that sell their fresh products all year round. Some might do delivery, but most will allow for pick up. While fresh produce might not come for a few more months, eggs, dairy and meats are available all year round.

Finally, if you need one more incentive to be measured with your shopping, keep in mind that the shortcomings in the food distribution chain is likely to cause increases in price for many items. Furthermore, distribution centers will likely focus their efforts on big p(l)ayers: grocery stores in affluent neighborhoods with customers who can afford

the inflated prices. In other words, even though there should be enough food for everyone, many could experience unnecessary food shortages leading to unnecessary increased food insecurity in many neighborhoods and regions.

Will I get sick when I go to the grocery store? *The short answer: unlikely if you wash your hands and avoid touching your face.* Given the level of social anxiety at the moment, walking in the grocery store can feel like walking into a scene from the movie *Contagion* or *The Road*. While the risk of infection should not be ignored, actual exposure to the virus in your local grocery store is simple to minimize. Let's remember that the virus must successfully attach to the inner lining of your nose or your mouth (where it will be able to finds its way to your lungs if not cleared by your immune system) to infect you. This could happen if someone who carries the virus projects tiny water droplets into your mouth or your nose when coughing or intensely talking to you within your immediate personal space. For the moment, there is no evidence that the virus can live "airborne"; meaning the virus is not likely to live outside of the water droplets and float in the air. Even if it was able to float in the air, there is no indication so far that it could actually infect people this way. Yet, we will only know the answer to this question for sure in a year from now if we are lucky. The six-feet radius mandated for social distancing is indeed recommended to avoid droplets (and to minimize the risk of exposure to airborne particle if they do exist indeed). In other words, you will not be infected if you walk next to someone who is infected and only casually and respectfully smile at each other or establish eye contact.

A more pressing issue is that the SARS-Cov-2 virus contained in the tiny droplets can survive on various surfaces. A highly publicized study found that on different surfaces from a few hours (e.g., paper) and up to one day (e.g. cardboard) or even longer (e.g. 3 days for plastics and 4-5 days for stainless steel). The virus could then get in contact with your nose and your mouth when you touch the contaminated surface and then touch your face. In fact, some people touch their faces up to 23 times per hour, and 44% of these touches involve contact with our nose or mouth. Scary stuff. Yet, it is important to realize that the virus-survival study was done under optimal lab conditions to test just how long the virus could survive in best-case scenarios (for the virus, that is). In reality, most viruses are fairly sensitive to changes in their environment such as fluctuations in temperature, humidity, and exposure to sun; conditions that are often associated with transport to-and-from supermarkets and your home. So once, again, while the risk of infection is real and should not be ignored given the fact that you have to touch different surfaces at the grocery stores (e.g., carts, freezer doors, cans, etc.), the risk of exposure to the virus can be easily minimized by avoiding any contact between your hands and your face (and then thoroughly washing your hands) and avoiding having a lengthy discussion with anyone within a 6-feet radius.

Should I wear a mask or gloves or both? *The complicated answer is no (unless you have identified health reasons to do so)*. Let's start with gloves as this one is easy. Because the virus is not transmitted via your skin, gloves offer no additional protection. Furthermore, gloves are all too often improperly used (next time you go to the grocery store, notice how many people wear gloves but still talk on the phone or scratch their faces with the gloves on...this is entirely counterproductive). You are better off keeping it simple: avoid touching your face and wash your hands regularly.

As for masks, it gets complicated. Very complicated. Masks are a proven way to limit the transmission of infections such as influenza and cold viruses in populations that are trained to use it. For example, medical professionals who are regularly exposed to infectious agents should wear clean masks as much as it is possible. Also, masks can be effective in populations who use masks regularly (as in some East Asian societies). In the latter though, people who are sick wear masks in order to prevent the transmission of viruses to others. In cases where the virus is not airborne,

there is very little evidence that a face mask will provide additional protection to the person wearing a mask, or worse, an improperly used mask could even increase the risk of infection. Are masks an effective measure to protect yourself from COVID-19? Probably very little. Could masks be part of a strategy to slow down the spread of COVID-19? Probably yes. Yet, for the time being what we know is that the scale of the current pandemic combined with a limited manufacturing landscape in the US led to a shortage of masks in hospitals around the country. Therefore, while it could be beneficial to have as many people as possible wearing masks to limit the spread of the virus from asymptomatic carriers, for now masks should be prioritized for the personnel working on the front lines of this epidemic (e.g. doctors, grocers, etc.), for people with increased susceptibility, and for people who are showing signs of infections (or who have been in close contact with someone infected). Finally, if you are asked to wear a mask or you think you might have COVID-19 and want to minimize the risk of transmission to others, make sure you use it correctly, and that your never touch it without washing your hands, and that you dispose of it carefully: don't leave your spoiled facemask in your shopping cart to be disposed of by someone else (see below).

How can I minimize the risk of transmission when I go to the grocery store? *The short answer is avoid touching your face and avoid having discussions with people who are standing within 6 feet of your mouth and nose.* Now, given all the things you have to think about during this pandemic and the stress associated with the weekly visits to the supermarket, it is easy to forget the two simple rules described above. Moreover, it is important to remember that not only you are trying to minimize the risk of you being infected, but also of you spreading the infections to others. In fact, people working in grocery stores are much more likely to be exposed to the virus than you are and deserve to be protected. For this reason, I try to follow the following practices when going to the supermarket. First, I visit the grocery store at less busy times of the day, i.e., early in the morning. Second, I use a phone app to list all the items I wish to buy, arranged by section of the supermarket to avoid going back and forth in the store (an old-fashioned list on paper works too, as long as you just keep it on one hand and don't try to cross off items as you go). Third, I disinfect the shopping cart, my phone, and my hands in that order with sanitizing wipes, hand sanitizer, or a gentle bleach solution on paper towel (you could carry in a sealed plastic bag). Then, I take my phone/list in my left hand (this will be my "clean" hand) and I use my right hand (my "dirty" hand) to navigate my shopping cart and pick up food items. In other words, my right hand will be my sole point of contact between my person and the store (except for the soles of my shoes!). As I go through the aisles I am careful to only touch what I want to bring home. Also, as long as you don't engage in an active conversation with anyone, it is OK to walk by someone who is also using the same aisle. I use the self- checkout machines to minimize the work of cashiers, again, only using my right hand to transfer the items from my basket to the desk and also touching the screen with my right hand only. I will often use both hands to pack my items into my bags, however: if available, I use the paper bags provided by the store. Finally, I bring the bags to the trunk of my car, wipe down or otherwise sanitize my hands before entering the car, and drive home listening to my favorite tunes.

Again, I want to emphasize that there is a very low probability of buying the rare items that have enough viral particles on them to make you sick. The guidelines above are probably excessive, and simply avoiding touching your face and washing your hands will go just fine. That being said, the above strategy helps me reduce the unreasonable stress level associated with grocery shopping these days and contributes to protecting the people around you and the grocers who work in there every day. Remember, we should make choices and move through the world not as if we are trying to *avoid* catching Coronavirus, but as if we *already have it* and are trying to avoid spreading it to others. This mindset will lead to the safest environment for all.

Should I disinfect my groceries at home? *The short answer: if only for managing your stress levels, yes.* You finally made it home and feel pretty good about how you handled the challenges of the grocery store. Great job. But wait! how do you deal with the cans, pasta boxes, and even more dauntingly, the produce? While some viral videos suggest keeping all of your groceries in quarantine for days before you even look at them, this is not a viable option for everyone. What do you do with things that need to be refrigerated or frozen? First of all, let's start by saying that the risk of getting infected while putting your groceries away is very low. In fact, the Washington Department of Health just released a announcement stating there is no need to disinfect your groceries given what we know about the virus. Again, simply avoid touching your face while handling your groceries and wash your hands afterwards.

That being said, given the high level of stress associated with the pandemic and the difficulty to deal with an invisible enemy, it is normal to wish for airing on the side of caution. For this reason, many public health experts still suggest you disinfect your groceries when you get home by following these easy steps:

1) Identify a counter or any other easy-to-clean hard surface, and divide the surface in two areas, one where you will put your "dirty" grocery bags and a second where you will place newly disinfected items.

2) Empty your bags and wipe down the surfaces of **all** your packages (e.g. pasta boxes, cans, or vegetables in plastic) with a gentle bleach solution. Although to be honest, I don't bother making a bleach solution—I put Lysol on a rag and wipe away). For now, put the produce aside. Once the reusable bags you took to the grocery store are empty, put them outside under the sun or in the basement for a few days (ideally for a whole week, until your next trip to the supermarket). If they are paper bags, dispose of them. Disinfect the surface where the bags had been and wash your hands.

3) To clean your fruits and vegetables, simply rinse them under cold tap water for a good minute or two (as you would do with your hands). Don't use the spray station as you can create aerosolized water droplets (this is the same reason why the CDC no longer recommends washing your turkey on Thanksgiving, or any raw meat really). Put the produce to dry in a clean dish rack for 30-60 minutes and wash your hands. In fact, you will find that washing your produce when you get home will extend the shelf life of your fruits and veg as well!

4) (Optional, but why not!) Put the clothes you wore at the supermarket in the wash with laundry detergent.

5) Pour yourself a glass of wine or a nice cup of tea, and safely put all your clean groceries where they belong in your home, i.e., the fridge or the cupboards. Wash your hands. Start cooking!

Again, I want to reiterate that the risk of getting infected while putting your groceries away is very low. Any step you take will go a long way to further reduce the risk and the stress associated with you or your family getting infected. Therefore, it is OK to make mistake(s) during the procedure above. Any step you take will go a long way to further reduce the risk of your household getting infected and making you feel at ease within your own home.

Is it safe to order take-out? *The short answer is yes.* Remember, take-out food is made by professionals who have been trained to make *safe* food. In fact, there is no mandated policies for making food that tastes good, but there are indeed many regulations to make sure that your food, delicious or not, is safely handled and safe for consumption after delivery on your plate or at your door. In fact, many key players in the food service industry have responded

to the current pandemic with additional safety regulations. While small mistakes happen even in the food industry, resulting in infrequent food poisoning, the good news when it comes to SARS-Cov-2 is that there is no evidence it can be transmitted via food. Therefore, the main risk of infection once again comes from food packaging. The current recommendation is to simply treat the packaging as you would treat any packaging that comes from the local grocery store. Put the food container on an easy-to-clean hard surface. Open the container, wash your hands, and move the food to a clean serving platter you have at home. Discard the packaging, wash your hands, and wash the hard surface that was in contact with the packaging; then wash your hand (again) and enjoy your meal.

Also, I would like to point out that the food service industry is one of the most negatively impacted by the COVID-19 public health crisis. Therefore, enjoying your favorite take-out is not only a safe way to fill one of your essential needs, but also a good way to support local businesses and workers that depend on you. If take-out is not an option for you for whatever reason right now, consider buying gift certificates for yourself and your friends. A gift certificate is basically a 0% interest loan for the restaurateur. Even if your local restaurant or café doesn't sell gift certificates, it is worth calling or emailing them to suggest prepaying for your next month or so of coffees, pastries, or sandwiches.

I hope this answers most of your questions regarding food. *Bon appétit!*

1. A widely distributed video by public health expert Dr. Jeffrey Van Wigen recommends transferring items such as pasta and bread to a new container you have at home; I think this is overkill and probably increases the chance of getting your food contaminated with whatever is on your hands or on the box during the transfer. I would suggests simply wiping down the surface.

#18

Masks: Pros and Cons

Brooke Jude

In the age of coronavirus: should I wear a mask?

The topic of face masks, in light of the current outbreak of coronavirus, and the especially high concentration of cases of COVID-19 here in NY, has led to an abundance of questions:

- ***Who should wear them?*** *If I'm ill? If I'm well? If someone in my house is ill?*
- ***When should you wear them?*** *When I'm out in public? When I am in a crowded location like a store or transportation? At home? Always?*
- ***Which ones to use?*** *Do cloth masks work? Can they be homemade? How about a scarf or bandana?*
- ***Who do the masks protect?*** *The wearer? Those in contact with the wearer?*

The questions do not stop there. Moreover, the guidelines are changing swiftly, even day to day. (*In fact, during the writing of this document on April 3, 2020, the CDC recommended that cloth face coverings be used by everyone in public spaces!*) The answers I provide here will be neither the final call nor the right answer for all of you out there. But I do hope to present the current evidence and reasoning, so that you will be able to make the very best decision for you and your situation as to whether or not to don a mask.

Types of masks

A crucial first point is understanding the basics of medical masks, vs. other types of facial coverings (scarf, bandana, homemade mask—see references below for instructions, should that be your decision). **Medical masks**, such as depicted in the image below, are part of the personal protective equipment (PPE) that is essential for the protection and safety of first responders, individuals who are coming in direct, close contact with infected individuals. But even these two types of medical masks have two very different jobs.

JAMA https://jamanetwork.com/journals/jama/fullarticle/2762694

The N95 respirators, the more circular, fitted coverings, are made of a type of material that binds to a wide range of small particle types (see link below for an in-depth look at design of mask material types). Under typical use, N95 respirators will prevent the nose and mouth of the **wearer** from being exposed to droplets and particles harboring virus. Incidentally, these masks will also prevent the spread of virus **to those within a 6-foot radius of the wearer**, due to, again, the

material and fit of these masks. However, these are designed for (hopefully) healthy first responders and front-line caregivers—the major goal is to provide the wearer protection. These are the masks that are currently most coveted and needed in hospitals and other healthcare facilities. These should NOT be the ones used out in the public, mostly due to their scarcity, as well the ability of the general public to take other measures of protection.

In contrast, the thinner, rectangular, disposable **surgical/procedure masks** fit looser to the face. Designed to be discarded after each wear, they are made of nonwoven, filter-type material, and are meant to protect **others in a 6-foot radius of the wearer**, by blocking the airborne release of virus on large droplets formed by coughing or sneezing. A recent letter published by the National Research Council indicated that even more passive activities such as breathing or talking may release virus in the 6-foot zone surrounding an individual, which may give some insight into the apparently high infectivity of this virus (see link below for details).

Yet these surgical masks are not a long-lasting protective measure. Simply by putting them on and taking them off, you can contaminate the outside of the mask. Once removed, you run the risk of putting possibly contaminated material close to your face and increasing the possibility for infection. In a perfect scenario, these masks would be used by someone who might be infected, but not aware of it. They would carefully put on the mask, and then go out in public without touching the mask. In doing so, they would potentially protect others who come closer than social distancing rules dictate. When they return home, they would discard the mask and wash their hands for 20+ seconds with soap and water.

Could **cloth masks/cloth face coverings**—ones that can be sanitized and are reusable, readily available, and easily made at home—serve the same purpose? Or could a **bandana** or **scarf** work? Possibly—*if* the mask is worn with the same care as a surgical mask. That means it should be put on with freshly washed hands; it shouldn't be touched, fitted, retied, or adjusted over the course of the errand; and it should be removed and washed before being worn again. All of these mask/coverings may keep those unknowingly infected from infecting others when they are out in public spaces.

Current guidelines (CDC and WHO)

Looking at the local, national, and international guidelines can serve as a starting point in deciding what choices to make for yourself in the mask/no mask debate. Although the news seems to vary widely every day about this topic, the current position of the WHO is that masks are for first responders (N95, and surgical), actively ill patients (to protect those around them), and for those individuals who are directly caring for COVID-19 patients (inside the social distancing hot zone) and have a higher than average risk of carrying and passing the virus onto others they come in contact with. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/when-and-how-to-use-masks

Prior to April 3, the Centers for Disease Control had a remarkably similar set of talking points as the WHO, recommending masks for the ill and caregivers, and recommending handwashing, social distancing, and stay-at-home measures for all others https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html

On April 3, 2020, the CDC recommended cloth face coverings for all those out in public spaces https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html. This is a shift from earlier recommendations,

primarily in response to a growing body of evidence that asymptomatic individuals may be spreading the virus much more than previously thought.

If universal face-covering is executed perfectly, if everyone wears masks that are put on with clean hands, and aren't touched or contaminated over the course of wear, and if everyone still practices hand-washing and 6-foot social distancing and **remains at home as much as possible**, then this new recommendation might help with the overall flattening of the curve.

There is a counter argument that by simply adding this recommendation, individuals might relax their commitment to other proven preventative measures. They might visit more crowded areas, relax 6-foot distance measures, and not adhere to strict cleanliness of facial coverings.

Remember, these types of masks/coverings are designed to protect others, **not the wearer**!

The best-case scenario is that all who are infected are in the safety of their homes, not spreading to others. If everyone going out in public assumes that they are infected, and if everyone wears face coverings, always washes hands, and **still faithfully practices social distancing**, this could be the best possible compromise.

Mask-Wearing Pros and Cons
Here, we are talking about cloth facial coverings such as sewn masks, scarfs, and bandanas*

Pro Mask
- Responsible stance that you are protecting others
- Peace of mind when out in public, should others not be social-distancing, or if a location becomes crowded
- Control over the cleanliness of the mask, disinfection, disposal
- Potential barrier preventing touching face and nose with hands

Con Mask
- False sense of security, more likely to go out more, to more crowded locations
- Sense of security might spill over to not washing hands carefully and mindfully
- May touch face more as you adjust an ill-fitting mask

The bottom line? In the community, the best way to avoid infection is to simply avoid where infectious particles are, by staying home as much as possible, practicing social distancing measures in public spaces, and by adhering to strict hand-washing hygiene. If everyone in a community adopts the mindset that they are infected, and that they are protecting others from getting infected by wearing a facial covering, that may be one more safety measure to help protect our communities.

JAMA Infographic https://jamanetwork.com/journals/jama/fullarticle/2762694

Further reading (all things masks!)

What are masks made of? (article from CIDRAP makes arguments against masks for all): http://www.cidrap.umn.edu/news-perspective/2020/04/commentary-masks-all-covid-19-not- based-sound-data

A new (4/3/2020) article published in Nature Medicine discusses how the size of infectious aerosolized particles (in this case influenza and seasonal viruses) might just be captured/blocked by wearing surgical masks, and may indeed protect others within the social distancing hot zone: https://www.nature.com/articles/s41591-020-0843-2

Are viruses spread passively to others through talking and breathing? https://www.nap.edu/catalog/25769/rapid-expert-consultation-on-the-possibility-of-bioaerosol- spread-of-sars-cov-2-for-the-covid-19-pandemic-april-1-2020

How to get masks for all—reuse them? Sanitize them? Make new kinds of masks, filters, respirators? There is currently no shortage of brilliant and creative minds working on these problems, and making amazingly fast progress!

http://web.stanford.edu/group/prakash-lab/cgi-bin/labsite/covid19/
https://www.sciencenews.org/article/coronavirus-covid-19-ppe-face-mask-shortages-creative-solutions

Made the decision to wear a mask out in public? Here are some mask-making instructions:
https://JENNIFERMAKER.COM/face-mask-patterns-cricut
https://www.atlantichealth.org/patients-visitors/donate-volunteer/donate-supplies-covid-19/make-facemask-help-covid-19.html
https://www.coxhealth.com/innovation/masks/
https://masksnow.org/
https://www.deaconess.com/How-to-make-a-Face-Mask
https://www.craftpassion.com/face-mask-sewing-pattern/#face-mask-pattern

No. 19

Why is this virus different from all other viruses?

Felicia Keesing

Hi, Everyone.

My post today focuses on the virus itself. In honor of my family's holiday celebrations later this week, I'll state my question this way: **Why is this virus different from all other viruses?**

Let me start with some basic virus biology. Viruses aren't cells, and they're not living organisms. They're parasitic particles that hijack the cells of living organisms and use these cells to make more copies of themselves. A virus particle basically consists of a fatty membrane with a bit of DNA or RNA inside. The fatty membrane has proteins embedded in it, which help the virus invade the cells it will parasitize. For more on the specific components of SARS-CoV-2, the coronavirus that causes Covid-19, check out this amazing infographic.

A virus first has to get into a host so that it can hijack the host's cells. Viruses generally get from one host to another through the host's bodily fluids, so the virus particles in the bodily fluids of the infected host have to come into contact with the bodily fluids of a new host. Some viruses travel in blood, others in saliva or mucus, others in feces or urine. SARS- CoV-2 appears to travel to new hosts through saliva and mucus, and also through feces.

Once a virus invades a new host, it takes some time before it begins making copies of itself. That's called the *incubation period*. After the incubation period, the virus begins making copies of itself and starts to spread within the host. At this point, it can also spread to new hosts. This is called the *infectious period*. The immune system of an infected host is typically fighting the virus, and if all goes well, the immune system will eventually destroy the virus particles. At that point, the host is recovered, and may be immune to reinfection, depending on the specific virus. In some cases, the immune system is never able to fight off the virus, as is the case for HIV. We know that the immune system can fight off SARS-CoV- 2, though, so there's a bit of good news.

With this basic background, we can begin asking how SARS-CoV-2 is different from other viruses that cause disease in humans. As my points of comparison, I'll primarily use two other coronaviruses—the viruses that cause SARS (Severe Acute Respiratory Syndrome) and MERS (Middle East Respiratory Syndrome)—and the influenza virus that causes the flu, with guest appearances by other notorious viruses like Ebola virus and HIV.

How long is the incubation period? The average incubation period of SARS-CoV-2 is about 5 days (see this report), though it can be as long as 14 days, and perhaps a bit longer. This is longer than the 1–3 day incubation period for influenza, for example, but shorter than the 9–21 day incubation period for the virus that causes chicken pox,

or the much, much longer incubation period for HIV (for a simple table). So this virus doesn't have an unusual incubation period.

How infectious is it? Epidemiologists measure the rate at which a virus spreads with a measure called Ro (which is pronounced *R-nought*). Ro is the number of new infections that arise from a single infected host. Ro for measles is 12–18, meaning that a single infected person typically infects 12–18 others. Ro for the 1918 influenza virus was 1.8, for Ebola it's about 2, for the common cold virus it's 2–3. You can see a table of Ro for well-known infectious diseases here. For SARS- CoV-2, it's 1.4–3.9. But back in 2002, the first SARS virus had a similar Ro, yet was much more easily contained. In sum, SARS-CoV-2 doesn't stand out for its infectiousness.

(Note that we're practicing social distancing in an effort to reduce the Ro of the virus. If we can get Ro below 1, there will be fewer and fewer infected hosts over time and the infection will die out.)

How deadly is it? This is harder to estimate than you might expect. You've probably heard "case-fatality" estimates of 1–3%. This statistic is calculated as the number of current deaths divided by the number of current cases, which doesn't sound very complicated. But we know that the number of current cases is an underestimate almost everywhere because of the lack of testing, and because a lot of people never even know they're infected. Also, for the nerdiest among you, there's a several-week lag between the current number of cases and the number of deaths that will ultimately arise from those cases. This would tend to make the fatality rate look *lower* than it actually is. And finally, as you already know, the fatality rate is not the same for all categories of people. Older people are much more likely to die, and so are people with certain underlying health conditions. (And one more thing: a key reason that we're all trying to "flatten the curve" is because the fatality rate is higher when hospitals are overrun with critical cases and can't adequately treat them all.)

Even given all of this uncertainty and variability, the fatality rate from infection with SARS-CoV-2 is much lower than the fatality rate for SARS (15%), MERS (34%), or Ebola (25–50%). [Keep in mind that the fatality rate is much, much higher than it is for the seasonal flu (0.1%), and about as high as the fatality rate for the 1918 flu pandemic (2.5%).]

How many infected people don't have symptoms? If you haven't already read my post about the proportion of people infected with SARS-CoV-19 who never develop symptoms, now would be a good time to do that. (On the Google Classroom site, it's the post from 3/26/20.) The bottom line is that 20–30% of people infected with SARS-CoV-2 appear to develop no symptoms at all. That might seem high, but it's not unique. For seasonal influenza, it's thought that 50% of infected people have no symptoms, though estimates of the percentage for all influenzas range widely. A significant percentage of people infected with SARS also appear to have had no symptoms, with one study estimating 13%. And there were asymptomatic people infected with MERS (although that percentage appears to be somewhat lower). So the frequency of people infected with SARS-CoV-2 who have no symptoms does not seem to be a particularly distinctive characteristic of this virus.

When are people most infectious? Scientists are still learning about SARS-CoV-2, but several studies suggest that the viral load of infected people is already very high when symptoms begin. Tracking of cases has also shown that people without symptoms can transmit the virus. For the original SARS, the rate of viral shedding peaked a week or more after the onset of symptoms. This meant that people had typically been isolated and were being treated in a

hospital by the time they were most likely to infect others. (That's also why so many SARS infections were acquired in hospitals.) For MERS, one study found that viral load peaked two weeks after patients had developed symptoms. What about for influenza? Influenza is different. A study in Germany followed influenza infections in households. Most patients reached their highest viral shedding rates a few days after symptoms began, though there were some people who shed virus particles 1–4 days before they experienced symptoms. So to put this all together, SARS-CoV-2 appears to be shed at high rates just as symptoms are beginning, and sometimes before symptoms begin, and sometimes when there never are symptoms, which is similar to what we see for influenza.

So, why is this virus different from all other viruses? It's not the deadliest virus or the most infectious. It's no sneakier than the influenza virus. It doesn't have the longest incubation or the shortest. But **it has a perfect storm of traits**—its infectiousness, its incubation period, its fatality rate—and it has seven billion susceptible hosts to infect. These traits make it very difficult to identify infected people before they've already transmitted a deadly infection to many other people.

So what should you do? You should keep doing everything that I hope you have been doing for weeks already:

- Practice social distancing.
- Stay home as much as possible.
- Continue good hygiene at home and, even more importantly, whenever you absolutely must go out.
- Don't go to the store or any other public place if you think you or someone in your home has been exposed.
- Be kind to yourself and others, and do what you can to help, as long as you can do it safely. There are a number of resources available in local communities, such as Red Hook Responds.
- If you've recovered from Covid-19, consider donating some of your blood plasma. Your antibodies are incredibly valuable right now. Share your superpower if you can.

Stay safe and protect others,
Felicia

No. 20

St. Stephen's in the 1918 Pandemic

Helen Tieger '85

With the endless coverage of the Covid 19 crisis, we are frequently hearing expressions such as "This is unprecedented," or "We have no roadmap for this situation." This is true of Covid 19, but it helps to look at how people in different times addressed unprecedented situations. Myra Young Armstead's article of March 24 provides an excellent summary of the Influenza Pandemic of 1918 from the North American perspective. How did Bard College, then named St. Stephen's, cope with this pandemic that took the lives of so many Americans?

By some great good fortune, the College did not directly experience an outbreak of influenza during that national crisis. Had the Annandale community been hit with the flu, it is quite likely that you would not be reading this today. The entrance of the United States into World War I in 1917 had a devastating impact on the enrollment of tiny St. Stephen's, and this combined with a period of unsteady leadership of the College almost closed its doors. An examination of the college newspaper, the *St. Stephen's Messenger* from spring of 1918 through the fall of 1919 provides a parallel to the narrative of the flu pandemic, but one that sheds light on how this community responded, maintaining a kind of normalcy even during a time of tremendous upheaval.

The first reference to the pandemic appears in the April 15, 1918, issue of the *Messenger*, and came from alumnus Paul Hartzell '15, stationed at Camp Crane, Allentown, Pennsylvania. He wrote to his alma mater of the effects of a quarantine during the first wave of the influenza pandemic, which must have been read by students with trepidation lest the College suffer the same fate:

"The camp was under quarantine for four and a half weeks, it was lifted only the other day. After such a confinement, you can imagine how red the town was that night. Very few indeed waited for evening mess in their desire to get out at the first possible moment."

In the same issue, the St. Stephen's Glee Club was to perform in nearby Kingston; preparations were underway for the spring dance; and a new activity was introduced by the Junior Class called "Snap Week," which was to involve snapping photos of life on campus over the course of one week, then to be preserved in the library for 25 years as a kind of time capsule. (Sadly, this excellent tradition was not maintained!)

More significantly, the front page of that issue also includes mention of the fact that Dr. Irville Davidson was appointed acting dean by a special meeting of the Board of Trustees. The [1] appointment was considered "essential at this present time." Not mentioned here was the fact that the College's President, William Cunningham Rogers, had been granted a paid one-year leave of absence due to poor health. Dean Davidson watched the student roster dwindle

to 18 as students either left to join the army, or didn't apply the following semester. By September, he concluded "we can't run the College for that number". But college life continued for the students [2] who remained.

The May 15 issue included a list of alumni and current students then serving in the war, along with information about where they were stationed. Also mentioned was that Junior Weekend (May 24–26) was to be postponed indefinitely, "the effect of war" being the chief cause. Junior elections were held, however, and paid advertisers to the paper included The National Bank of Red Hook, *The Tivoli Times* (a weekly publication of Madalin, New York), and "Luckey, Men's Shop on the Corner" of Poughkeepsie, among many others.

The front page of the June 1, 1918, issue reads: "Only Four Men Graduate Out of One of the Largest Entering Classes." Of the 18 men who had entered St. Stephen's in 1915, seven or eight had left to serve in the infantry, cavalry, or to work in hospitals in the United States and abroad. The four remaining graduates all stated their intentions to enter the Episcopal ministry after pursuing theological studies, but one (Walter Whitmore) first planned to enter the National Army upon graduation.

In this same issue, another headline read: "Commencement Festivities To Be of a Simple Character on Account of War." Taking place between Sunday, June 2 and Wednesday, June 5, these festivities included several days of sermons, a rendition of *Gounod's Gallia* by the College choir, reunion gatherings for the four existing fraternities, a dance at Ludlow-Willink Hall, and finally, Commencement Services followed by a farewell luncheon at Preston Hall. The four graduates must have been exhausted, but they would have understood themselves to be part of a long tradition of campus and religious life.

Meanwhile, coming to terms with the lack of students and critical state of the College, Dean Davidson traveled to Washington and secured a unit of the Student Army Training Corps (SATC) for St. Stephen's College in the fall of 1918. This program provided simultaneous academic and military training for students, paid for by the United States government. Almost one hundred students were hastily recruited, an extraordinary turnaround for scholarly St. Stephen's. The *Messenger* was not published that fall as the campus was converted into a military facility, so there is little student description of what was clearly a period of tremendous activity. In his book *Education for the Common Good*, President Reamer Kline quotes Dean Davidson, who writes:

"...We had to find some new faculty members to teach map-making, military law, sanitation, and so on, and we had to conduct two sets of courses, one for the soldiers and one for the few civilian students who still remained." [3]

Davidson continues on to say that President Rogers had almost no part in this; the faculty ran the College. By November, the Armistice was signed, ending WWI, and the SATC was disbanded in December. The government paid its bills, and the College remained open.

The January 1919 issue of the *Messenger* reports that at the disbanding of the SATC, some students expressed regret at the departure from the College, where friendships had been forged. Efforts to maintain these connections through SATC reunions are reflected in subsequent articles, a testament to the intensity of feeling experienced during that brief time.

In February, the *Messenger* reports that Dean Davidson was appointed acting president during Dr. Rogers's continued leave of absence. Rogers would actually resign in April, and would not attend the Commencement at all that year, sending a letter of regret that illness prevented his attendance. [4]

During this final period of global activity for the influenza pandemic, only indirect mention is made of the virus in the *Messenger*. In noting the passing of alumnus Rev. Charles David Fairman '12, the March 1919 issue includes the fact that he died of double pneumonia after caring for those who had been sick with influenza, [5] and in April there is an entry reporting that the Rev. Peter Lange was granted a two-month leave of absence "after suffering an attack of influenza" among other afflictions. The absence of articles about this pandemic in the college [6] newspaper indicates that life at St. Stephen's provided far more immediate topics—existential and otherwise—to report on . [7]

The following fall brought President Bernard Iddings Bell to the College, and his leadership brought a period of fame and expansion to the College in the 1920s. But given the precarious existence of St. Stephen's during the period we remember for the 1918 influenza outbreak, it is reassuring to know that here at Annandale, traditions were maintained, dances were enjoyed, and classes went on through it all.

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1. Irville Davidson served the College in many capacities from 1899 until 1940. In addition to his tenure as acting dean and acting president, he taught Latin, English, German, and Greek. For 16 of these years he also served as librarian.
2. Kline, pp. 60–61.
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4. *St. Stephen's Messenger*, October 19, 1919, v. 26 https://digitalcommons.bard.edu/cgi/viewcontent.cgi?article=1081&context=messenger
5. *St. Stephen's Messenger*, March 1919, v. 25, no. 4 https://digitalcommons.bard.edu/cgi/viewcontent.cgi?article=1077&context=messenger
6. *St. Stephen's Messenger*, April 1919, v. 25, no. 5
7. A final note to add that Kline makes reference to two 19th century epidemics that forced the closure of St. Stephen's for several weeks each time. During Warden Fairbairn's tenure, in March of 1875 the College was closed for three weeks due to an epidemic of "varioloid" (smallpox). Thirteen years later an outbreak of typhoid required the same measures. Faith, fortitude, and courage: the St. Stephen's community had these in abundance. And perhaps a pinch of luck.

No. 21

B Cells, T Cells, and Possible Immunity to COVID-19

Michael Tibbetts

Recent reports have suggested that COVID 19 disease is associated with a low number of B cells and T cells.[12] Why is this important?

The Body's Immune Response to Viruses:
The immune system's response to viruses is primarily mediated by two classes of cells, T cells and B cells. These cells produce proteins that recognize the virus and either target the virus directly, or identify cells infected with the virus and eliminate them.

What Are B Cells:
B cells are antibody-producing cells, each able to produce one kind of antibody that recognizes one foreign substance (antigen). When we become infected with a virus, the B cells that make antibodies recognizing that virus get signals to divide and to secrete antibodies. This results in a large number of cells all pumping virus-specific antibodies into the system. Antibodies bind to the virus and can subvert its action in two ways. Their binding may get in the way of the virus's ability to bind molecules on cell surfaces, blocking them from infecting the cells. The antibodies attached to the viruses also act as flags that are recognized by other kinds of immune cells, which consume and dismantle the virus.

What Are T Cells:
There are two general classes of T cells, CD4+ and CD8+ that have distinct, important roles in an immune response. Like B cells, they each carry their own specific antigen-recognizing molecule, called a T cell receptor. Also like B cells, each T cell carries a T cell receptor that can recognize one and only one antigen.

The CD4+ T cells are needed to mount a robust antibody response. B cells will not proliferate or start secreting antibodies unless there is also a CD4+ T cell that recognizes the virus. Think of this as a cross-check to prevent an antibody response to one's own molecules (an autoimmune response).

The second class of T cells, CD8+, are responsible for identifying cells infected with the virus. While still inside a host cell, (initially, the epithelial cells of the lungs, in the case of SARS-CoV- 2) viruses are invisible to antibodies. Antibodies exist outside of cells and can only bind to substances in the extracellular spaces and fluids of the body. If a CD8+ T cell recognizes a cell infected with a virus, it gives that cell a signal which causes it to dismantle itself from within, in an organized way. This process of apoptosis (cellular suicide) helps eliminate cells that have become virus-producing factories.

Reduced Numbers of T Cells and B Cells in COVID 19 Patients:
Scientists don't yet know if the virus causes the reduced numbers of T cells and B cells in COVID 19 patients, or if people with already reduced T cell and B cell numbers are simply the ones that show the most significant clinical symptoms; the elderly and people with pre-existing conditions. What we do know is the reduction in these cells is worse in people with severe cases. However, in most cases, the immune response is still active enough to ultimately clear the virus.

Based on these observations, at least one group of researchers is recommending the use of drugs that stimulate the immune system as a COVID 19 treatment.[3]

The reduced number of immune cells may also have implications for the ability of someone to develop lasting immunity to the virus, after having the disease. Typically, when one has a viral infection a strong B cell response is generated, and after the virus has been cleared, some fraction of those proliferated B cells remain in our bodies as "memory" B cells. Since there are now more B cells that recognize this specific virus, if we become reinfected, the time it takes for the immune system to "see" and respond to the infection is drastically reduced. In ideal circumstances, shortened to the point that we never even realize we were infected.

For reasons that are still poorly understood, some viruses are better at generating lasting immunity than others. In the case of COVID 19, we just do not know either the degree of immunity or how long immunity lasts once someone has been infected with the virus. However, reduced numbers of B cells in people with the disease may mean that there are fewer memory B cells post-infection. The good news is that this should not have any effect on our ability to create a vaccine for the virus. Theoretically, since it is not accompanied by viral production, vaccination should simply create a surge in B cells, including memory B cells.

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No. 22

How Can We Think Ethically about Medical Resources During COVID-19?

Kathryn Tabb

Dear Fellow Members of the Bard Community,

I'm a philosopher of medicine and a bioethicist. My aim here is to introduce some of the ethical issues surrounding medical rationing that are increasingly prevalent in the news these days. Medical rationing refers to decisions made about the distribution of medical resources under conditions of scarcity. As Malia Du Mont and Helen Epstein have made clear in their wonderful contributions to this series, the United States was woefully unprepared for this epidemic. The reckless choices made early on, especially around the production and distribution of tests, have already had tragic consequences.[i] Alongside tests, the most widely discussed shortage facing American hospitals right now concerns ventilators, the medical devices that take over the work of lungs severely compromised by SARS-CoV-2 (the virus that causes coronavirus disease 2019, or COVID-19 for short).[ii] But increasingly, there are shortages up and down the supply chain, which have caused rationing decisions to be made on the fly. For example, a woman in Los Angeles with systemic lupus erythematosus reported being refused her usual prescription of hydroxychloroquine, since the drug was being rationed by her healthcare provider for use with COVID-19 patients[iii] (see Felicia Keesing and Kristen Lane's contribution about the uncertainty surrounding this new treatment)[iv]

Medical rationing proceeds according to triage protocols, instruments developed by bioethicists and other clinicians to guide practitioners in making determinations about how scarce resources should be allocated. The word "triage" (from the French *trier*, meaning "to sort") refers to the separation of patients into categories. Debates over triaging are often over what those categories should be, and which criteria should be used for determining who falls under them. The best place to start in understanding these debates is with the distinction between consequentialist thinking and anticonsequentialist thinking about the appropriate criteria for triage. I will introduce each of these in turn.

Consequentialist Thinking about Triage

In philosophy, consequentialism refers to the school of ethics that prioritizes consequences; an action that has better consequences is thought to be more ethical. While this might seem obvious, consider the case in which a positive end requires unsavory means. For example, it can be tempting to make a loved one happier by lying to them. A consequentialist might argue that, in the main, the lie is ethical because of its good outcome. On the other hand, many would insist that lying is wrong, no matter the result. You may already be thinking of a counterexample—a so-called "white lie" that you personally think would be defensible, perhaps. Such counterexamples are the stuff of philosophy, but we don't have space to dally with them here![v] Our aim is just to grasp the fundamentals of consequentialism.

Consequentialism relies on analyses of what counts as the "best" outcome. You may be familiar with the phrase "the greatest happiness for the greatest number," associated with utilitarians like John Stuart Mill and Jeremy Bentham.[vi] But how should "happiness" be assessed in a medical setting? An option often discussed in the bioethics literature is the maxim to make the choice that preserves the greatest number of lives. But there is a common intuition that this is too broad; that there is a principled difference between a life that will end in two weeks and a life that will end in 20 years. Accordingly, some ethicists have argued that the criterion should instead be the sum total of *years of life* saved, rather than *numbers of lives* saved. With this approach younger, healthier people will be prioritized over older, sicker people.

Such criteria, which are widely accepted, can be contrasted with those that encode biases against certain groups.[vii] For example, before it shifted course on account of public outrage, the state of Alabama was maintaining guidelines to providers stating explicitly that "persons with severe or profound mental retardation, moderate to severe dementia, or catastrophic neurological complications such as persistent vegetative state are unlikely candidates for ventilator support." As White and Lo have recently argued, "such exclusions violate a fundamental principle of public health ethics: use the means that are least restrictive to individual liberty to accomplish the public health goal."[viii] They also may violate the law. The Office for Civil Rights at the U.S. Department of Health and Human Services has raised alarm bells about triage protocols that explicitly run afoul of national laws against discrimination on grounds of disability, race, age, spoken language, and a host of other factors.[ix] Consequentialists argue that it is possible to build protocols based on their principles that do not cross these ethical or legal lines. In the next section, I discuss critics who think they are wrong.

Anti-Consequentialist Thinking about Triage

The most common grounds for objecting to recently introduced—or recently publicized—models for medical rationing have come from those who reject the basic consequentialist premise that some lives should be prioritized over others. These critics do not believe that equity in the right to life can be compromised for any other goal. For example, the Disability Rights Education & Defense Fund argued in a recent brief that the use of criteria such as number-of-lives and years-of-life amounts to discrimination against people with disabilities.[x] Due to preexisting health conditions, people with disabilities—*on average*—have shorter expected lifespans than the able-bodied, and also—*on average*—require more medical resources (e.g., more time on a ventilator). Therefore, even consequentialist criteria that don't explicitly take diagnostic status into account may indirectly cause resources to be withheld relatively more frequently from people with disabilities.[xi]

This logic can be extended to other demographic groups that are at higher danger from COVID-19. For example, there is emerging evidence that the disease poses an elevated mortality risk for African Americans. Due to systematic racism in healthcare, housing, and employment, as well as the long shadow of slavery and modern-day economic discrimination, rates of environmentally caused diseases like asthma, obesity, and diabetes are higher among black Americans than white. Also significantly, less than 20 percent of African Americans have jobs that allow them to work from home.[xii] In an open letter to the secretary of the Department of Health and Human Services written on March 27, Elizabeth Warren, Ayanna Pressley, Robin Kelly, Kamala Harris, and Cory Booker emphasized that this means that African Americans are, on average, more likely to have underlying conditions that will raise their health care costs, should they fall ill with COVID-19, and more likely to contract it.[xiii] Triage protocols that evaluate the amount of resources patients require may end up favoring already privileged racial groups, deepening, rather than assuaging, the appalling bias African Americans have long faced[xiv] from American medicine, especially during public health crises.[xv]

Anti-triage Thinking

Some people who reject consequentialism believe that ventilators should be given out on a first-come, first-served basis to patients with similar levels of need, regardless of other factors.[xvi] Others argue in favor of a lottery system, in which everyone who could benefit from their use is entered into a pool and names are chosen randomly as machines become available.[xvii] It is important to note that both first-come, first-served protocols and lottery protocols are *still* forms of triage planning. Guidelines need to be in place to determine who is eligible for access, even under these models. Furthermore, both raise their own worries about equity and practicalities. Who arrives first for medical care is easily gamed by those with money and influence, for example, and having every member of a lottery pool in reasonable proximity to an awaited ventilator poses logistical challenges. Protocols are still needed to guide physicians in assessing urgent medical questions like the following: What counts as "critical condition?" What are "negligible odds of improvement?"

Some critics go further, and reject even these anticonsequentialist approaches to triage. For example, in a recent Wall Street Journal commentary, Allen C. Guelzo, a senior research scholar at Princeton's Council of the Humanities, asks whether "this sudden reach for rationing is even necessary," given the use of "lockdowns [that] have certainly been much more than nothing."[xviii] He urges Americans to not take the "easy way out" of the dilemmas raised by COVID-19. According to this sort of view, failing to provide care to everyone who could benefit from it is just fundamentally unacceptable—even un-American—and as such, planning for shortages is ethically questionable in and of itself.

Final Thoughts

To speak frankly, I find this latter kind of response from a public intellectual to be shocking. I see the lure of avoiding the painful, politically fraught work of mounting a principled case against triage protocols, but believe that, nonetheless, critiques must target the way triage is being planned, not the fact that it *is* being planned. For, as Ezekiel J. Emanuel and colleagues have grimly insisted in the New England Journal of Medicine, "rationing is already here."[xix] Given what was known on its date of publication, March 26, Guelzo's piece displays a willful lack of awareness of the extent of the crisis.* Healthcare workers were protesting in the streets that day because they lacked appropriate personal protective equipment, or PPE, which had resulted in the death of a nurse at Mount Sinai, mere miles from Princeton, on March 24.[xx] And the math on the sufficiency of ventilator stockpiles has never been complicated. I write on Sunday, April 5. Mayor Bill de Blasio has said that, as of now, New York City will run out of ventilators by Tuesday, April 7.[xxi] Louisiana, which is weeks behind New York as a hotspot for infections, will run out by April 9, according to its governor.[xxii] States are bidding in desperate competitions against each other and the federal government for remaining supplies.[xxiii]

Triage protocols are what Elaine Scarry would refer to as "thought-laden tools," that is, "procedures [that] are so efficiently internalized that mental space is left over for addressing additional complicating problems."[xxiv] They are there for the clinicians we have all read about, weeping in the hallways of hospitals because they are forced to decide who should live and who should die.[xxv] Triage protocols support decision-making when thinking becomes impossible, because of exhaustion, lack of time, or the paralysis that accompanies morally devastating choices.[xxvi] Without them, clinicians risk being overwhelmed not just by medical decisions but also by ethical ones, and left deeply traumatized by their own choices.[xxvii] Overwhelmed healthcare workers are also at greater physical risk, because of an increase in errors in safety protocols due to fatigue and stress. Systemically, asking clinicians to make decisions on the fly introduces inefficiency; resources will be spent on those who have no chance of recovery, as well as those who don't need them to survive.

That said, the available models for rationing are all fraught. Critics of consequentialism are, I think, absolutely right that years-of-life and number-of-lives criteria are indirect forms of discrimination. Analogous to rejoinders like "all lives matter" or "I don't see color," triage-planning efforts that ignore the gross structural inequalities that have resulted from a long history of racial and class violence will compound existing public health outrages. Lottery and first-come-first-served systems both have much to recommend them, but both will result in our healthcare systems being overwhelmed much more rapidly than they would be with the more stringent triage protocols currently in effect. In a sense, adopting these policies now would spike the curve we are all trying to flatten. Hospitals would be less capable of handling their normal intake loads, such as patients with heart attacks, women giving birth, those who have been in car accidents, etc. Disadvantaged communities, many of which are located in healthcare deserts, will feel these shortcomings first.

As befits a philosopher, I've raised problems here, rather than solved them. But I think it's important that we collectively wrestle with these problems, and I believe that new and radical solutions will only come out of open debates over what medical rationing has been, and what it could be. To imagine we can get by without any form of triage planning—be it first-come-first-served, a lottery system, or a consequentialist protocol—is to ignore the realities of American medicine, which is beset by inequalities, shortages, and a history of discriminatory and cruel policies. The current crisis has only brought into view old ethical problems; all that's new is how impossible they have become for the more privileged among us to ignore.

* I find Guelzo's piece problematic for a deeper reason as well, one that goes beyond the scope of this brief. To suggest that our healthcare system was *already* just, that medical rationing wasn't *already* rampant, is to reveal an ignorance or willful disregard for the experience of most Americans. It reveals that for some, triaging only becomes a concern when consequentialism is not working in their favor.

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No. 23

PPE Face Shield Production: Updates on Bard's 3D printing PPE network

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Christopher Ahmed
Kathryn Tab

with support of Keith O'Hara, Maria Cecire, Paul Cadden-Zimansky, Jonathan Becker, Erin Cannan, Mark Halsey, Susan Merriam, Tom Keenan, Emily McLaughlin, CCS students, Bard CCE, and Bard LLI.

Dear All,

Thanks to Paul (Cadden-Zimansky) from Physics, we managed to retrieve two 3D printers from Rose and now Ross and I have a makeshift lab in Tivoli set up to fabricate reusable face shields. Production is slow and supplies are hard to get, but we expect to have about 50 reusable face shields ready to be distributed from Tivoli per week. (photos attached). Studio Arts is also producing face shields (Maggie and Mindy cc'd here) and, in fact, a small batch of them has already been distributed to Columbia Memorial Hospital yesterday. Hayden Sartoris and Christopher Ahmed are also trying to get Experimental Humanities's 3D printing machine up and running. We hope to be able to grow this small, distributed assembly line with the help of CCE/OSUN, but, for now, this small effort is moving along slowly.

With production on its way, local distribution is now crucial. We want to make sure the face shields end up in good hands, so, **if you know of any local testing center or anyone in the healthcare world needing this piece of equipment locally, please email Douglas O'Connor—cc'd here**. Doug is centralizing the distribution efforts with the help of CCS Bard students, and he is also in touch with other PPE fabrication networks and volunteers around the Hudson Valley. This will allow us to calculate supplies and machinery needed, and, if pertinent, how to get a fundraising campaign off the ground.

Thanks for your help and please forward this to anyone you think can provide specific details on the needs for this type of PPE locally. In addition to CMH, other scheduled deliveries of face shields are to: Saint Clare's Hospital in Dover, New Jersey (where a Bard student's relative works, on whose behalf the student has made a request) and Albany Med in two week's time.

Stay well!
Ivonne Santoyo-Orozco

Mindy and I have our production line going as well. I will have three more 3D printers arriving in approximately one week and will be able to print nine face shield armatures every three hours. They were bought through a recent Bard MFA grad Luba's GoFundMe campaign. It's quite incredible. https://www.gofundme.com/f/protective-shields-for-health-workers Between Ross, Ivonne, Mindy, and I, we will have a lot to distribute starting in about a week.

Maggie Hazen

Katie Tabb will also join our face-shield volunteer group. She will be crucial not only in connecting us with medical experts to make sure our shields are safe to distribute, but she will also be helping us by sewing the elastic straps to the headband.

Stay well,
Ivonne

So far, we are focused on CMH in Columbia County--which also serves Greene County, I believe--but we are also doing outreach to hospitals and other medical establishments in the Hudson Valley. I hope to hear back about their PPE needs soon so we can factor them into production and distribution/delivery schedules. Feel free to reach out to me with information, suggestions, supply donations, or contacts.

Stay safe and healthy everyone.

Doug O'Connor '06
Bard College Management Information Systems
oconnor@bard.edu
845-758-7285

If donations are possible, they could be made either in kind (acetate, filament, and even 3D printers—we can provide specs as required) or in money (we can make public the expenses).

Ivonne Santoyo-Orozco

No. 24

Federal Government Accountability and Pandemic Preparedness

Malia Du Mont '95

My previous essay, on pandemic strategy development in the federal government, highlighted the efforts that the executive branch of the U.S. government has taken in pandemic planning and preparedness. In this follow-up essay I want to outline the accountability and oversight mechanisms and structures in the federal government, which are meant to help government avoid (and learn from) problems such as the ones we are encountering today in pandemic preparedness and response. The bottom line is that unsuccessful federal strategies and plans are a failure not only of the strategic planners but also of those responsible for overseeing the planners.

Executive Branch Role in Accountability

• Inspectors General: Each federal department has an Office of the Inspector General (OIG). The mission of these offices is to detect and deter fraud, waste, and abuse; promote effectiveness; and ensure ethical conduct. OIGs across federal government pursue their mission through a variety of methods including investigations—self-initiated or in reaction to a complaint—that can result in a range of outcomes from internal audits to criminal charges. These offices also serve as a resource for whistleblowers. As such, administrative independence and an apolitical and objective approach to their work are essential to the effective functioning and integrity of OIGs.

HHS (Health and Human Services) has the largest OIG in the federal government, with over 1,500 employees, the majority of whom oversee Medicare and Medicaid. The HHS OIG's work on infectious disease response and preparedness can be viewed on this webpage. Here you can see the result of investigations into entities such as hospitals that participate in Medicare, which assess whether they are in compliance with federal requirements, including the requirement to engage in all-hazards emergency preparedness planning.[1] The only HHS OIG report on this topic so far in 2020 is a survey of hospitals in response to COVID-19. A 2019 report relevant to today's situation points out that "HHS did not always efficiently plan and coordinate its international Ebola response efforts," but a report from 2018 notes that "hospitals report improved preparedness for emerging infectious diseases after the Ebola crisis."

HHS does not currently have an inspector general. The senior official in the HHS OIG is Principal Deputy Inspector General Christi Grimm, a career official who was promoted to her current position in January of this year. This week she has been the target of internal criticism for the aforementioned survey of hospitals during COVID-19, which was released on Monday and highlighted severe shortages of testing supplies, thermometers, and masks. An HHS senior official stated that the OIG did not inform his office quickly enough about the survey's findings, and President Trump characterized them as opinion and "just wrong."[2]

• National Security Council (NSC): The NSC does not make policy or have direct authority over any federal departments, but is the president's principal forum for considering national security matters—including national health security—with senior advisers and officials. The NSC has a coordinating role in facilitating the development and implementation of policies that involve multiple federal departments, otherwise known as the interagency. As an issue with diplomatic, economic, health, and other follow-on impacts both internationally and domestically, pandemic response policy is an example of a crosscutting interagency effort that is typically addressed at multiple levels within the NSC staff structure.

The NSC reports directly to the White House, so its structure and size changes somewhat according to each president's priorities. The NSC generally consists of a number of directorates, each focused on a priority issue. Under the Trump administration, the NSC's global health function—including pandemic preparedness—resides in the Weapons of Mass Destruction Directorate. This directorate includes staff with expertise in global health, but its senior director is an expert on North Korean nuclear proliferation. There are not currently any NSC directors whose primary focus is global disaster response.[3]

Legislative Branch Role in Accountability

Constitutionally designed checks and balances to ensure accountability of Executive Branch departments are exercised through several Legislative Branch institutions.

• Government Accountability Office: The U.S. GAO is an independent, nonpartisan watchdog agency headed by the comptroller general. It examines how federal funds are spent and reports to Congress with objective analysis to help federal agencies be more efficient. Members of Congress often ask the GAO to undertake analysis of Executive Branch policy and practices. A search for "pandemic" on the GAO website yields almost 400 results going back over a decade, including reports, testimony, and a March 2020 "Watchdog Report" podcast on federal government pandemic preparedness in response to COVID-19. As far back as 2005, the GAO was warning that "challenges remain in preparedness" for a pandemic. Most of the identified challenges at that time centered on vaccine availability for an influenza pandemic, but the GAO also highlighted the lack of sufficient capacity: "A large-scale outbreak, such as an influenza pandemic, could strain the available capacity of hospitals by requiring entire hospital sections, along with their staff, to be used as isolation facilities."[4]

Coronavirus-relevant reports released recently by the GAO include assessments of the National Biodefense Strategy,[5] one of which points out:

> There was no documented methodology or guidance for how data are to be analyzed to help the enterprise identify gaps and opportunities to leverage resources, including no guidance on how nonfederal capabilities are to be accounted for in the analysis. Agency officials were also unsure how decisions would be made, especially if addressing gaps or opportunities to leverage resources involved redirecting resources across agency boundaries. Although HHS officials pointed to existing processes and directives for interagency decision-making, GAO found there are no clear, detailed processes, roles, and responsibilities for joint decision-making, including how agencies will identify opportunities to leverage resources or who will make and enforce those decisions.[6]

The National Biodefense Strategy does not stand out for being singularly unsuccessful; there are similarly critical GAO assessments of many other strategies for at least the past decade. Developing and implementing interagency strategy is complex, difficult, and iterative. GAO reports outline challenges and opportunities, and also make recommendations for improvement, to which Executive Branch departments are required to respond as part of their accountability to the Legislative Branch. In the report referenced above, the GAO made several recommendations to clarify processes, roles, and responsibilities for joint decision-making. HHS formally concurred with all the GAO recommendations, and is developing steps to implement them. If typical GAO processes are followed, in approximately a year, the GAO will produce a follow-up evaluation of HHS's effort to implement the recommendations, and thus the iterative policy improvement dance will continue.

• Congressional Committees: Both the Senate and House of Representatives have oversight responsibilities for Executive Branch departments, which they exercise through committees that draft legislation and authorize funding. A key mechanism by which Congressional committees pursue their oversight function is through hearings. For example, when Executive Branch departments produce strategy documents, it is typical for the relevant Congressional committees to call a hearing so they can direct questions to the responsible Executive Branch officials and ensure that these strategies address appropriate priorities.

Senate Health Education Labor & Pensions (HELP) Committee: HELP has broad jurisdiction over American health care, education, employment, and retirement policies and the Executive Branch agencies that deliver related programs and services. Other than a March 2020 hearing on COVID-19 response,[7] the most recent relevant committee meeting was an executive session in May 2018 under the leadership of committee chair Senator Lamar Alexander on the subject of "Pandemic and All-Hazards Preparedness and Advancing Innovation Act of 2018."[8] This was a bipartisan reauthorization of a law originally passed in 2006 that created a new senior position in HHS—the assistant secretary for preparedness and response (ASPR)—and outlined the mission and duties Congress expected this senior official to undertake. In the session, Senator Alexander and other members noted the act's bipartisan nature and unusually long history, which created a unique reservoir of deep senatorial expertise and collaboration on these issues.

In January 2018, the HELP Committee held a hearing on "Our Nation's Preparedness and Response Capabilities" for public health threats.[9] The committee heard testimony from Executive Branch leaders including the HHS ASPR, Dr. Robert Kadlec. In response to Senator Richard Burr's question, "Are we prepared for the public health threats we face?" Dr. Kadlec testified as follows:

> "Quite frankly, if you had to look at Nation State threats that we are considering today, or multiple Nation States that are willing to use terrible weapons against, both physical as well as potentially cyber, I think we are not prepared. And quite frankly, those are the things that keep me up at night as well as a pandemic that could emerge again from Asia. As well as the risks that have come up that [FDA Commissioner] Dr. Gottlieb identified with synthetic biology tools now that allow nefarious people to do unimaginable things potentially. So I think we have a long way to go."

The reauthorized act was passed into law in June 2019.[10] According to HHS, the 2019 law enhances its authorities to prepare for and respond to public health emergencies, authorizes new public health and medical preparedness programs, and reauthorizes funding for existing public health and medical preparedness programs.[11]

Given the severity of the current crisis, one may wonder why the HELP Committee did not hold more meetings and hearings about pandemic preparedness. One answer is that, like other government institutions, they focused on more immediate and tangible priorities like the opioid crisis and hurricane response. When discussing pandemics, committee members spoke mainly about the need to develop and stockpile vaccines and fund associated research. The 2006 act and its subsequent reauthorizations were widely seen as successful and one of the increasingly rare instances of true bipartisan work in the Senate. But with only one committee of 22 senators overseeing all the health, education, employment, and retirement policy of the United States, bandwidth is a clear challenge. Senate and HELP leadership would have needed to raise pandemic preparedness much higher in their policy priority list, a difficult proposition considering the other issues under their purview.

House Subcommittee on Health, Employment Labor, and Pensions: The similarities between this subcommittee and its counterpart Senate HELP Committee end at their shared oversight mission. The House subcommittee does not have a history of expertise or bipartisan work on public health preparedness, and political tensions are evident. Over the past four years, this subcommittee has not held a single hearing related to pandemic policy. Its parent, the House Committee on Education and Labor, held a hearing in 2018 on "Examining the Policies and Priorities of the U.S. Department of Health and Human Services," where the single witness was HHS Secretary Alex Azar.[12] Ranking member representative Bobby Scott shared his frustration, noting that "this is the first time an official from HHS has appeared before this committee since President Trump took office," despite repeated invitations. Committee chair Virginia Foxx mentioned that she had received complaints from other committee members that HHS had previously failed to respond to repeated written queries on a range of issues. Representative Scott was further frustrated that Secretary Azar cut his hearing participation short, stating it is "impossible to do oversight [...] when some cabinet secretaries refuse to fit the Committee oversight hearing into their busy schedule." For his part, Secretary Azar read a prepared statement that explained HHS priorities, including the opioid epidemic, treating serious mental illness, and healthcare reform. He mentioned pandemic preparedness once, as one of the biodefense, preparedness, and global health security programs receiving investments under the president's budget.[13] The committee has held no other hearings touching on the subject of pandemic preparedness since 2018.

The Judicial Branch also has a role in federal government oversight and accountability, but I will leave it to the lawyers among us to undertake that analysis.

Federal government accountability depends on several factors, including the willing participation of Executive Branch officials in oversight activities that require them to answer to Legislative Branch authorities. It also depends on sincere investment in administratively independent oversight offices like OIGs and the GAO. Our constitutional system has in effect designed a structured, ongoing conversation between the different branches of government that is meant to result in increasingly effective policy. But as noted above, even in cases where good relationships exist and professional, bipartisan work is taking place, it is hard to prioritize a potential crisis that has a low likelihood of occurring.

In the end, federal government accountability in our democracy comes down to the citizens, which is why all these resources—hearing transcripts, GAO reports, OIG audits—are publicly available.

1. It was not until February 2019 that HHS's Centers for Medicare and Medicaid Services added, "planning for emerging infectious diseases" to the all-hazards emergency preparedness guide.
2. politico.com/news/2020/04/06/with-worst-to-come-3-in-4-us-hospitals-now-facing-covid-19-167853
3. More staff does not necessarily translate into better preparedness: the Obama administration established a Domestic Policy Council to ensure that domestic policy issues received the same level of senior leader attention as foreign policy issues. However, this administrative bifurcation delayed and confused the government's ability to respond effectively to the Ebola crisis, and led to Obama's decision to create in 2016 an NSC Directorate for Global Health and Biodefense— which under Trump has been folded into the Directorate for Weapons of Mass Destruction and Biodefense.
4. gao.gov/products/GAO-05-863T
5. Pandemic influenza and pathogens are mentioned only three times in the Strategy, with two of those mentions in relation to the danger of an unintended release of pathogens from scientific research facilities. The Strategy was published in 2018.
6. gao.gov/products/GAO-20-483T#summary
7. help.senate.gov/hearings/an-emerging-disease-threat-how-the-us-is-responding-to-covid-19-the- novel-coronavirus
8. Video of the meeting is at this link: help.senate.gov/hearings/s2852-pandemic-and-all-hazards- preparedness-and-advancing-innovation-act-of-2018
9. A transcript of the hearing is here: help.senate.gov/hearings/facing-21st-century-public-health-threats- our-nations-preparedness-and-response-capabilities-part-i
10. The full test of the law is here: congress.gov/116/bills/s1379/BILLS-116s1379enr.pdf
11. phe.gov/Preparedness/legal/pahpa/Pages/pahpaia.aspx
12. edlabor.house.gov/hearings/05/30/2018/examining-the-policies-and-priorities-of-the-us-department-of- health-and-human-services
13. There is no transcript of the hearing, but video is available here: youtube.com/watch?v=Yv_jS5KGjKU&feature=youtu.be

No. 25

Care and Play

Carol Garboden Murray

I wasn't sure that a message from Nursery School would be meaningful to the Bard community, but I received so many kind comments from people recalling all that they learned in the beginning years of their child's life, and from the early childhood teachers, and from Kristine Williams, and Jane Korn. Thank you for sending your generous and thoughtful greetings and fond remembrances.

What we learn in nursery school is how to **care** and how to **play**. It seems that these two lessons are especially important now. At Bard, pedagogy matters, and I now see clearly how Bard values care and play, as a way to think, live, and learn—so it makes perfect sense that early childhood is valued on our campus.

CARE: In early childhood we have the opportunity to see our dependence upon one another up close, and to analyze the nucleus of care—the essential care between the child and parent, which is an ethic and a model for relationships, trust, and living with one another.

PLAY: At nursery school, we are also privileged to witness the brilliance of humans as they learn through play. Play is research—it drives children to experiment and make meaning. Play is the original pedagogy—driven by inquiry, fueled by curiosity, and sustained by wonder.

Here are a few resources from the Abigail Lundquist Botstein Nursery School, which we have shared with our early childhood community on the topics of **care** and **play**: A five-minute talk about care

I am posting guidance for families home with young children during COVID-19 regularly on my website, which is free and easy to download and share.

Carol Murray and all the teachers at Bard Nursery School & Children's Center

No. 26

Vaccine Development: A Primer

Brandt Burgess

As SARS-CoV-2 continues its spread throughout the population, and given the dearth of proven pharmaceutical options available against the virus, many are asking when a vaccine will be available to the public. Dr. Anthony Fauci, head of the National Institute of Allergy and Infectious Diseases and one of the world's leading infectious disease experts, has estimated that timeline be 12 to 18 months. Many in the media and the public are asking, "Why does this process take so long?"

Well, the simple answer is that it is complicated. But how complicated? Let's explore.

Below, I will briefly describe the multistep vaccine development process that involves a team of hundreds of individuals with wide-ranging expertise (medical officers, researchers, technicians, ethicists, pharmacists, chemical engineers, statisticians, government administers, etc.) and thousands of human research subjects all working in a highly coordinated manner.

Please note that this is a brief overview of the process that no doubt leaves out many important details.

The Process:

1. Identification of a viral vaccine candidate(s)
Vaccines consist of mainly two items—an antigen of the virus (an antigen is a part of the infectious agent that can illicit an immune reaction in the human body) and an adjuvant (the matrix in which the antigen is suspended). Viral vaccine antigens are often one of three types: an attenuated virus particle (this is a genetically modified virus that no longer causes disease), a killed virus (a virus that is completely inactivated), or a fragment of one or more of the virus's surface proteins. There are also newer types of vaccines that utilize nucleic acid vectors (RNA and DNA) to encode parts of viral proteins that serve as the antigens when they are replicated in the human host.
Once the antigen(s) is selected, the vaccine is then formulated with an adjuvant, which helps stabilize the antigen and allows it to be efficiently delivered to the body so it can elicit a robust immune reaction.

2. Preclinical studies
These are studies using the vaccine candidate in an animal model (an animal species that has been determined to best mimic the disease in humans) to test whether the vaccine is safe and if it elicits a protective immune response. This stage of the process also looks at different doses of the vaccine antigen to help inform how much vaccine needs to be administered to humans to be effective.

It should be noted here that animal models more often than not are not good predictors of efficacy in humans. This should not be surprising as they are different organisms. For this new coronavirus, scientists do not yet know which animal is the best to use in the preclinical studies, e.g., mice, ferrets, rabbits, etc. However, as of yet, there is no better way of performing these "proof-of-concept" studies.

Preclinical studies require review and approval by an Institutional Animal Care and Use Committee (IACUC), a group of scientists and a veterinarian that determines if the animals used in the research are being properly used and cared for during the studies.

3. Investigational New Drug (IND) application

Assuming the preclinical studies are successful, the vaccine development team must submit an IND (Investigational New Drug) application to the FDA. This license application must include the information from the animal trials, how the vaccine will be manufactured, and how it will be studied in humans. Following review by experts, an approval means that the vaccine can move forward to human clinical trials.

At the same time, the vaccine development team must seek approval from an Institutional Review Board (IRB) for the upcoming clinical trial studies in humans. These applications are often hundreds of pages long. The role of the IRB is to ensure that the health and safety of the human subject participants are protected and that any risks are mitigated to the extent possible. The risk can never be 100% eliminated; however, that is acceptable if the benefit of the studies is considered to be higher than the risk—as the benefits of vaccines against human disease generally are.

4. Human Clinical Trials

Once the IND is approved by the FDA and the vaccine team receives approval for the studies from an IRB, the team begins the clinical trials, which typically go through four Phases (I-IV).

Phase I: The vaccine is tested in a very small number of human participants. The volunteers are administered the vaccine in a clinical setting, and are closely monitored by researchers and medical staff for several days. The researchers are looking to see if the vaccine is safe in humans and if it elicits a specific immune response (antibodies) to the vaccine. If no problems arise and an immune response is observed, the vaccine moves to the next Phase.

Phase II: The vaccine is now administered to a much larger group of participants. In this Phase, the vaccine efficacy is studied; i.e., does it actually protect individuals from the virus. The researchers also look at different doses of the vaccine antigen to determine what is the most effective amount.

These participants are monitored and information about potential short-term side effects (called adverse events) is gathered. The severity and the occurrence rate of these adverse events are used, in part, to determine if this is a viable vaccine or not.

If the vaccine is shown to be effective against the virus and appears to be safe with few adverse events, the most effective dose is identified and moved to the next Phase. It should be noted that most clinical trials fail at this stage.

Phase III: This is the large-scale trial stage, often involving thousands of participants. The immune responses are monitored and medical outcomes are observed; the team is looking to determine if there is a statistically significant

decrease in the disease/symptoms in the research participants vs. the general public (which essentially serve as the control group).

If the researchers are able to determine that there is a statistically significant reduction in disease or disease severity, and the vaccine does not cause significant adverse events, then the vaccine moves to the next step.

5. Biologics License Application (BLA)

Following the first three Phases, the vaccine development team submits a Biologics License Application (BLA) to the FDA. The application provides the FDA review panel consisting of a broad range of experts (medical officers, microbiologists, chemists, biostatisticians, etc.) with the efficacy and safety information necessary to make a risk/benefit assessment and to recommend or oppose the approval of the vaccine. Also during this stage, the proposed manufacturing facility(ies) undergoes a preapproval inspection. If the FDA grants the BLA license, the vaccine can go into full production for distribution to the public at large.

6. Phase IV: Widespread vaccination of the public

An effective vaccine has been developed for use by the public. Rapid large-scale manufacturing and distribution of the vaccine to the public is a large logistical problem that needs to be overcome. This Phase is more of a monitoring phase, as the vaccine team studies the effectiveness of the vaccine across various subgroups of the population: age, sex, racial background, etc. Long-term safety and side effects are better identified as the number of data points increase substantially.

Some additional points:

The vaccine development process is incredibly expensive. A 2018 study[1] of the costs of clinical trials (Phase I–III only) held in 2015 by a group from Johns Hopkins estimated the average cost to be $19 million dollars.

The complexity of vaccine development highlights the importance of government-academic-private industry partnerships to speed this process along.

Overall, vaccine development is a long, expensive process with many Go/No Go checkpoints spread throughout the timeline that cannot be shortcut if rigor and public safety are to be maintained. Therefore, a projected 12–18 month timeline for a SARS-COV-2 vaccine is optimistic, even with this being a high priority for all those involved.

References:

1) Moore, T.J., Zhang, H., Anderson, G., and Alexander, G.C. (2018) *JAMA Intern Med* Nov 1;178(11):1451-1457.

Additional information about the vaccine development process:

From the U.S. Department of Health & Human Services https://www.vaccines.gov/basics

From the U.S. National Institute of Allergy and Infectious Diseases (NIAID) https://www.niaid.nih.gov/research/vaccines

From the U.S. Food & Drug Administration https://www.fda.gov/vaccines-blood-biologics

No. 27

Mask Making How-tos

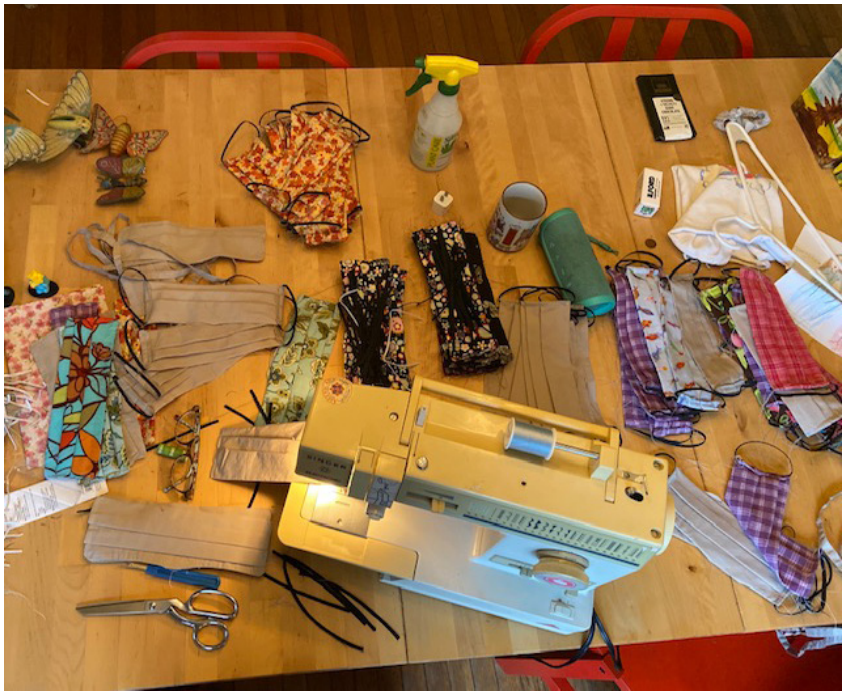
Saidee Brown

Members of the Costume Shop at the Fisher Center, Audrey Smith from Buildings & Grounds, Rosalia Reifler from Environmental Services, and Saidee Brown from the President's Office have been engaged in sewing nearly 200 face masks for our essential employees at Bard. Here is a bit of information from Saidee for those who would like to try their hand at mask making.

I am hardly an expert on sewing or these masks. Moe Schell has been instrumental in organizing so many local people that she should write this and she is also a sewing expert!

The attached PDF is the pattern I am using now because it makes a little larger mask than what we were making and includes a pattern sized for kids. Our first round was based on a similar pattern.

There is a ton of information out there on masks—materials to use and designs. We have been using cotton with a tight weave—quilting fabric or flannel, 1/8-inch elastic for the ear loops—you can cut some elastics down to size. Elastic is so hard to get now that most people are using fabric ties. And then there is the question of the filter—we used interfacing and other people are cutting HEPA filters.



Ulster/Dutchess mask making initiative
is a group on Facebook and I think might have been started by Moe Schell—she has certainly spearheaded this group donating supplies and information. She has been amazing.

Mask Makers of the Gunks
is another local Facebook group doing great work to organize sewers and provide support and supplies. They have some good video tutorials and have a few businesses with industrial-cutting abilities that have used their machines to cut whole bolts of fabric to size for masks.

Both of those groups have numerous posts about the local companies who have been donating supplies and sharing resources, as well as pickup locations for supplies and drop-off for masks to be distributed.

Hope this is helpful. I am happy to answer questions people might have or connect them to someone who can answer their questions. These groups are sewing and donating masks to hospitals and nursing homes and grocery stores and people they meet on the street. Some people are starting to make gowns and shoe covers for hospitals too.

Saidee

No. 29

Chemistry of Cleaning and Disinfecting

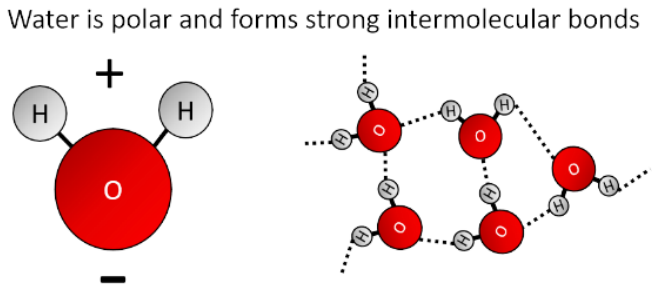
Christopher LaFratta

According to the CDC website: "It may be possible that a person can get COVID-19 by touching a surface or object, like a packaging container, that has the virus on it and then touching their own mouth, nose, or possibly their eyes, but this is not thought to be the main way the virus spreads."

So, while it is not very likely that you will catch the virus from your mailbox, it can't hurt to limit exposure by cleaning commonly touched surfaces. There are two main ways to get rid of germs: chemical and physical. The physical method involves getting the germs off the surface and actually can be explained using a very useful concept known as polarity. I will explain how soaps work using this concept of polarity before getting into chemical methods of disinfection. (If you want to skip the chemistry lesson, you can jump to the very informative infographic at the end.)

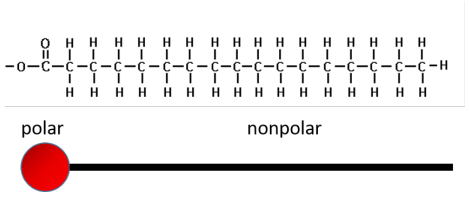
Physical Method

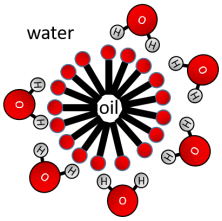
The water molecule has an oxygen atom connected to two hydrogen atoms and has a shape like a wide letter "V" with the O at the bottom and the two Hs at the tops of the "V". Each atom has a positively charged nucleus and negatively charged electrons surrounding it. The nuclei of two atoms are bonded to each other using the electrons as a glue to prevent the nuclei from repelling each other. The total number of electrons and protons are equal so the whole molecule is neutral or carries no net (+) or (–) charge. But, the O atom has a stronger affinity for electrons than do the H atoms and so while they are sharing electrons in the bonds, the O atom is sharing them unequally. This results in the molecule having a negative side near the O and a positive side near the Hs. The molecule is said to be *polarized* because one side is (–) and one side is (+). The opposite of polar is nonpolar, which means there is not a (+) or a (–) side of the molecule. The polarization causes two water molecules to be attracted to each other, because the opposite charges attract each other and this intermolecular interaction is much stronger than a similarly sized nonpolar molecule, like methane (CH_4). It turns out that carbon, C, atoms have approximately the same affinity for electrons as H atoms do, and so hydrocarbons, molecules containing Cs and Hs, are nonpolar. Nonpolar molecules are not very strongly attracted to each other and this is evident by the fact that CH_4 is a gas, the molecules bounce off each other, and water is a liquid, the molecules roll over each other, at room temperature. When polar molecules like water are mixed with nonpolar molecules like an oil (long chain of Cs and Hs) the two liquids separate, why? The reason is not so much because oil fears water, although we say nonpolar molecules are "hydrophobic", but more because water is so strongly attracted



to itself. When in a mixture of oil and water, two water molecules find each other, they hang on, and as they bump into more water they displace oil molecules in their way in favor of making more polar connections between water molecules. This has the effect that the water ends up together in one pool and the oil is excluded in another pool.

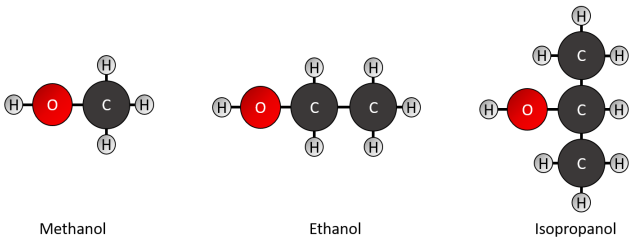
What does this have to do with removing germs? Well, consider the wonderful ability of soap to remove oil from your hands. There are different types of soaps but they share an important characteristic, they are amphiphilic. This means they love *both* polar and nonpolar environments, because within one soap molecule there exists both a polar side and a nonpolar side. Imagine a molecule with a long hydrocarbon chain consisting of about 17 Cs and 33 Hs at the end of which were two O atoms. The O-side would be slightly polarized or may actually have an extra negative charge and would be attracted to water (a.k.a. hydrophilic) while the long C-chain portion would be nonpolar and hydrophobic.





When the soap molecules interact with oil on your hands the C-chain side surrounds the oil and make a droplet whose exterior is hydrophilic and thus readily carried away by water, and so the oil washes off your hands. In fact, the way soaps are made is from oily/fatty starting materials and reacting them with a strong base to give a negative charge to the O-side. Two common oils for soap making are palm and olive oil, which give Palmolive its name. Soap is effective not just on oil but also on germs because the membrane that encases bacteria and viruses is susceptible to being broken up and dissolved by soap. The same hydrophobic/hydrophilic interaction is what gives biomolecules, like membranes and proteins, their shape and soap can be used to disrupt this interaction in bacteria and viruses.

Alcohols are a class of molecules that have hydrocarbons connected to an OH group and are somewhat amphiphilic. The first three alcohols, which have one, two, and three carbon chains, are called methanol (wood alcohol/causes blindness), ethanol (drinking alcohol), and isopropanol (rubbing alcohol). All of these are good solvents in the sense that they can be used to dissolve things, like an ink stain. Like soap, they too can physically break up the membrane that holds together bacteria and viruses.

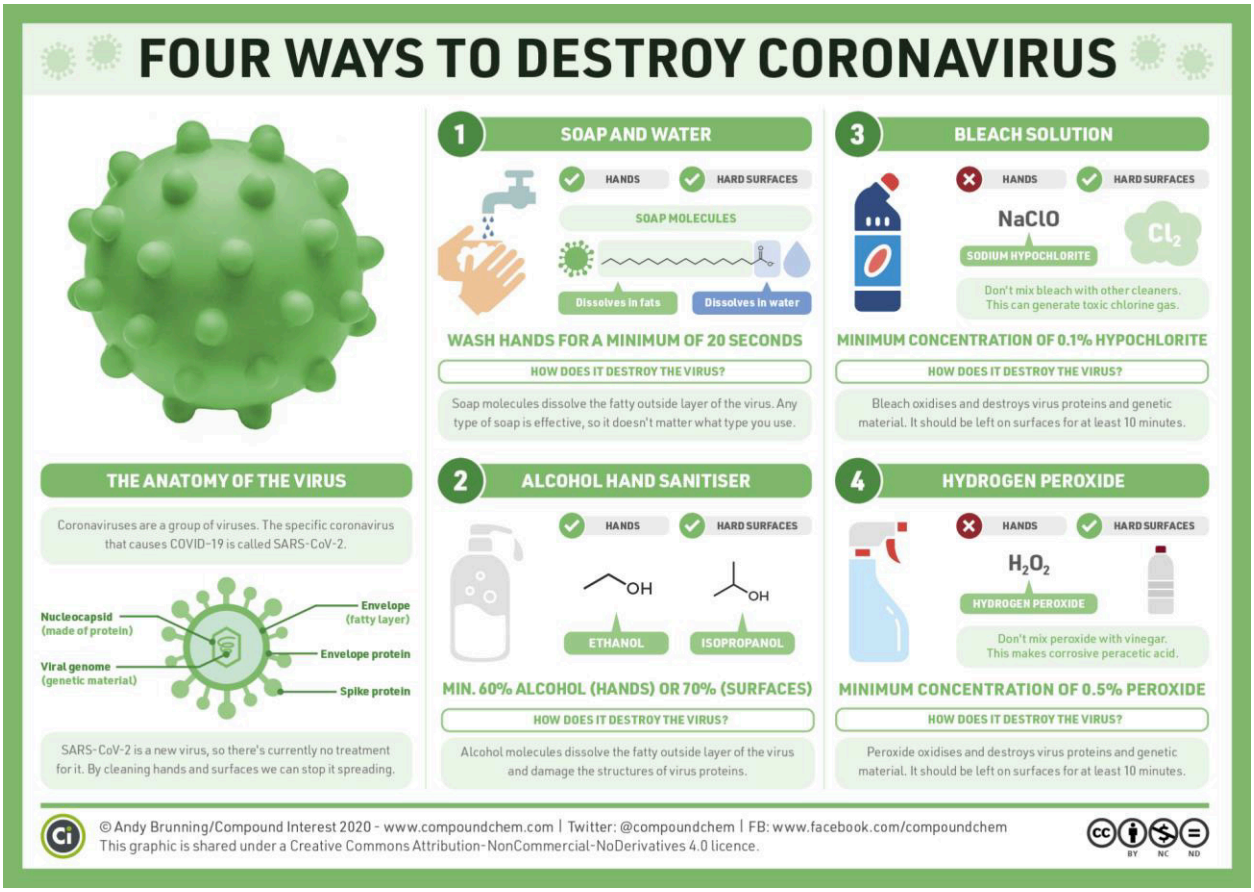


Chemical Methods

There are also chemical cleaners that will cause reactions (making and breaking bonds) that can kill bacteria and viruses. The most widely used chemical disinfectant is bleach. Bleach is a solution of hypochlorite ion, OCl^-, in water. Hypochlorite provides the active ingredient in bleach, which is chlorine, Cl_2. By itself Cl_2 is a very toxic gas (it was the first chemical warfare agent used in WWI) but in dilute solutions it can be handled safely. Its reactivity stems from the fact that, like oxygen, chlorine has a very high affinity for electrons. If it bumps into a molecule that is holding onto electrons less strongly, which is very likely, it will rip them away, making/breaking bonds. This type of electron exchange, when one molecule takes electrons from another, is called an oxidation-reduction reaction. In this case the

chlorine is said to be reduced and the other molecule is said to have been oxidized. As you might have guessed oxygen gas, O_2, plays this game as well, hence the name "oxidized". Chlorine can oxidize the molecular walls of bacteria and viruses and kill them. Hydrogen peroxide, H_2O_2, is also a very good oxidizing agent and is an excellent disinfectant. There are many other chemical disinfectants, like quaternary ammonium compounds, that I won't go into detail about.(https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2). None of these reactive chemicals should be mixed because *they do not need to be* and because the products of those reactions are almost always toxic.

One very important point to make about products that work this way is that they will react with many types of molecules and so their effectiveness will be reduced if they are reacting with molecules that are not the virus. In other words, if you spray an object (e.g. doorknob) with bleach and there is grease, filth, and a little virus on the doorknob, the bleach may react with so much grease and filth that the virus survives. Therefore, these products should be used AFTER the surface has been cleaned of grime and only then should it be disinfected. Also, these oxidizing agents should be left on the surface to react for several minutes, the infographic below says at least 10 minutes, to sufficiently destroy the virus.



From https://www.compoundchem.com/2020/03/31/destroy-coronavirus

No. 30

VENTURING OUT ON A RAINY DAY . . .

Jennifer Manon and Allison Pulver

A drizzling, rainy day, if the winds are not gusting and there is no risk of a storm, can be a magical time to be outside. Key to a positive experience is having the proper gear, such as a hooded raincoat, rain boots, and mud-worthy clothes underneath; a rain suit or rain pants are bonus coverage.

Getting out the door can be the hard part (for all of us!), however, once outside in the elements of rain, a full sensory experience opens up to us:

the SMELL OF RAIN,
the SPRINKLING OF RAINDROPS ON OUR SKIN,
the SOUND OF RAINFALL,
the FEELING OF CALM MIST—RAINDROPS CLINGING TO BRANCHES AND LEAVES THAT WE CAN ALMOST TASTE.

Below are a few ideas to lure us outdoors in the rain . . .

PUDDLE SEARCH
jump, splash, ripples, reflections

MUD PIE

Mixing natural ingredients found outdoors offers endless possibilities. Repurpose toys and kitchenware such as containers, measuring cups and spoons, buckets, and pans, etc., to create your own mud kitchen.

Gather ingredients with your child—moss, wild flowers, stones, dirt, branches, bark, etc. Collect rainwater, stir, measure, pour, strain, design, and decorate!

SING THE FUNNY "MUD PIE" SONG WITH JENNIFER AND HER DAUGHTER . . .

https://my.kaymbu.com/moments/video/5e947c4a29b26400324f011c

Listen to the sounds raindrops can make as they land on different items.

Paint using rainwater with watercolor paints or simply dip brushes into rainwater to see "wet" versus "dry."

SINGING IN THE RAIN

Using the above book, we sang "Singing in the Rain" with the children. The song caught on quickly as the children carried on making up their own words throughout the rest of that day!

Join Allison singing the book! youtu.be/_S16CUCElmI

Enjoy the April showers and worm rescues!

No. 31

"A Crisis within the Crisis": Racial Dimensions of the Coronavirus Pandemic

Myra Young Armstead

The disproportionate effect of pandemics on the poor is a fact of human history. Those without the financial means to access proper medical treatment and alternatives to congested living conditions are the most likely to get infected and die from contagious diseases. We are seeing a stark recurrence of these historical patterns in today's coronavirus crisis in the United States among people of color who are disproportionately found among the poor. In this case, persistent, systemic racism exacerbates poverty, rendering these populations the most susceptible to the disease. The table below summarizes rates of poverty in this country by race and ethnicity as a percentage of the total population.

Location	White and Poor	Native American and Poor	Black and Poor	Latinx and Poor	Asian and Poor*
United States	8 %	24 %	22 %	19 %	11%

Source: Kaiser Family Foundation data, taken from a sample of one percent of the total populations and based on the U.S. Census Bureau's American Community Survey, 2008–18. In 2018, the poverty threshold of the federal government for a family of two adults and one child was $20,212. The table does not include data of those who identify as being "of multiple races" or "other."

Multiple disadvantages of poverty especially handicap populations of color in fighting coronavirus. For one thing, handwashing, much less *frequent* handwashing, isn't possible if your water has been shut off for nonpayment of water bills owing to debt and unemployment. This is presently the case for thousands of homes in Detroit, where Blacks constitute 83 percent of the population.[1] Additionally, poverty combined with racial discrimination in the private housing market and government redlining policies explains why Blacks and Latinx in cities are disproportionately likely to live in segregated neighborhoods—often in public housing or multigenerational, crowded households where social distancing is difficult, not fully understood, and often not practiced.[2] Furthermore, these neighborhoods are often located in environmentally toxic or undesirable areas—e.g., near municipal bus garages, in food deserts—geographies that contribute to the relatively high frequency of underlying conditions of asthma, diabetes, obesity, and heart disease among their occupants—conditions that in turn render their victims the most vulnerable to COVID-19.[3] Compounding the negative health effects is the fact that, among the nonelderly who automatically qualify for Medicare, people of color in this country are more likely to be medically uninsured than whites, according to the table below.

Location	White Uninsured	Native American Uninsured	Latinx Uninsured	Black Uninsured	Asian* Uninsured
United States	8%	22%	19%	11%	7%

Source: Kaiser Family Foundation based on U.S. Census Bureau's American Community Survey, 2008–18.

* Includes Native Hawaiian and Pacific Islander.

This means that poor people of color often cannot afford to practice preventive medical care and generally remain unconnected to health care providers unless in emergencies.

This cruel mix of factors associated with systemic poverty and racial discrimination results in inordinately high fatality rates among minorities. Last week, for instance, figures indicated that in New York City, the epicenter of the crisis, the ethnic/racial group most devasted by the disease is Latinx; Blacks follow them in the mortality data. As of April 6, Latinx who make up 29 percent of the city's population represented a third of all COVID-19 deaths. At just under a quarter of the city's population, Blacks accounted for 28 percent of the COVID-19 deaths. The following table summarizes these troubling findings.

City	Latinx Population	Latinx C-19 Deaths	Black Population	Black C-19 Deaths
New York	29% of total	34% of total	24% of total	28% of total

Source: "Virus Is Twice as Deadly for Black and Latino People Than Whites in N.Y.C." *New York Times*, April 8, 2020

Elsewhere in the country, African Americans top the list of racial groups for whom the coronavirus is most deadly. Blacks account for 32 percent of COVID-19 deaths nationally, despite being only 13 percent of the nation's population. The Center for American Progress's Lab reported on April 14 that "Across all the existing data, Black residents are 2.4 times more likely to die than we would expect based on their population. Most severely, in Wisconsin, Blacks are 5.5 times more likely to die of COVID-19 than their population share, followed by Michigan, where Blacks are 3.6 times more likely, and in Illinois, where they are 3.3 times more likely to die." The following table captures the starkness of this disparity through April 13.

Location	Percent Black	Percent of C19 Deaths among Blacks
Chicago	29	67
Los Angeles County	7	14
Michigan	14	50
Milwaukee County	25	63
Louisiana	32	65

Source: "The Color of Coronavirus," apmresearchlab.org/covid/deaths-by-race#latino

Modern governments generally develop proactive measures in response to disasters. For example, President George W. Bush apparently learned a hard lesson: Taking to heart national failures during Hurricane Katrina (2005), he ordered the establishment of a federal pandemic plan after reading John Barry's 2004 book on the 1918 influenza pandemic (*The Great Influenza*). The result of that was funding for the website, pandemicflu.gov, and for the Centers for Disease Control and Prevention (CDC) to begin strategic planning for future pandemics.[4] The next administration, the Obama administration, benefited from that foundation by activating the Emergency Operations Center at the CDC when the Ebola virus first appeared. The CDC immediately deployed its personnel to West Africa to coordinate a response that included vector tracing, testing, education, logistics, and communication. Altogether, the CDC trained 24,655 medical workers in West Africa, educating them on how to prevent and control the disease before a single case left Africa or reached the United States, and Obama ordered the rerouting of travelers heading to the U.S. through certain specific airports equipped to handle mass testing. In America, 6,500 people were trained through mock outbreaks and practice scenarios before a single case hit the country.[5] Three months after this response, on September 30, 2014, we got our Ebola first case in the U.S. That man had traveled from West Africa to Dallas, Texas, and had somehow slipped through the testing protocol. He was immediately detected and isolated. He died a week later. Two nurses who tended to him contracted Ebola and later recovered. All the protocols had worked.[6] The spread of the virus was contained. The Ebola epidemic could have easily become a pandemic. But thanks to the actions of our government, it never did. The present presidential administration abolished the White House office on pandemic preparedness, and therefore initially had to scramble haltingly to mount a coherent national strategy for addressing the present health crisis, but thankfully with the critical assistance and experience of Dr. Anthony Fauci and the CDC, that strategy is slowly beginning to show good results in cooperation with state governors.[7]

How will the nation respond to the death toll left behind because of COVID-19? These racial disproportions, which have been acknowledged by the U.S. Surgeon General, have prompted the governor of Michigan to create the Michigan Coronavirus Task Force on Racial Disparities.[8] One hopes that similar efforts will be made by other states. However, what is clearly needed is a reinvigorated pandemic planning infrastructure at the federal level—one that includes ways of rectifying health-related, systemic, racialized poverty.

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4. U.S. Homeland Security Council, "National Strategy for Pandemic Influenza: Implementation Plan," May 2006 (Washington, D.C.: U.S. Government Printing Office, 2006).
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7. See Mark Olshaker and Michael T. Osterholm, *Deadliest Enemy: Our War Against Killer Germs* (New York: Little, Brown, 2017) and Gabriel Debenedetti, "Obama's Ebola Czar, Ron Klain, on How Trump Has Bungled the Coronavirus Response," *Intelligencer*, March 12, 2020. nymag.com/intelligencer/2020/03/obamas-ebola-czar-on-how-trump-bungled-coronavirus-response.html
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No. 32

Agency amidst Powerlessness: Nurturing the Autonomously Motivated Self during the COVID-19 Pandemic

Richard Lopez

In the past few weeks, my guess is that each one of us has experienced challenging and poignant moments of introspection in which we have taken stock of our lives, our relationships, and what is most important to us. Stripped away of the distracting, dizzying bustle that is 21st century human existence, and absent regular physical contact with dear friends, family, and work colleagues, we have been confronted with our inner selves in ways that have been illuminating and constructive at best, and perhaps uncomfortable and alarming at worst. At the very least, we have probably been struck with a biting sense of powerlessness and loss of control over our lives.

This is completely understandable, and I would argue it is even good to acknowledge as much, because such disorienting circumstances present us with an opportunity we would otherwise never have. Holocaust survivor and psychiatrist Dr. Viktor Frankl is known to have said, "When we are no longer able to change a situation, we are challenged to change ourselves." Here, I will briefly lay out some principles behind one of the most comprehensive psychological theories of human personality and behavior, Self-Determination Theory (SDT; Deci and Ryan, 2000), and how it can speak to our present moment and provide us with some scaffolding and direction by which we can assess and reorient our motivations and values, whatever they may be, and potentially come out the other side with a favorably altered sense of self, purpose, and vitality.

SDT posits that people have three fundamental psychological needs, the satisfaction of which are critical for well-being and human flourishing. First, there is the need for *autonomy*. Not to be confused with independence or self-reliance, autonomy refers to humans freely exercising their agency to pursue goals that are self-endorsed and intrinsically valued and nurtured by oneself (Ryan and Deci, 2017). With this in view, it may be beneficial to complete a personalized goal inventory to determine which goals, personal and professional, we were actively—and maybe painstakingly—pursuing before the pandemic hit. Going down the list, we may find some goals that remain personally meaningful and whose worth are obvious to us, while we may want to revisit or abandon other goals that we do not thoroughly endorse and value. Indeed, it may be fruitful to generally ask questions such as: why am I even pursuing X *to begin with*? And: why have I *not* been pursuing Y?

Next, we have a need for *competence* according to SDT. That is, when approaching various goals and tasks, even challenging ones, we prefer having the appropriate skill set and knowhow so as to exhibit effectiveness over the task at hand. In the thick of quarantine, this need is seemingly harder to fulfill at first blush. Our behavioral repertoire has suddenly become restricted to things we can do in and around our homes. But with a little creativity there are

many skills and hobbies we can set ourselves to, and even mundane tasks and chores, when taken together, can keep our sense of competence afloat (e.g., strange as it may sound, I have felt a newfound sense of accomplishment and purpose completing diaper changes for our son, Jack, who may have aided in the writing of this piece).

Last but not least, SDT proposes we have a need for *relatedness*, or connection with others. Other psychologists have termed this the "need to belong" (Baumeister and Leary, 1995). This psychological need does not describe mere social contact or conversation, but rather a well-defined sense that one is known and valued while meaningfully embedded within a social network. Despite physical distancing measures and the attendant isolation we may feel at the moment, this need is readily fed during quarantine thanks to myriad ways we can communicate with loved ones across time and space, complete with customized Zoom backgrounds. Locally, there are community-building volunteer opportunities already underway through local churches and newly formed nonprofit organizations (e.g., Red Hook Responds). As with the need for competence above, the ways we can experience relatedness do not have to be complicated or earth-shattering. It is simply a matter of knowing we can contribute something valuable to others and that others recognize our contributions. Ideally, this happens dynamically so that a vibrant interdependence emerges.

Critically, SDT also affirms that *how* we fulfill the above-mentioned needs is just as important for our sense of self and wellbeing as the needs themselves. SDT defines a general *autonomy-control* continuum along which our motivations can be placed: when we are *autonomously* motivated, our goals are freely chosen and generally reflect the true self. In this case, we are more likely to persevere if the going gets tough or our original plans are thwarted. However, when we experience intense internal or external pressure to pursue our goals, we lose our sense of agency and our behaviors become *controlled* in such a way that they are discordant with how we think about ourselves and the things we intrinsically value and care about. Empirical studies suggest that being autonomously motivated confers psychological and health benefits across many life domains, including higher education, the workplace, athletics, healthcare settings, and many more.

To conclude, I invite all of us to consider how we might nourish our core psychological needs of autonomy, competence, and relatedness, as well as articulate and pursue self-identified goals in a more autonomous and agentic manner. This is always a timely endeavor, but I would argue it is especially timely during a global, existential crisis such as the one brought about by COVID-19. And while this process will likely play out differently person to person, what I hope I have shown is that SDT offers us a roadmap that moves and empowers us toward new heights of self-knowledge, meaning, and growth.

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No. 33

Literature and Epidemics

Karen Sullivan

> We are on the edge of disaster without being able to situate it in the future; it is rather always already past, and yet we are on the edge or under the threat, all formulations which would imply the future—that which is yet to come—if the disaster were not that which does not come, that which has put a stop to every arrival.
>
> The disaster, unexperienced. It is what escapes the very possibility of experience.
>
> Maurice Blanchot

Epidemics are everywhere in Western literature. In Sophocles's *Oedipus Rex*, if Oedipus, King of Thebes, vows to find the assassin of his predecessor Laius, it is because his city is being ravaged by a plague and the Oracle of Delphi has attributed this disaster to the unpunished crime. In Boccaccio's *Decameron*, if ten young men and women gather in a villa outside Florence and tell stories, it is because they are fleeing the Black Death. In Shakespeare's *Romeo and Juliet*, it is because Friar Lawrence is quarantined that he is unable to deliver a letter to Romeo, alerting him to the fact that Juliet is faking her own demise; as a result, Romeo, believing his beloved to be dead, commits suicide, and Juliet, awakening to discover his body, joins him in death. Cholera is an especially literary disease. Gustav von Aschenbach, in Thomas Mann's *Death in Venice*, refuses to leave Venice despite the cholera epidemic spreading through the city because of his love of the Polish youth Tadzio. Florentino Ariza and Fermina Daza, in Gabriel García Marquez's *Love in the Time of Cholera,* love each other with a "passion" (*cólera*) that resembles the illness. The unhappily married couple Kitty Garstin and Walter Fane, in W. Somerset Maugham's *The Painted Veil,* reconcile during a cholera epidemic in China. Epidemics, with their tendency to wreak havoc on societies and individuals' lives, bring to the surface the latent nature of the people they affect, in a manner that plays out well in myth and fiction.

At the same time, epidemics are nowhere in literature. In none of the texts mentioned above is the epidemic the major focus of the literary work. Most often, it serves as a colorful backdrop against which the author explores a relationship between two characters that has nothing to do with the disease per se. In those narratives where the epidemic is the major focus, it is often a metaphor for a more fundamental threat to human existence than a bacterium or a virus. During the epidemic in Oran, Albert Camus writes in *The Plague*, "Each of us had to be content to live only for the day, under the vast indifference of the sky." The problem isn't that the plague is cruel, striking down human beings with no concern for their lives; the problem is that it is meaningless, killing people with no intent to punish and sparing others with no intent to grant mercy. If the plague is indifferent, it is because the sky itself is indifferent. Faced with the essential absurdity of their lives, human beings are left on their own to

decide how to act, and it is this truth that the epidemic exposes. The meaningless of epidemics is what presumably makes them so curiously absent from literature. Though the Black Death destroyed around a third of the European population in the 14th century, our popular image of this epidemic owes more to postmedieval fantasies of the "Dark Ages" than it does to any literary or even historical texts from the time, which remain almost entirely silent about this event. Though the Spanish flu killed a minimum of 50 million people around the world, it left no legacy in world literature analogous to that of World War I, which was going on at the same time and which caused far fewer casualties. "Novels, one would have thought, would have been devoted to influenza," Virginia Woolf writes, and a few authors (Katherine Anne Porter, Willa Cather, Thomas Wolfe) do speak of the disease, but not many. In their meaninglessness, epidemics leave little to be said about them.

Still, if one turns to the handful of literary works that have treated epidemics, one can observe a few patterns. The epidemic arrives without people at first recognizing it has arrived. A dead rat is found lying on the middle of a landing. A funeral motorcade passes by as one is attempting to cross the street—and then another one. A stranger is spotted collapsed in an alley. For a time, rumors spread that people are dying, but then the numbers of the dead subside, as if it was a false alarm. It is not credible that the plague should be appearing in our own city, and it is irresponsible to spread panic by suggesting that it is doing so. Then the epidemic begins again in earnest, and there is no denying that it is here. The wealthy flee to their second houses in the country, though there are concerns that they are bringing the disease with them. According to Daniel Defoe's *Journal of the Plague Year*, "Nothing was to be seen but waggons and carts, with goods, women, servants, children, &c.; coaches filled with people of the better sort and horsemen attending them, and all hurrying away." The plague gradually builds to a crescendo among those who are left in the city. A pit is dug for the bodies of the afflicted, but it is so large that no one believes it will be filled. Then more such pits need to be excavated. Given the general terror of infection, social bonds break down between neighbors, between friends, and even between families members, who shrink from giving each other the assistance they need. Boccaccio writes, "What is . . . scarcely to be believed, fathers and mothers were found to abandon their own children, untended, unvisited, to their fate, as if they had been strangers." People turn to science for assistance, but the physicians can offer no cures. They turn to God for comfort, but the clergymen can make no sense of the disaster. As too many people die to mourn them properly, the customs associated with death fall into abeyance, especially given that the survivors expect that they too will soon succumb themselves. Then finally, for no reason at all, the epidemic is over. As the numbers of the dying abate, the distress that was long seen on the faces of passersby is replaced by smiles. "Some would . . . ask, 'What good news?' and when they answered that the plague was abated and the bills decreased almost two thousand, they would cry out, 'God be praised!' and would weep aloud for joy."

Life continues after the epidemic, but the memory persists in those who escaped its threat. Katherine Anne Porter, who came close to dying of the Spanish flu, would go on to live among leftist intellectuals in Greenwich Village and Mexico, to teach at prestigious universities, and to win the Pulitzer Prize for her short stories. Yet in *Pale Horse, Pale Rider*, she would return to her experience of the epidemic, concluding the short novel with the words, "No more war, no more plague, only the dazed silence that follows the ceasing of the heavy guns; noiseless houses with the shades drawn, empty streets, the dead cold light of tomorrow. Now there would be time for everything." In contrast to wars and revolutions, there is no cultural memory of epidemics once they are gone. But then the epidemic returns.

No. 34

Ask a Practitioner: Linking the Life of the Mind to Civic Engagement

Erin Canaan

At a time when the whole world is in turmoil and thousands of people are homeless and hungry, it behooves all of us to reconsider our political and religious beliefs in an effort to clarify in our minds the standards by which we live. What does Democracy mean to any of us? [1]

The opening lines of Eleanor Roosevelt's *The Moral Basis of Democracy* are eerily relevant. It's like her grandmotherly gaze is reaching out to us across time, with a loving but disappointed expression, to remind us that the questions faced by her generation have not yet been resolved. She might ask us gently, "Why is that exactly; and, what have you been spending your time doing?" Good questions. What **are** we willing to sacrifice for democracy and what **have** we been up to?

Eleanor made an active choice to write a book informed by history, religion, politics, human rights, empathy, love and the human condition with the backdrop of a country in crisis. Although she enjoyed only a few years of formal education, Eleanor chose to turn to what are essentially the liberal arts to find answers to the very real existential questions that were facing the country at that time. She was a practitioner rather than a philosopher, but she used ideas to inform her action. It was her ability to do this, to link ideas to thoughtful action even in the face of crisis that I find particularly helpful in this moment.

Now more than ever, I believe it is critical to strengthen the links between the life of the mind and civic engagement. We must use all the tools we have to expand our collective imagination, to push our understanding of what is possible, and to remove the divides between the academy and the "real world".

In honor of all the *Top 10 Ways to Spend Your Time during a Pandemic* lists that have popped up offering ideas for cooking, reading, and binge-watching, I decided to create a list of my own, which I developed with Eleanor's voice in my ear. My list encourages us to more actively engage the local, to build the skills of our students, and to expand our notions of what we consider to be the life of the mind.

In a speech given at the 10-year anniversary of the *Universal Declaration of Human Rights*, Eleanor highlighted the critical role local engagement plays in global human rights.

Where, after all, do universal human rights begin? In small places, close to home—so close and so small that they cannot be seen on any map of the world. Yet they are the world of the individual person: the neighborhood he lives in; the school or college he attends; the factory, farm, or office where he works. Such are the places where every man,

woman, and child seeks equal justice, equal opportunity, equal dignity without discrimination. Unless these rights have meaning there, they have little meaning anywhere. Without concerted citizen action to uphold them close to home, we shall look in vain for progress in the larger world.

Here is my list.

1. Read In Your Hands, a community-organizing guide created for the 10-year anniversary of the *Universal Declaration of Human Rights*. It provides practical guidance to individuals to facilitate a unified practice for human rights education, planning, and evaluation in local communities. The power of community organizing is real and has a long history that involves practical skill-building tied to ideas and innovative thinking.

2. Identify one local organization, library, or school where you can use your expertise to give a talk, workshop, or program, or with whom you can partner on a research project. The power of this kind of approach is manifest in the scientific community's response to Covid-19: "Never before, scientists say, have so many of the world's researchers focused so urgently on a single topic."

3. Attend a town hall meeting (or the equivalent—they are all online now) and encourage your students to participate as well. Eleanor states, "*One sacrifice which we must make is to give our government an interested and intelligent participation—this means that when a city, town, or county meeting is called, we will not find something more interesting or attractive to do that evening. We often make the mistake of believing that what happens at the bottom makes no difference.*"[2]

4. Encourage students to read the local paper and write a letter to the editor. The issues students care about (sustainability, equality, human rights, prison reform, evidence-based decision making, arts and culture) are all there on a scale that encourages a sense of agency and helps students connect to the issues that are important. You might think of writing one yourself.

5. Follow the money. Understanding the links between money and power in the American democratic process and the corresponding movements, strategies, and mechanisms to limit that power will be key to a student's understanding of American politics.

6. Ask students to adopt a piece of legislation and call their local official to lobby for that legislation. Practicing how to place pressure on the levers of power will serve students in the future.

7. Encourage students to read about how to activate citizen power. Books like Eric Liu's *You're More Powerful than You Think: a Citizen's Guide to Making Change Happen* or one of Citizen University videos offer clear, digestible guidance.

8. Invite students to use their expertise to teach civics to kids. ER wrote a series of books on civics for kids. We shouldn't wait until students are 18 to engage global citizens.

9. Teach leadership and encourage students to get leadership training. We are in a leadership void and cannot afford to **not** think about leadership. A recent *Forbes* opinion piece titled, What Do Countries with the Best

Coronavirus Responses Have in Common? Women Leaders, was a reminder that there are different ways to approach leadership. Together with our students, we should examine the skills and practices of effective leaders to prepare ourselves for thoughtful action in the future.

10. Studying leadership encourages us to practice optimism and self-reflection. I don't suggest that we practice a Pollyanna naivete that does not recognize the circumstances in which we find ourselves. As educators, it is our duty to be honest, and it is also our duty to show a way forward. This should incorporate self-reflection to help students understand their own capacity for leadership and growth. "*. . . Laws and government administration are only the results of the way people progress inwardly, and that the basis of success in a Democracy is really laid down by the people. It will progress only as their own personal development goes forward.*"[3]

Eleanor took risks on behalf of democracy using her platform as first lady to amplify American inequality, which earned her one of the largest files in J. Edgar Hoover's FBI. Her "outspokenness and liberal agenda were a threat to the status quo in American Society." Her FBI file included investigations of her "communist activities, threats to her life on the grounds of her disloyalty to the country, close monitoring of her activities and writings, and a record of possible insurrectionary groups that she may have influenced." As I contemplate my own responsibilities, I have found great comfort in Eleanor's voice and her ability to act, speak, and write in the face of her own fears and the active, public derision of powerful people:

We must know what we believe in, how we intend to live, and what we are doing for our neighbors. Our neighbors, of course, do not include only the people whom we know; they include, also, all those who live anywhere within the range of our knowledge. That means an obligation to the coal miners and sharecroppers, the migratory workers, to the tenement-house dwellers and the farmers who cannot make a living. It opens endless vistas of work to acquire knowledge and, when we have acquired it in our own country, there is still the rest of the world to study before we know what our course of action should be. Again, a sacrifice in time and thought, but a factor in a truly Democratic way of life.[4]

1. Roosevelt, E. 1940. *The Moral Basis of Democracy*, p.5.
2. Ibid. Page 67.
3. Ibid. Page 55.
4. Ibid. Page 69-70.

Resources

Read Eleanor's 1938 My Day account of a visit to Bard's campus.

Using Engagement in the classroom (CCE and OSUN resources): Engaged Liberal Arts and Sciences Resources
Open Society University Network Resources

Supporting Student Action:

GRANT APPLICATION: THE COV-AID STUDENT ENGAGEMENT AWARD Wednesday, April 15, 2020 – Monday, June 1, 2020 A joint project of the Talloires Network (TN) and the Open Society University Network (OSUN)

The COV-AID Student Engagement Award is a pilot grant program to respond to the unfolding global pandemic that will publicly recognize and support undergraduate students at OSUN and Talloires Network member universities who are adapting or seeking to adapt their community engagement efforts to the challenges presented by COVID-19.

Student Award Amount: up to $2,500 USD - Number of awardees: 10

No. 35

Coping with and Emerging from Isolation

Malia Du Mont

We undoubtedly still have a long road ahead of us in the United States before all areas of the country have experienced the peak of COVID-19 infections, and the rate of increase of hospitalizations and deaths slows and eventually reverses. Nonetheless, with the peak hopefully behind us in New York, and public officials beginning to take steps towards the reopening of the economy, it is useful to think about what that means for each of us on an individual level. What will it feel like to emerge from isolation?

I write about this topic because I have experienced what I think is a relevant analog to our current situation: I have been deployed to a war zone. There are more similarities than you might expect. I spent 15-hour days, seven days a week sitting at a computer in a windowless room. Most of my work involved reading reports and writing analyses, punctuated by regular videoconferences with colleagues around the world. My in-person interactions were largely limited to the small number of colleagues who shared my office. Due to my work schedule and the dangerous context, I went nowhere except the building where I slept and showered and the small military camp where I worked. I wore the same thing every day. I could not visit my family, but I talked by phone with them every day (we were able to make 10-minute calls from the camp phone center). All my waking hours were spent at my computer, on my daily trip to the camp gym, and on quick visits to the chow hall to eat pretty much the same thing every day (oatmeal for breakfast, grilled cheese for lunch, and a weekly rotation of entrees for dinner). The camp operated one tiny convenience store with a limited selection of offerings. We received mail every day, much of which was care packages—so many sweets and other goodies that we had a table overflowing with them at the entrance to my office, and at one point we were literally inundated with dozens of boxes of donated Girl Scout cookies. It was very easy to gain weight. (I had my mother ship me plenty of chewing gum, to keep my mouth busy and make it easier to avoid such temptations.) And, like today, the toilet situation was a constant subject of discussion because there was no running water on the top secret compound where I worked. While we never ran short of toilet paper, we were always making mental calculations, especially in the frigid dead of winter in mountainous Kabul: was it better to make a quick trip to the porta johns on the compound, or go through the process of walking through the snow to the building that did have running water to use the toilet there? Another thing we never ran short of was work. The work of analyzing the extremely complex sociopolitical and military situation in Afghanistan was never-ending and difficult. At the same time, we often felt forgotten and unappreciated because other national priorities—in our case, the war in Iraq—diverted attention and resources from what we were doing.[1] Through it all, danger and death made a constant, all-encompassing backdrop to our work.

It was not an easy situation, but our shared sense of mission, commitment to each other, knowledge of the long-term implications of our efforts, and pride in the importance of what we were trying to do, sustained us then—the same way similar feelings connect us now. Our dedication to duty gave us the discipline to engage in our work then—

much as it does now. It was one of the most rewarding times of my life, and the relationships I built with those few people I actually got to see on a daily basis remain special to me. Nonetheless, by any measure it was a very unusual way to live, not even taking into account the physical danger we faced. How did we all survive with our humor and ability to focus on our work intact? And how did we return to "normal life" afterwards? I would like to share a few thoughts on both questions that I hope will be helpful and relevant to our circumstances today.

First I want to return to the word "humor." As any fan of the TV show *MASH* knows, military service members excel in identifying the absurdities we encounter, and using them as a shared experience we can all (ruefully) laugh about. Did the command sergeant major send out a group email announcing food shortages and "sorry for the incontinence"? There was nothing we could do about the shortages, but we could laugh that in his rush to send the email he wrote incontinence instead of inconvenience. Did the cook at the chow hall once forget to put cheese on my grilled cheese sandwich? As one of the few areas where I could exercise (limited) choice, food was an extremely important boost to my daily morale. Confronted with the shockingly cheese-less grilled cheese sandwich, I, a grown professional woman, nearly burst into tears, but in the end I decided it was actually tragically funny that I was being deprived of my anticipated slice of cheese. When "normal" life is no longer under your control, finding humor—bleak or not —can be extraordinarily helpful. I even made a list of ridiculous experiences that initially maddened me but later made me laugh. I called it "Lieutenant Du Mont's List of Things That Are Extremely Annoying." I kept it at my desk, and added to it as the situation warranted. Just like Monty Python, my list got funnier (but no less absurd) the more I saw it. Laughing was a way to let off steam, and writing annoyances down was a way to externalize them instead of holding onto them or impotently fuming over them.

My year in Afghanistan was one of the few times in my life I have kept a journal. Because I had so little free time, I rarely wrote for more than 10 minutes a day, but I would think about those 10 minutes throughout the day, and store up moments and ideas to explore later in writing. I could not write in my journal about the classified contents of my work, so instead I wrote observations about things that happened and how I felt about them. Since much of my job was writing for other people, I enjoyed this little bit of writing for myself. In retrospect, it was a useful way for me to process my experiences on a daily basis. About once a month, I would draw on my journal entries to write a long letter to friends and family who had no other frame of reference for my life.

I kept my family as close as possible. When I got to work every day at six a.m., I would put away the photos that the marine officer on night shift kept on our desk. Then I would take out framed photos of my family and place them prominently. I emailed with my mother at least once a day to assure her I was still alive, and I made at least one phone call to family every day. Many times these emails and phone calls were brief and did not say much, but it was nonetheless helpful that they occurred and were part of my daily routine.

Most of the time I was happy with my work and enjoyed my relationships with my colleagues, and felt reasonably satisfied with the situation despite its strangeness and deprivations—especially because I knew others who had it worse. I was not always able to put on a happy face, however. There are no days off in a war zone, and I was feeling particularly sorry for myself when I got scheduled to work the night shift on Christmas—the timing of which ensured I would miss the holiday meal the chow hall was preparing for the 99 percent of service members who were not on night shift. I tried to be festive that night by singing Christmas carols to myself. But carols are meant to be sung together; that knowledge struck me hard and made me sadder. So I let myself be sad and give appropriate

recognition to the legitimate reasons I was sad. And I continued with my work because there was no option to do otherwise—and being unproductive on top of being sad would have made me feel worse.

After a year in Afghanistan, it was time to return home. Emerging from the isolation of deployment was a relatively rapid process: it took a week for me to travel from Kabul through Kyrgyzstan, Turkey, Germany, and Fort Benning, Georgia, before I returned to my home in northern Virginia, where normal life had been continuing without interruption. Our upcoming return to "normal" will not be nearly so rapid; it will happen in collective stages over months and years. Nonetheless, I think some of my experiences are relevant, so here are a couple of pointers to consider when thinking about the postcoronavirus world.

- Be careful when driving. The first time I got into a car after my deployment, I was so unused to driving and felt so excited and free to take myself where I wanted to go, that I suddenly realized I was driving 80-plus mph without meaning to. This is not unusual; in fact, it is fairly common for redeploying service members to get into car accidents after returning home, simply because they are not used to driving anymore and are too reckless. Please take a moment to recognize that you are not used to driving the same way you were, and neither are the other drivers on the road. Be more careful and vigilant. Do not take all the precautions to prevent yourself from getting the virus only to get into an accident when this is all over.

- Recognize that it will be strange to see people again. In the first months after redeploying, I found it overwhelming to walk down a crowded street. I had spent a year cooped up with a small number of people, communing mainly with my computer, and suddenly I was being bombarded with lots of sensory input. I temporarily lost that facility we take for granted, of being able to walk among strangers without really paying much attention to them. I had not realized how hungry I was for the sight of other people's faces. I found myself staring at people, and often (mistakenly) thought I saw someone I knew. This feeling faded over time as I got used to being in crowds again. It will be weird for all of us to see people and many more cars in the streets than we see now. Even if we yearn for "normal," we are getting accustomed to this current period of "not normal," and switching ourselves back will not be instantaneous.

- Keep up with all the good practices you have started. After returning home from Kabul, I no longer wrote in my journal, emailed my mother every day, nor went to the gym as often. I wish I had, but my predeployment life did not include those things, and I went right back to my predeployment habits. I was one person being sucked back into the ongoing flow of Washington, D.C. life. Our current situation is different since it simultaneously affects all of us. Hopefully, we can collectively preserve the good things we are developing, and make them part of our postcoronavirus "new normal."

Malia Du Mont enlisted in the Army Reserve in 1999, and became an intelligence officer in 2003. She deployed to Afghanistan, where she was the officer in charge of analysis in the theater headquarters in Kabul, in 2006–07.

1. I recall a media analysis at the end of 2006 of the top three TV evening news broadcasts. It showed that the aggregate amount of time that all three of them collectively devoted to Afghanistan coverage totaled less than 10 minutes for the entire year. During the same time, Iraq was in the headlines nearly every day.

No. 36

Boxes or Spiderwebs: Forecasting COVID-19

Matthew Junge

Mathematicians are fairly adept at modeling the natural evolution of epidemics. However, most "off the shelf" models were not built to describe the dramatic levels of intervention—business closures, travel limitations, and social distancing—that we are living through during the COVID-19 pandemic. The model in the so-called *Imperial Study* from Ferguson et al. has been particularly influential in policy decisions.

I will go over the basic idea of the model as well as its strengths and weaknesses. Then, I will briefly describe a project with Felicia Keesing (Bard; biology), Nicole Eikmeier (Grinnell; computer science), and myself that was recently awarded a National Science Foundation RAPID grant. The goal is to develop network models that better capture the geographic and social complexity of the current pandemic.

The Imperial Study. One aspect of the Imperial Study uses a complex version of the SEIR compartment model. Each individual in a population is assumed to be in one of four compartments: Susceptible, Exposed, Infected, or Recovered. Susceptible individuals are healthy, but lack immunity. Exposed individuals have the virus, but are not contagious yet. Infected people are contagious. Recovered individuals have either recovered or died.

$$\boxed{\mathrm{S}} \longrightarrow \boxed{\mathrm{E}} \longrightarrow \boxed{\mathrm{I}} \longrightarrow \boxed{\mathrm{R}}$$

Parameters for the infectiousness, incubation period, lethality, and recovery time yield equations relating the amount of the population in each compartment. For example, the exposed group increases at rate proportional to the infected and susceptible population sizes, while decreasing at rate proportional to the incubation period. Formally,

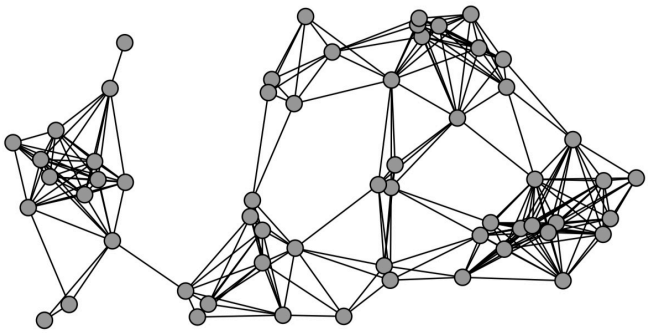
$$\frac{dE}{dt} = \beta \cdot I \cdot S/N - \delta \cdot E.$$

with β and δ the infectivity and incubation parameters and N the population size. Putting all of the relations together gives a system of equations that describe how the counts of individuals in states S, E, I, and R evolve over time.

The Imperial Study uses detailed data about the population, such as demographics, density, and workplace/class sizes to further stratify the compartments. They obtain an involved set of relations, which a computer can approximately solve. Their findings that (1) with no intervention, millions of UK and USA inhabitants might die and that (2) transmission is split about equally between households, schools and workplaces, and the community strongly influenced decisions to implement the current levels of intervention.

A strength is the use of precise sociographic data, as well as features specific to COVID-19. Another is that the calculations are tractable, which allows for concrete forecasts. A shortcoming is that the equations only make sense if the population is perfectly mixed. For example, a student is assumed to be just as likely to infect a close friend at school as a complete stranger. This assumption makes inferences about the rate of spread in and between the different compartments somewhat questionable.

Network models. An alternative model for infection spread in a society uses SEIR dynamics on a network in which people are represented by vertices (dots) and connections by edges (lines).



Infected vertices may only spread the infection to neighbors along edges.

The advantage of using a network is that it can more accurately model the face-to-face connections through which disease spreads. Additionally, social distancing measures are easily incorporated by deleting edges and vertices. The downside is that it is often impossible to obtain tractable equations. Instead one can perform simulations and attempt to make inferences. That is the starting point for our project, from which we hope to gain new insights about infection spread on modified networks and test the robustness of models like those in the Imperial Study.

No. 37

Pandemics and Biodiversity

Felicia Keesing

Hi Everyone,

In the midst of this pandemic, we are all rightly focused on what we can do to protect ourselves and each other, and on how we can slow or stop the spread of the virus that causes COVID-19. But I want to take a moment to look ahead. I want to ask what we know that could help prevent *future* pandemics. The answer might surprise you.

Over the past 50 years, humans have been exposed to hundreds of *emerging infectious diseases*. About 75 percent of these emerging infectious diseases are *zoonotic*—diseases that can be transmitted between humans and other animals like mammals, birds, and reptiles. COVID-19 is a zoonotic disease. We think it jumped to us from a wild mammal, and then began spreading between people. We also know that we can transmit the virus to other species, like tigers, lions, and Syrian hamsters.[1] You're familiar with other zoonotic diseases, too. Lyme disease is zoonotic, and so is Ebola. SARS and MERS are zoonotic, and far back in human history, tuberculosis, smallpox, and the plague also emerged from animals.

If animals are the sources of so many infectious diseases, should we be afraid of wildlife? Is biodiversity dangerous? This would be true if all kinds of animals were equally likely to transmit pathogens to us. If that were true, the more types of animals there are, the greater the risk would be. But they're *not* equally likely. In fact, **the next zoonotic disease is far more likely to come from a rat than a rhino**. It's worth learning why.

Most zoonotic diseases come from mammals, our closest relatives.[2] There are lots of different kinds of mammals, from aardvarks to elephants to leopard seals. But the most diverse mammals —by far—are rodents.[3] Perhaps not surprisingly, then, most zoonotic viruses have come from rodents.

Rodents are remarkable creatures, and many of them are quite resilient, even to the kinds of damage that we're doing to the environment. A recent study found that 100 percent of some orders[4] of mammals are threatened. Which ones? Rhinos and their relatives, manatees. And bandicoots.[5] Primates aren't doing so well either. How are rodents doing? Few are threatened. **Rodents are less vulnerable to biodiversity loss than other types of mammals are.**

But even within the rodent species, some harbor many more dangerous pathogens than others do. What do we know about the rodents that harbor these pathogens? And how are they different from the rodents that *don't*? For this question, I'll turn to the work of Dr. Barbara Han, a Red Hook resident, dear friend, and scientist at the Cary Institute of Ecosystem Studies in Millbrook. She and her colleagues found that rodents that have given us zoonotic pathogens

have certain traits in common. They tend to have large geographic ranges and short lifespans. They tend to mature early in their short lives, and have lots of babies in each litter.[6]

These are the very traits of species that thrive when people disturb and disrupt ecosystems. Many years ago, my own work in Kenya revealed a pattern that is now widely documented: **when biodiversity is lost, rodents thrive**. In African savannas, for example, elephants, giraffes, and zebras dominate when biodiversity is high. But when these charismatic large species disappear— and they are always the losers in a competition with people—rodents become twice as abundant.

Closer to home, Dr. Rick Ostfeld and I, together with our colleagues, have shown that biodiversity also keeps rodent abundance low in northeastern forests of the United States. This has huge consequences for our health because when rodent abundance is high, our risk of contracting Lyme disease and other tick-borne diseases skyrockets. For Lyme disease, as for so many emerging infectious diseases, rodents are the most common source of the zoonotic pathogen that makes us sick.

Biodiversity is not bad for us. Indeed, **biodiversity actually protects our health**. That's because areas with high biodiversity have lower densities of the species most likely to make us sick.

There is much we can learn from the current global catastrophe that will help us contend better with future epidemics. But it would be far better if we could prevent future epidemics altogether. One of the best ways to do that is to preserve, protect, and restore natural biodiversity.

Felicia

1. Syrian hamsters could save us, as it turns out. They look like they might be the best model organism for studying this virus in the lab.
2. A few, like West Nile virus and avian influenza, come from birds.
3. Almost half of all mammals are rodents. Bats are the next most diverse group.
4. An order is a group of mammals like rodents, or primates, or carnivores.
5. Bandicoots would be more important to you if you were Australian.
6. If you can't think of a rodent that doesn't have these traits, I encourage you to look up capybaras and beavers.

No. 39

Herd Immunity

Felicia Keesing

Hi Everyone,

In a March column in the *New York Times*, science and health reporter Donald McNeil proposed a thought experiment: Imagine if every person on the planet could sit down, at least six feet from each other, and not move for 14 days. At the end of those 14 days, the virus would be gone, or close enough.[i] We'd be done with this.

Unfortunately, this global time-out won't work, and for a number of reasons. Among these is the fact that we're mammals. We need to eat constantly. If we were snakes, going without food for 14 days would not be a problem.

My goal today is to explore another way we might end this—by creating herd immunity. **What is herd immunity? How could we get it? And how long would it take?**

In essence, herd immunity is simple. If enough people are immune, the virus will eventually die out. But why? To survive, the virus has to keep infecting new hosts. But finding a susceptible host becomes increasingly unlikely as more and more people become immune. More immunity also means fewer people shedding virus particles that could land on others.

But herd immunity is more complicated than that characterization would suggest. Let's start with how herd immunity could be achieved. One path to herd immunity would be to simply allow the virus to do what it is currently doing—infecting people around the world, some of whom acquire immunity. Eventually, enough people would be immune that the infected would be unlikely to pass the virus to a new host before their body cleared it. We could call this **the laissez-faire path to herd immunity**, and it is fraught. Along the way, many people would die, and many others would suffer debilitating illness.

The second path to herd immunity is through vaccination. **The vaccination path to herd immunity** is appealing but slow. If a vaccine can be developed to render us immune to infection, and if enough people get vaccinated, we could achieve herd immunity with less debility and loss of life. But a vaccine will take time to develop. One group has had some success so far. They have a candidate vaccine that they suspect could be tested by September. It's worked in rhesus macaques, and tests are beginning in people next month. But many candidate vaccines fail at this stage. And even if it is safe and effective in people, the global production, distribution, and administration of any vaccine will take time.

The third path to herd immunity is a combination of the other two, and it is the path most countries around the world are taking, even if that choice is by default.[ii] In the past week, there have been reports of the first antibody surveys, which provide a measure of how many people have already been exposed to the virus. About 20 percent of people in New York City, for example, appear to have been exposed already. Elsewhere in New York, the number is smaller. Some places around the world report percentages less than 5 percent, a few others as high as 30 percent. Why does this number matter? It gives us an idea of how much further we might have to go to achieve herd immunity.[iii] But this takes some further exploration.

First, and most importantly, **we don't yet understand the *immunity* part of *herd immunity*.** For example, we don't yet know if people with antibodies to this virus—SARS-CoV-2—can be reinfected. If previous exposure doesn't protect you in the future, the laissez-fair path to herd immunity is not an option, and the vaccination path will only be possible if the vaccine invokes a different kind of immune response. There are a lot of other questions about immunity to SARS-CoV-2, like how long protection lasts, if it occurs at all, and whether everyone is equally protected.

We don't know that much about the size of the herd required to achieve herd immunity either. News reports would suggest that we'll have achieved herd immunity when 50–60 percent of the population is immune, but how do they get that number? The proportion of the population that needs to be immune to achieve herd immunity is estimated using a measure of how readily the virus is spreading from person to person. If each infected person infects a lot of other people, we need a higher percentage of immune people in order to achieve herd immunity. If each infected person infects very few, we could get by with a lower level of herd immunity. A study that came out in March estimated that herd immunity to covid-19 would require 45–85 percent of a population to be immune. To understand why that range is so large, we need to go deeper still.

Right now, many people in the world are under movement restrictions, allowed to leave their homes only under very limited circumstances, and forbidden from gathering in groups of any size. The goal of these efforts is to reduce transmission of the virus, and the data indicate that places that are doing this well are slowing its spread.[iv] By lowering the rate of transmission this way, we're lowering the level of immunity we need to achieve protection for our herd, but we're also slowing our path to getting there. In contrast, the more we transmit, the greater the number in our herd that need to be immune and the more quickly we get there, but at a devastating cost. **In a nutshell, if we want to go back to normal, we're going to need almost everyone to be immune to the virus**. We're going to need a vaccine.

So let's do a new thought experiment. Let's imagine that antibodies to SARS-CoV-2 are fully protective and last a lifetime. Let's imagine that the fatality rate is much lower than we originally estimated because many more people have been exposed than we knew. Let's imagine that this promising vaccine is effective and safe in humans, and that our leaders are already making a plan for its global production, distribution, and equitable administration. In this world of our imagination, we are tantalizingly close to herd immunity, with the potential to achieve it sometime this fall.

In the real world, what do we do? **In practical terms, herd immunity is a way of socially isolating the virus.** But for now, socially isolating ourselves is our best available strategy. While it reduces transmission, it also buys us time to develop and test vaccines. So we should keep doing what we have already been doing for weeks. We should maintain

rigorous social distancing, practice the best hygiene of our lives, and support our essential workers—and everyone else—in every way we can. Herd immunity isn't something anyone achieves alone.

i When people started moving again, a few with unusually long periods of viral shedding might still infect others, but those cases could be easily tracked down and managed.

ii There is another option, and that is to rid your country of the virus entirely. New Zealand, for example, is well on the way to this endpoint. They responded early and aggressively to the pandemic, and now they are tracing and quarantining the handful of remaining cases. As long as no new cases are imported, New Zealand could eliminate the virus entirely. This path is foreclosed to most countries, which have seen less decisive, less science-based leadership.

iii It tells us other things as well. For example, if the number is high, it indicates that there are a lot of undetected cases. That means that there's a lot of asymptomatic transmission, and it also means that the case fatality rate is lower than we have been estimating.

iv This website estimates the current rate of transmission of the virus for each state in the United States using a measured called Rt (which is a practical version of the much discussed Ro). Values below one, indicated in green, are a main goal of social distancing.

No. 41

Plague as "Anger": A Brief Philological Musing

Shai Secunda

While medical experts work arduously and heroically to guide humanity through, and hopefully out of, the COVID-19 crisis, those of us who are confined to our homes and old-fashioned scholarly habits turn to books and words in search of the precious secrets of philology. In that spirit, I offer a few indulgent observations on an old Jewish word for plague, which I came across in some recent literary voyages.

The Babylonian Talmud—an encyclopedic work of Jewish law, lore, and interpretation composed mainly in an Eastern dialect of Aramaic in Iraq around the sixth century CE— deploys a curious word for "plague"—*ritḥa* (ריתחא). For example, in the following passage about a rabbi named Rava who flourished in the Persian capital region in the fourth century CE, we read (tractate Bava Kamma 60b):

> [If there is] pestilence in the city, gather-in your feet [and stay home], as it says "And none of you shall go out of the opening of his house until morning" (Exodus 12:22), and it says "come, my, people, enter into your chambers, and shut your doors behind you [hide yourself for a little moment until the anger has passed]" (Isaiah 26:20), and it says, "Outside the sword will bereave and in the chambers, terror" (Deuteronomy 32:25).
>
> Rava, in a time of **plague** (***ritḥa***), used to block up the windows. As it is written, "For death has come up through our windows" (Jeremiah 9:20).

It is ever interesting, even gratifying, to discover examples of the ancients practicing good public health policy. Indeed, the history of quarantining is a long one, with precedent dating back millennia. Yet, it is not for medical wisdom that we normally turn to such sources, but for insight—strange insight—about how people saw the world. In that vein, the Talmudic Aramaic word for plague, *ritḥa*, is curious and may point to some curious pathways by which late antique Jews thought about plagues.

While *ritḥa* is a rare word for plague in Talmudic Aramaic, it has more common senses, including "heating up," "seething," "boiling," and "anger." My initial thought was that *ritḥa* as "plague" is diagnostic and refers to the fevers and inflammations of those afflicted with the disease. In fact, a cognate term shows up in a medical text composed in the closely related Syriac dialect describing eye diseases like abscesses and inflammations.

But it seems more likely that the Talmudic Aramaic word for plague reflects a well-established religious belief that plague results from divine anger. Thus, a passage in the Book of Numbers has Moses tell his brother, Aaron, to "take

the fire-pan and place fire upon it from the altar and put in incense and carry it quickly to the community and atone for them, **for the fury has gone out from before the LORD**, the scourge has begun" (Numbers 17:11).

This apparently strict moralist system of sin and atonement seems quite "Biblical," and of little relevance or interest to many of us. But notably, classical Jewish texts did not think about plague and its relation to divine anger as direct punishment for moral failing, but rather discerned a more complex—and frightening—cosmic event that cannot be easily understood, or solved, with the standard theology of reward and punishment, and religious activities of prayer and penitence. Another recurrence of the word *riṭḥa* in the Talmud (tractate Ketubot 106a) has a certain Rabbi Joseph refusing to pray when plague visited his students. Apparently, when there is angry pestilence in the world, even the rabbis and the wonder workers admit that it is best to batten down the hatches—as the Israelites were counseled during the plague of the first born in Egypt: "none of you shall go out of the opening of his house until morning." Indeed, this same rabbi was said to have remarked on this Biblical verse: "Once permission is granted to the Destroyer, he does not distinguish between the righteous and the wicked; in fact, he even starts up with the righteous!" (Bava Kamma 60a)

The Talmudic idea of a Destroyer out in the world that cares little to distinguish between God- fearers and heathens lends itself to a demonological interpretation. Some historians of religion have surmised that the rabbis may have been influenced on this point by their Zoroastrian neighbors, who in Middle Persian spoke of Xešm—the demon of Wrath. In a somewhat related vein, medieval Jewish mystics, including the circle that produced the core of the Jewish mystical tradition, the Zohar, saw plague as stemming from the angry demonic Other Side of the Godhead(!). Since Biblical Hebrew memorably describes divine anger as "heat of the nostrils," and based on Aaron's above-described response to plague, the Zohar (*Vayakhel* 2:218b) recommends burning incense to "clear" the divine breathing passages (in the absence of actual incense, they suggested reading an old Talmudic passage *about* incense, following the old Jewish belief that words and study are their own kind of action).

Put differently, the old Jewish Aramaic word *ritḫa* and its associations seem to betray a profoundly "unreligious" view uttered by these religious men; namely, that pestilence should *not* be seen as a divine punishment for sin that might be removed with repentance, rather an uncontrolled (and regular?) expression of cosmic anger during which God cannot save humankind. I might add that this anthropomorphic conception of plague as anger may be thought -provoking for those environmentalists who to like to think in such terms about the world and its natural chastisements for our environmental "sins," which may have contributed, in one way or another, to the COVID-19 crisis.

No. 45

Security and COVID19

John Gomez

Since the onset of COVID-19, the Bard College Office of Safety and Security has been faced with many changes and challenges. This memo will outline our response and best practices.

In response to the pandemic, the Security Office has been practicing social distancing, which presents some challenges.

Protecting the campus requires a certain level of information sharing and personal interaction. Duties as simple as assisting with a lockout for a student or accessing a building for Environmental Services may bring members of the Security Office into direct contact with community members.

For this reason, all members of the Security Office have been issued PPE equipment such as masks, gloves, and eye protection. When responding to a call for service, we have been utilizing the PPE equipment to help keep both the members of the Office as well as the community members safe.

The Security Office has taken extra measures to disinfect all equipment utilized on a daily basis. This takes place at the beginning and end of each shift, nine times a day, at a minimum. This includes items such as the key rings that each guard carries while on patrol. Due to the way that COVID-19 has spread, the security vehicles are disinfected by the security officers both when they begin their shift and at its completion. All items that security officers use and share are also disinfected at the beginning and end of each shift.

The Old Gymnasium has been set up with desks and computers and currently serves as the patrol office. This space allows members to complete reports and administrative duties while maintaining distancing.

With all these recent changes we want you to know that the Security Office will continue to provide the same service it always has, 24 hours a day.

We urge you all to be smart, be safe, and hopefully we will reconvene our Bard community in the fall.

No. 46

Plagues Now and Then: Disease and Social Order in Thucydides and Lucretius

Robert Cioffi

Exactly 2,450 years ago, during the early days of the Peloponnesian War, Athens faced a sudden epidemiological disaster as a novel plague of unknown origin began to attack its citizens. The plague was almost certainly bacterial as opposed to our current viral menace, but in the days before antibiotics it proved equally intractable for medical professionals. The Athenian historian Thucydides, who lived through the war and survived the disease, wrote about it in his *History of the Peloponnesian War* (published at the end of the 5th century BC) as a warning to future generations. "I will simply set down its nature, and explain the symptoms by which it might be recognized by the student," he writes, "if it should ever break out again." There is still disagreement today among medical historians about what the disease was—typhoid, smallpox, bubonic plague, measles?[1] But whatever it was, it was horrible: pustules forming on the skin; fevers that drove men and women to throw themselves in tanks of water; and all manner of diarrhea and stomach ulcers. By conservative estimates virtually the entire population of Athens would be infected over the next three to five years, and perhaps a quarter would die.[2]

Cause and effect, leadership and its consequences, are closely correlated in Thucydides's account. In the ancient Greek world, plagues were often seen as a referendum on society and its leaders. One only need to think of the disease afflicting Thebes at the start of Sophocles's *Oedipus Tyrannus* or the plague sent by the god Apollo to punish Agamemnon in Homer's *Iliad* to know that an ancient community was only as healthy as its leadership and social order (often called *nomos*, "custom" in Greek). Athens's democratically-elected leader Pericles inadvertently exacerbated the plague when, early in the war, he urged farmers to seek shelter in the city. As we now know, such a decision had the opposite effects of modern public health guidelines to "reduce density" and "stay at home." The resulting disease destroyed not just lives but the very social fabric: lawlessness reigned, respect for the gods was absent, and, perhaps worst of all, altruism proved deadly. "If they were afraid to visit each other," Thucydides wrote, "they died alone . . . but if they dared to do so, death was the consequence. This was especially the case for those who made any pretensions to virtue."

Closely connected to *nomos* in Thucydides's *History* is *logos*, the Greek word for the faculties of reason, intellect, and language. We often see in Thucydides's text individuals struggling to use *logos* to master and affect the world. For instance, just a few pages before the plague narrative, Pericles outlined his vision of Athens as a beacon of democratic virtue in his funeral oration for the first casualties in the war. His speech was a model for Abraham Lincoln and John F. Kennedy:

In conclusion, I say that this whole city is an example for Greece and it seems to me that each person among us has a body that is self-sufficient for all kinds of conduct with the most versatile grace. This is no boast tossed out for

the present moment in words alone; rather it is a truth proven in our actions. The power of our city, which we have acquired from our habits and our way of life, proves this. For Athens alone of the cities now in existence is greater than its reputation, and Athens alone gives no reason . . . for its subjects to question its right to rule.

The plague dismantled this vision of an open society and Athenian exceptionalism. Immediately after these inspiring words delivered by a charismatic leader, we encounter a radically different portrait of the harsh realities of an epidemic that, in Thucydides's telling, draws on and subverts Pericles's language. Thus, Pericles's claim that an Athenian citizen has a "body that is self-sufficient (*sōma autarkes*) for all kinds of conduct" is answered with a dire condemnation that no "body . . . is self-sufficient (*sōma . . . autarkes*)" to withstand the disease. But perhaps even more chilling is what is absent from the plague-ridden city. Virtue, so central to the funeral oration, has entirely deserted Athens. Even funeral customs, described by Thucydides as *nomos*, were neglected as bodies piled up in the streets, in fountains, and in sacred places. There were, quite simply, too many dead to bury and observe the proper social order of things.

The structure of Thucydides's narrative ultimately follows a tragic pattern of arrogance, delusion, and destruction. Even after Thucydides concludes his description of the plague and begins a summary of the military operations during the same year, the disease rages on and continually frustrates the Athenian war efforts. In response, Pericles returns to the speaker's platform for the final time in the *History*. He's defensive. He reasserts the city's military supremacy, claims that Athens cannot risk letting go of its empire, and, finally, he offers a plea to stay the course:

Know that we, as Greeks, ruled over the most Greeks, we sustained the greatest wars . . . and we inhabited a city that was in all ways the best provided for and the greatest.

Pericles makes his last and most potently emotional bid to the Athenians: remember that we were once the greatest and can be again. In Thucydides's version, he appears to speak voluntarily. Accounts by other ancient authors, however, suggest that he was, in fact, brought to trial and was speaking in his defense.[3] Thucydides's selectivity emphasizes Pericles's isolation; he stands alone as a leader whose superlative optimism has been revealed for what it is: just words.

From the language of his final speech, it is clear that Pericles has recognized that this world is different from the open, happy, and free society that he imagined in his funeral oration. He admits that the plague happened "beyond what we Athenians were ready for." "What comes from heaven," he continues, "must be borne with resignation and what comes from war with courage." Appeals to the gods in Thucydides are few and rarely effective, but Pericles's admission has a broader implication. In the funeral oration there is no place for the divine; now his only explanation is to blame the gods.

One of the lessons of the Athenian plague is the failure of law and language to bend the world to their will. In the end, the plague undid both Pericles and his city. The angry Athenians fined him, but reelected him general. And when he died of the disease in 429 BC,[4] Thucydides says that the Athenians let "private ambitions and private interests" take over, which led to their terrible defeat in Sicily. At times in the *History*, reason seems ascendant, as it does in Pericles's rosy-colored image of a city unperturbed in war and peace. But the plague shows us the utter failure of *nomos* and *logos* to control natural and divine forces. Epidemics win out, rending the social contract to shreds. What is left behind is "lawlessness" (the absence of *nomos*), an ugly image of humans, who, Thucydides observes, "now easily dared to do openly what they used to do secretly."

Four hundred years later, the Roman poet Lucretius returned to the plague of Athens in the final lines of *On the Nature of the Universe*, his philosophical masterwork written in Latin epic verse.[5] Lucretius aimed to translate Epicurean philosophy into Latin poetry and to provide comfort to a world in turbulence. At the start of his second book, he deploys a powerful metaphor to describe the true philosopher's *ataraxia*, or sense of calm:

It is sweet, when the storm clouds roll in across the sea and disturb the deep,
to watch another's great toil from dry land.
Not because it is a lovely pleasure for someone to be vexed,
but because it is sweet to understand from what misfortunes you yourself are free.

For Lucretius, such calm comes from a profoundly material understanding of the world. Everything, he argues, is composed of only two elements: atoms, literally "that which cannot be divided," and emptiness, which he called "void." His stark materialism downplays the significance of the gods and the afterlife. This is for him profoundly comforting. "Death," he claims, "is nothing to us." Instead of worrying about the future, one should focus on the present.

For a poem that works so hard to argue against the fear of death, Lucretius, however, ends on a dark note with an account of the Athenian plague. His description of the dissolution of society closely follows Thucydides's, but unlike the *History*, his poem ends abruptly—so abruptly that many have believed it to be unfinished. His last words are a dire observation of how profoundly affecting plagues can be: "No one could be found, whom neither disease nor death nor grief tested at that time." Perhaps he intended to write more and never got the chance, but in its present stake of preservation, readers of Lucretius have been left to contemplate the devasting consequences of disease as his poem's final message.

Both Lucretius and Thucydides suggest, as we now know all too well, that disease is not just a medical challenge. It is also a social phenomenon and moral referendum. Pandemics reveal. They test, as few other calamities do, the power of our traditions, laws, and politicians to hold together a society that has ceased to function as normal. Of course, in many ways, we are far better off than the Athenians were. Modern medicine holds out hope of a vaccine or a treatment; we have the ability to limit the disease's spread; and today's doctors are risking their lives to save as many of the sick as they can. Yet, few of us have it in our power to control how and when this crisis will end. Thucydides and Lucretius teach us that what we can control is how we record, respond to, and learn from this new reality. Thucydides, at least, should know. He was a survivor.

1. E.g. https://www.ncbi.nlm.nih.gov/pubmed/15081502
2. R.J. Littman 2009. "The Plague of Athens: Epidemiology and Pathology" *Mount Sinai Journal of Medicine* 76: 456-67.
3. Plutarch *Pericles* 35.5 and Hermippus Fr. 46 K
4. Plutarch, *Pericles* 38.
5. For more on Lucretius, see Stephen Greenblatt's essay in *The New Yorker*: https://www.newyorker.com/culture/culture-desk/invisible-bullets-what-lucretius-taught-us-about-pandemics

No. 47

In the Shallows

Tim Davis

In the first week of Quarantine, *The New York Times* called me to ask how I was responding as a photographer. I remember being stunned at the question; feeling like a gazelle tumbling to the veldt in the jaws of a lioness, a microphone shoved in its rictus face asking, "So, how does it feel?" But photographers do respond immediately, and holistically to every stimulus, every crisis, every query. The camera imagines it's entitled to an entire parallelogram of opinion even as the tripod falls, even water damaged on Omaha Beach, even as the world's certain geometry crashes and burns. It is in the nature of photographers to squeeze out little widgets of awareness along an assembly line, hoping to fashion them later into proper working cognition.

That reckoning with what you've done is the most difficult (and artful) part of the job of photographer, and is a buoyant joy for me—a highly keyed man with ADHD and appetite—who finds the act of taking pictures as natural and energizing as rubbing eyes when tired. As a child I fantasized about archaeology and paleontology, and, despite how unsuited I'd be to the meticulous, patient, gridded realities of those professions, the vision of finding fossilized ankylosaurus eggs appearing beneath my brush is a vivid analogy for what it feels like to sift through one's

photographs every day, trying to understand what *what you did*, meant. This semester I am teaching a class called "About About," designed particularly to help students build something from the fragments of their instinct and visual awareness.

My initial response to the crisis was to pick through my archive for pain. Photographs are not the most natural medium for expressing the inner worlds of their maker. The camera laps up the outer world like a family dog at a mud puddle, but imagine asking Fido how a mud puddle tastes, and you understand how challenging it is to describe the photographer's emotions. Over the years, I've found it more and more useful, though, to coax students into reckoning, photographically, with their feelings. When you are a young professor ready to shock systems and propose new priorities, it's startling to find yourself dealing with young people whose breakups and family deaths have already knocked them off course. I started asking those students to abandon their projects, and just photograph any thing or situation that made the pain feel present—the way after a bad split, every song on the radio seems like a love song, an affront to you. I found that the work was often more resonant, innovative, open to experiment, than before the shock that had set it off. Now I always talk about photographs in terms of form, content, and *feeling*.

Pain was easy to find. Photographing in Los Angeles and Upstate New York in the last three years, exclusively with a digital camera, and fairly tirelessly, I saw a lot of sadness and anxiety and decay and death. But the pictures almost inevitably thrummed with the joy of discovery. Photographers are a sane lot, I believe, because of how many times a day they meet with success. Every time you make a good picture, there's your mother standing over you in a shining pinafore saying, "Good Job, Timmy!" The camera constantly pats you on the back. You don't have to finish the symphony, rewrite the novel, or get all your citations in order, you just press a button and a complete work of art has fallen into your open arms. All you have to do was wander around all day in Coxsackie. So the overwhelming emotion in most photographs, no matter how devastating their subjects, is the joy of discovery. I felt I needed something to counteract that joy, some buffer between the world and my clarity about its pictorial possibilities. That's when I headed for the swamp.

If you travel downhill around here you hit a swamp. I'm drawn to them, mostly because they are so visually distinct from their surroundings. The ground isn't ground. It is reflective instead of absorbent, and seethes with unfamiliar plant and animal life. On one of my early quarantine walks, after a late March snow, I photographed an old basketball floating in a swampy gully, covered with seasons of moss and ugliness. Balls are markers of the fluid dynamics of our planet, and can be found at river deltas and canal locks the world over. Head north up 9G to Linlithgo, where the Roe Jan meets the Hudson, and you'll find dozens of them sheltered in phragmites and Japanese knotweed at this vital confluence. But this ball was special, its pebbly crafted leatherette surface hairy, tactile, transformed. It bobbed there, an ideal analogy for how I felt, altered and immobilized. I kneeled down in the muck to take the picture and knew I'd done it right. *Good job, Timmy*.

Minutes later someone posted on the *Tivoli Neighbors 12583* Facebook group warning of a creepy man walking up Lasher Avenue with a camera. I received a text about it and turned my attention away from a majestic still wintry orchard in order to reinstall that hateful app on my phone to check it out. Fear and paranoia were swirling through the land (with good reason), and I suddenly knew that my picture of the ball had been inadequate. The clarity and certainty that mark my way of photographing, the forcefulness of my *attack*, felt incommensurate with the murkiness of the times. *Form, content, and feeling*: how do they swirl neurally together in the photographer's consciousness to turn this mysterious little act of button-pushing into the hail of insight I love to shelter under?

The next time I had a free hour (a rarity now that I'd been conscripted into a second job homeschooling a challenged seven-year-old), I ventured back to the swamp, this time with a tilt/shift lens. I don't deny that I had echoes of *Parsifal* in my head as I clunked downhill in my muck boots. There's that moment in Act 2 when Klingsor brandishes a lance at the hero:

> *Halt! I have the right weapon to fell you!*
> *The fool shall fall to me through his master's Spear!*

Parsifal snatches the spear out of the air, makes the sign of the cross with it, collapsing the world around them. Focus is as central to "button-pushing" as tone is to music. *Focus* means "hearth" in Latin. It is where the fire is burning in your picture. And yet, for almost every photograph being made (at least since the introduction of the Kodak in 1888, the plane of focus has marched backwards, parallel to the photographer's shoulders, a sheet of clear glass occupying x and y axes. The z-axis was left to its own devices, either contained in the focal plane's depth of field, or not. But for the first fifty years of the medium's history (and continuously, given the right equipment), the glass plane could rotate and spin, making the focus run diagonally through the image, from the hooves of a nearby gazelle to the tip of Mount Kilimanjaro, or from the shining eyes of your lover to the marble eyes of Abraham Lincoln, sitting three reflecting pools away. Decisions about how much of your picture is in focus are amplified when the focal plane tilts and swings. And amplification now seemed vital. There has never been a time of less certainty in the world, a murkier sense of the future. (On advising days this year I felt like a storefront psychic.) And as I began walking through the landscape, first in swamps and then across last year's cut corn fields and down empty small-town streets at night, I wielded my *right weapon*, letting the shallow and tilted depth of field sing in its muffled way my own stunted aria of uncertainty. I am calling it *In the Shallows.*

This crisis has made all of you think like photographers. You've been forced to imagine how to put your body in a particular position in relation to someone else, how far away you are from a subject, whether others are in your plane of focus. Social distancing is a way of *picturing* the world. My students have made extraordinary work. In all but a few cases, they seem liberated from the concerns and pressures of academic art practice, and are finding golden form-subject-feeling alloys lying in their own back yards. As you all become photographers, making visual decisions with deadly consequences, try to feel liberated as my students are. Connect your inner worlds to the outer field of view. It feels good. *Good job.*

Tivoli, NY. May, 2020

No. 48

Llamas to the Rescue!

Michael Tibbetts

The holy grail for fighting the COVID 19 pandemic is a safe effective vaccine. However, vaccines don't help people already infected with the virus. Therefore, an antiviral treatment would be an important tool to help infected people, while we wait for a vaccine to be developed. Despite some initial excitement about combination therapy with hydroxychloroquine and azithromycin, no clearly effective treatment has been found.

The spike protein on the surface of SARS-CoV-2 (COVID 19), needs to bind to the ACE2 protein on the surface of human cells in order to infect them. If we could find a molecule that binds to the part of the spike protein that binds with ACE2 and blocks the interaction, it would be a good candidate, therapeutic molecule. It would be even better, if the molecule was so specific that it didn't interact with anything in the host, minimizing the possibility of side effects. We would also need a way to efficiently make lots of the molecule.

Llamas to the Rescue!

A recent report describing just such a potential therapeutic molecule for SARS-CoV-2 has been getting some attention. The therapeutic molecule is derived from a type of antibody made by llamas. While all vertebrates produce antibodies as part of an immune response to infection, camelids (including llamas) make an additional, interesting form of antibodies that have particular promise as therapeutic agents.

As I wrote in an earlier post, antibodies are proteins that recognize and bind to foreign substances (antigens), including proteins on the surfaces of viruses. Antibodies have a characteristic size and shape. Each is composed of four protein chains and harbor two identical sites that bind an antigen molecule. In addition to the conventional form, llamas make another form of antibodies that have only one antigen binding site and are smaller than conventional antibodies. It is their small size that makes them so interesting, and through recombinant DNA technology, they can be made even smaller, creating so-called nanobodies.

In the world of proteins, human antibodies are relatively large, with a mass about three times the average. Their relatively bulky structure can make it difficult for them to access all of the nooks and crannies of their target antigen. In an immune response, this is generally not an issue, since the binding of an antibody to any part of an antigen acts as a flag, targeting the antigen for destruction by other components of the immune system. Those human immune system components only recognize human antibodies. So, treating a virus with antibodies from a nonhuman species would not be effective, unless those antibodies recognize the specific part of the virus' spike protein that allows it to infect host cells. This is where size matters. Very small proteins are more likely to have access to all parts of the spike protein. In addition, small proteins tend to be more stable and hence are effective for a longer period of time and require lower doses.

Nanobodies

Nanobodies are antibodies, derived from the nonconventional llama antibodies, which are engineered to be even smaller. An international, collaborative group of researchers has found a nanobody that binds to the very spot on the SARS-CoV-2 spike protein that interacts with the human ACE2 protein. The scientists who describe the nanobody also showed that when it binds to the spike protein it prevents SAR-CoV-2 from infecting cells in culture[1].

The scientists started by immunizing a llama with just the spike protein from the related SARS- CoV-1 and MERS-CoV coronaviruses. They then isolated antibody-producing cells from blood donated by the llama and screened them for those producing an antibody that recognizes the spike protein. To make the even smaller nanobody, the group took just the relevant part of the llama antibody gene and put it into yeast. The yeast was used to make lots of the nanobodies that were then tested for effectiveness. One of several nanobodies they tested completely blocked infection of cells in culture.

While we wait and hope for an effective vaccine, therapeutics to treat infected people are desperately needed. Nanobodies derived from llamas are an intriguing possibility. The scientific community has been investigating the potential of camelid antibodies for a couple of decades and there is cause for optimism about both their safety and efficacy.

1. Wrapp D, De Vlieger D, Corbett KS, et al. Structural Basis for Potent Neutralization of Betacoronaviruses by Single-Domain Camelid Antibodies [published online ahead of print, 2020 Apr 29]. *Cell*. 2020;S0092-8674(20)30494-3.

No. 49

Dangerous Misunderstandings and Their Implications for Higher Education and the Reopening of the Economy

Felicia Keesing

In my last post, I began with a thought experiment: what would happen if everyone in the world sat down, at least six feet apart, for 14 days? If we could do it, the pandemic would be over, because anyone who was infected would recover (or die from) their infection without passing it on to anyone else. In epidemiological terms, we would have reduced Rt, the *effective reproduction number*[i] of the virus, to zero, or Rt = 0.

But in reality, we're not talking about reducing Rt to zero at the moment because we can't.[ii] In fact, what we're talking about is trying to reduce Rt to a number less than 1, like 0.9 or 0.8. What does that mean? If Rt is 1, it means that one infected person transmits the infection to one other person, on average. Over time, with Rt = 1, the number of infected people would stay the same, but the actual people who were infected would change. Another way to say this is that if 10 people were infected, they'd infect a total of 10 others.

So what does it mean to say that Rt is *less than* one? It means that if 10 people were infected, they'd infect only 9 others (in the case of Rt = 0.9) or 8 others (in the case of Rt = 0.8). Whenever Rt is less than one, there will be fewer and fewer infected people over time. The further Rt is below one, the faster this decline will happen.

Right now in the United States, most states have an estimated Rt of between 0.75 and 0.98. https://rt.live/ A handful of states have Rt above 1, but even the highest—Minnesota this week—is only at 1.05. This means that what we're doing is working. We're reducing transmission through hygiene, social distancing, and self-quarantining, and it's causing the number of cases to go down over time.

In most places, **if we kept doing what we've been doing for long enough, the disease would slowly, slowly decline, potentially to zero**. The three important points about this are these:

1. The decline to zero would take a long time. Months and months. And months.
2. Along the way, more and more people would be getting infected, and some of them would die. The total number of people infected at any one moment would be declining, but the actual people suffering would keep changing.
3. As soon as we change what we're doing about social distancing, hygiene, and quarantining, Rt will change as well, almost certainly by going up.

Unfortunately, though, many of our decision-makers, and perhaps many of us as well, think that if the number of cases is going down, we can start to go back to normal. And many are using the Rt measures as a justification, either explicitly or implicitly. We need to remember that if we start to go back to normal, the number of cases will start

to rise again, and Rt will go back up. At best, this could mean modest increases that we can manage, as Germany is currently trying to do. At worst, we could end up right back where we were in March.

But there's yet another critical misunderstanding and it's having a huge effect on the decisions that people are discussing about when to restart businesses and institutions, and how.

In higher education right now, for example, there's much debate about whether colleges and universities can safely reopen for in-person instruction in the fall. The assumption behind many of these plans is that if we could find a way to create a low-density campus, we could reopen safely. Campuses are famously high-density places, which is part of why they are such dynamic spaces for learning and living and doing. So how does one create a low-density campus? There are at least 15 solutions being widely considered, including bringing only first-year students back for in-person classes, or offering some classes in person and others virtually. **To understand whether these scenarios would be safe—and which ones—we need to explore the concept of thresholds**.

In science, we think a lot about thresholds—levels above or below which something important changes in a fundamental way. Rt itself is often thought of as a threshold. If Rt is above 1, the disease is spreading. If Rt is below 1, the disease is dwindling. So Rt=1 is an important threshold with different outcomes just above and just below it. We use thresholds in our daily lives a lot. The speed limit is a good example. If you're driving above the speed limit, you're breaking the law. Below it, you're not. So when you're above a threshold, you're in one category, and when you're below it, you're in another.

A problem for many of the reopening scenarios is that they assume that there is a threshold density below which students (or workers) returning to campuses (or offices) will be "safe" and above which they won't be. But at least for now, there isn't. **For now, the less contact infected people have with others, the safer it will be**[iii]. It's not a threshold. It's a continuum.

In New York, Governor Cuomo understands this. That's why the state's plans for the first phase of reopening focus on businesses and activities that will let people move around more, but come into minimal contact. That's a yes for curbside delivery and tennis, and a no for eat-in dining and team sports. These limits acknowledge that there is currently no threshold density that's safe.

If we want to reach the thresholds of *safe* or *normal*, we will need better solutions. For example, we could reopen higher-density settings, including campuses, (fairly) safely if we could test everyone daily, trace their contacts, and quarantine anyone who tests positive. But we can't.[iv] We could reach a threshold of something like *normal* if we had a safe, effective, and widely available vaccine. But we don't.

As we plan the details of when and how to reopen more spaces and activities going forward, we face two critical decisions. The first is **how to lower the risks as much as possible**. This involves finding ways to maximize both hygiene (think masks, hand sanitizer, and extra cleanings) and distancing (think single-occupancy spaces, and socially-distant cafeterias). We must also have a workable plan for what to do when people inevitably become sick. How do we detect infected people quickly, and how do we responsibly and efficiently identify their contacts? For colleges and universities, how do we quarantine sick students? And how do we protect the most vulnerable?

The second decision is **what level of risk is acceptable**. With the tools we currently have, it's not a question of whether creating lower-density campuses or businesses is safe. It's a question of whether it's safe *enough*. That's not a scientific question, and it doesn't have a scientific answer.

i The effective reproduction number Rt is different from Ro (R-nought), though they're related. Ro is the number of cases that would arise if an infected person was in a population *in which everyone else was susceptible to infection*. In theory at least, it's an immutable property of a pathogen. In contrast, when some people are immune, through prior exposure or vaccination, or when people take active steps to reduce transmission (like washing hands or social-distancing or wearing masks), we need a different number. That's Rt. It's a measure of the number of new cases that are *actually* arising from each infected person, and it can change based on our behavior.

ii Except in New Zealand, where the badass government and public health experts have pulled this off.

iii If you're thinking about herd immunity, which I wrote about in my last post, herd immunity is indeed based on a threshold. Above a certain level of immunity in the population, cases will decline. Below that level of immunity, they'll continue to increase. So it's a threshold in the same sense that Rt=1 is. But above the threshold of herd immunity, people will still get sick and die—unless virtually everyone is immune through prior exposure or vaccination.

iv Quick tests are available now, but they're not available *enough*.

No. 50

Relying on *Emotional Intelligence* as We Come Back into Physical Space

Erin Cannan

Last week, Coleen Murphy Alexander and I hosted a "Water Cooler" meeting sponsored by the staff mentoring program. This program, organized by a group of dedicated staff volunteers, was designed to provide mentorship and community for new staff members, particularly those from traditionally under-represented groups. The leadership team, including Claudette Aldebot, Caitlin O'Donnell, and Cammie Jones, among others, has arranged monthly meetings, mentor matches, networking and professional development events, even during Covid-19. A shout-out to them for their incredible work.

Coleen and I led one of those sessions as a workshop on leadership and emotional intelligence. Had the workshop been given at another time, I am not sure participants would have allowed themselves to tap into the vulnerability they showed that day. We were honored that so many people decided to join and that they so actively opened up.

That got me thinking. Who is reaching out for support? Who is not or feels they can't? In what shape will we all return to the workplace? What undercurrents of fear, vulnerability, and anxiety will we be carrying with us when we step back into our offices? Who will have experienced loss? Where will the existing structural forms of racism, inequality, and economic devastation play out on campus and beyond? Who among us will express emotions that on the surface seem outsized or inappropriate but when put into context will make a whole lot of sense? Will people be kind? And what role can emotional intelligence play for us all?

Emotional intelligence is generally said to encompass five skill areas: self awareness, self regulation, motivation, empathy and social skills.

Since the introduction of the theory of emotional intelligence in the '90s, scholarly research has linked emotional intelligence to positive outcomes for learning, social and emotional health, productivity, job satisfaction, and workplace engagement. We need to consider how to underscore for ourselves and our students the importance of actively honing these skills to

The Five Components of Emotional Intelligence at Work

	Definition	Hallmarks
Self-Awareness	The ability to recognize and understand your moods, emotions, and drives, as well as their effect on others	Self-confidence Realistic self-assessment Self-deprecating sense of humour
Self-Regulation	The ability to control or redirect disruptive impulses and moods The propensity to suspend judgement—to think before acting	Trustworthiness and integrity Comfort with ambiguity Openness to change
Motivation	A passion to work for reasons that go beyond money or status A propensity to pursue goals with energy and persistence	Strong drive to achieve Optimism even in the face of failure Organizational commitment
Empathy	The ability to understand the emotional makeup of other people Skill in treating people according to their emotional reactions	Expertise in building and retaining talent Cross-cultural sensitivity Service to clients and customers
Social Skill	Proficiency in managing relationships and building networks An ability to find common ground and build rapport	Effectiveness in leading change Persuasiveness Expertise in building and leading teams

Daniel Goleman, "What Makes A Leader"
Harvard Business Review, November-December1998

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better ensure that we can actually step back into the supportive community we aspire to be and model what we hope students will themselves take with them to their future communities.

How can we develop our own emotional intelligence and encourage students to develop theirs, as we respond to this crisis? This question is all the more potent given that the pandemic is likely not the only crisis they will face in their lifetimes. What students learn about HOW to act will be determined by how WE act with each other as we move back into physical proximity.

Campuses are considered communities of practice where there is a shared craft.[1] The Ask an Expert series itself reflects a community of practice: multiple voices are invited to share their views, not only for the sake of responding and critiquing, but also for the sake of sharing, listening, reflecting, and contemplating. This feels different from the normal call-and-response common to academic communities, where critique and argument are emphasized. Debate and critique are, of course, practices for honing our knowledge, but they can sometimes cause us to overlook the important contributions of all members of the community, especially those who fit outside of traditional structures and whose voices have traditionally been undervalued or openly derided.

I like the potential of the Ask the Expert model as a way for us to continue in the future. Not because I don't believe in academic rigor—I do—but because I believe the series models patience, listening, and mindfulness in its structure. These habits will be critical to our reemergence into physical space together. We are going to be afraid. We are going to be at risk. We are going to believe that our particular circumstances require attention. We are going to seek certainty when there is none. This means that we are going to need to rely on each other as we explore all the creative ways we can address the needs of our community. We are going to need to act as models for students as they learn to be leaders for the future where collaboration, teamwork, and flexibility are going to distinguish their capacity from the capacities of artificial intelligence.[2]

Dena Simmons, director of Yale's Center for Emotional Intelligence, talks about how critical the links between feeling safe and learning are to children. Students achieve more academically when they feel safe. Although her focus is in the K-12 arena, her work focuses on the development of social justice pedagogy to address inequality, and uses work on emotional intelligence as a way to lift up students. It is not a leap to apply her strategies to the college sphere. Emotional intelligence is directly linked to academic outcomes:

> The ability to assess, regulate, and utilize emotions has been found to be associated with a variety of better academic outcomes, including achievement tasks, goals attainment, and academic performance.[3]

I reread Ask an Expert submissions to see if I could find messages that feed our collective emotional intelligence. Below, I highlight just some of those threads of wisdom that I found after only a brief perusal. This is not an exhaustive list by any means but it does draw our attention to our desire to use knowledge in all the disciplines to feed our well-being in some way. I think we aspire to be kinder and gentler, but that intention can sometimes be masked behind our own anxieties. Sometimes those anxieties are not even obvious to ourselves.

Some examples:

- Whitney Slaten's discussion with President Botstein included terms like "practice of listening" and "the listening global citizen" in discussing Gershwin.
- Robert Cioffi ended his submission, "Yet, few of us have it in our power to control how and when this crisis will end. Thucydides and Lucretius teach us that what we can control is how we record, respond to, and learn from this new reality."
- The Levy Institute's recently-published short papers don't focus on stocks but rather on the devastation of the pandemic in human terms. The series—with such titles as, *The Effects of Immigration Policy Undermines the US Pandemic Response*, and *The Pandemic of Inequality*—highlights concerns for inequality: "The costs of the COVID-19 pandemic—in terms of both the health risks and economic burdens—will be borne disproportionately by the most vulnerable segments of US society."
- Felicia Keesing encouraged a culture of care as critical to our preservation, "One of the best ways to do that is to preserve, protect, and restore natural biodiversity."
- Malia du Mont reflected on her military service, "It was not an easy situation, but our shared sense of mission, commitment to each other, knowledge of the long-term implications of our efforts, and pride in the importance of what we were trying to do, sustained us…"
- Richard Lopez's title says it all, "Agency amidst powerlessness: Nurturing the autonomously motivated self during the COVID-19 pandemic."
- Myra Young Armstead highlighted the devastating impact of systematized racism Covid-19 on communities of color. "How will the nation respond to the death toll left behind because of COVID-19? These racial disproportions. . . have prompted the governor of Michigan to create the Michigan Coronavirus Taskforce on Racial Disparities." She emphasizes the need for pandemic planning at the federal level to include "rectifying health-related, systemic, racialized poverty."
- Chris LaFratta lent his expertise in explaining the "Chemistry of Cleaning and Disinfecting" to help alleviate anxiety about transmission.
- Saidee Brown along with MANY others at the College submitted guides for the mask making that was so important to help protect members of the community.
- Katie Tabb asked us to think about the ethics related to access to medical resources and triage.
- Felicia Keesing ended one of her articles with, "Be kind to yourself and others, and do what you can to help, as long as you can do it safely." And, "If you've recovered from Covid-19, consider donating some of your blood plasma. Your antibodies are incredibly valuable right now. Share your superpower if you can."
- Gabe Perron encouraged us to enjoy our favorite takeout, "not only a safe way to fill one of your essential needs, but also a good way to support local businesses and workers that depend on you. If takeout is not an option for you for whatever reason right now, consider buying gift certificates for yourself and your friends. A gift certificate is basically a 0% interest loan for the restaurateur."

These examples remind us that we are building more than one kind of knowledge at Bard. They remind us that we are at our best when we humanize our knowledge, when we reinforce our collective experience, and when we take into account a diversity of thoughts, opinions and backgrounds. It is with the collective community that we can take refuge, even if it feels a little scary to be in proximity to each other. If we work toward patience and understanding as we come back together, then it is in that space that we will find new ways of being that reflect the principles that make

Bard. . . Bard. It is where we can stretch our notion of a place to think into that of a place to think differently, where a place to think can incorporate the best of who we all are.

Practical Exercise:
Emotional intelligence is a skill that can be honed and practiced over a lifetime. In our staff session, we looked at the skills Daniel Goldman associates with emotional intelligence (see the grid above) and we asked participants to rate themselves on each skill on a scale from 1-5. Following that, we asked them to rate themselves on the same scale for how they thought they were perceived by others.

I suggest we all reflect on our own skills and then write a reflection responding to the following. What do you think are the most vital skills to have in the workplace? For yourself? For others? Are they linked in some way to your strengths? How can you, or how do you, already incorporate emotional intelligence into your workplace interactions? How can you hone your skills and model them for students and colleagues?

Interested in taking some more time for reflection? Enjoy Gill Hasson's, *Emotional Intelligence Pocketbook: Little Exercises for an Intuitive Life*, John Wiley & Sons, Incorporated, 2017.

1. Wenger, Etienne, et al. *Cultivating Communities of Practice: a Guide to Managing Knowledge*. Harvard Business School Press, 2010.
2. Marr, Bernard. "The 10 Vital Skills You Will Need for The Future of Work." *Forbes*, Forbes Magazine, 29 Apr. 2019
3. Saeed, Wizra, and Riaz Ahmad. "Association of Demographic Characteristics, Emotional Intelligence and Academic Self-efficacy among Undergraduate Students." Journal of Pakistan Medical Association, vol. 70, no. 3, 31 Mar. 2020, p. 457.

No. 51

Race and COVID-19

Helen Epstein

Racial disparities in health have always been stark in the US. In the years after Emancipation, the health of African Americans, already much worse than that of whites, so deteriorated that insurance company actuaries predicted that by 2000, African Americans would be extinct. While the situation has much improved since then, middle aged blacks are still twice as likely to have high blood pressure and diabetes as whites, are three times as likely to have kidney failure and are twice as likely to die of heart disease. Black children are twice as likely as white ones to die in infancy and black women are more than three times as likely as white women to die in childbirth.

The causes of this health catastrophe are complex, but they boil down to a set of causes first identified by the brilliant sociologist W. E. B. Du Bois more than a century ago: unequal access to high quality health care, unsafe housing, food insecurity, exposure to air pollution, lead paint and other toxins, and the psychosocial toll of living with poverty, racism, mass incarceration, and other social problems.

Covid-19 is no different. Only a third of Chicagoans are black, but they account for half of COVID-19 cases and nearly 70% of deaths, most concentrated in five traditionally black neighborhoods on the city's South Side. Similar racial disparities are seen in Louisiana, Michigan, New York—and wherever epidemiologists have looked. According to a preliminary survey conducted by Johns Hopkins University researchers, the infection rate in predominantly black US counties is more than three times higher than that in predominantly white counties, and the death rate is six times higher.

Why are blacks so much more vulnerable to COVID-19? In part because they are more likely to suffer from hypertension, diabetes, obesity, and cardiovascular disease—all risk factors for severe COVID-19 disease. According to the Centers for Disease Control, the greater tendency for blacks to live in overcrowded, multigenerational households and the preponderance of blacks in jails and prisons, where respiratory infections spread rapidly, also contribute to the disparity.

In addition, blacks are more likely to be employed in essential services such as health care, nursing home care, and care for the disabled and in such essential government jobs as the postal service and public transportation. These people spend their working lives in infection hotspots, and can't stay home and work by Zoom.

The air in African American neighborhoods is also more polluted, heightening the risk of infection perhaps because COVID-19 can hitch a ride on tiny particles known as PM10, which remain suspended in the air for long periods. PM2.5, even tinier particles that penetrate deep in the lungs, raise the risk of death in infected people.

The good news is that the global lockdown is greatly improving global air quality. The bad news is that President Trump has been quietly lifting clean air regulations so that if and when the economy gears up again, rates of air pollution related afflictions such as diseases of the heart and lungs and defects in fetal growth could soar, along with COVID-19. Back in March, Chicago Tribune Columnist Dahleen Glanton raised the alarm about social media rumors claiming that high levels of melanin protected blacks from Covid-19. "Corona lowering gas prices, flights, cruises, and not messing with black people? God showing out," wrote one of Glanton's Facebook friends.

The limited spread of the epidemic in Africa may have contributed to this false belief. But low COVID-19 rates in Africa are most likely explained by climatic conditions—colds and flu are relatively uncommon there too—and by the fact that people spend less time in crowded indoor spaces such as buses, trains, and theatres. Even many schools and churches in Africa aren't entirely enclosed, and this may also help retard the spread of some respiratory diseases. Under-reporting and the early and strict nature of lockdowns in many African countries undoubtedly also contribute to Africa's low case counts.

In other words, our risk is shaped not by skin color, but by our social, political, economic, and geological situation and by what's in the air we breathe. We need to work together to make sure everyone—of every color, gender, age, and nationality—is protected, otherwise, no one is safe.

No. 52

Jewish Affordable Housing Projects in Late Tsarist Russia: Urban Housing, Public Health, and Communal Responsibility

Cecile E. Kuznitz

As New York City became the epicenter of the Coronavirus outbreak, observers noted that cities have long been viewed as bastions of disease. In particular, as the industrial revolution led to rapid urbanization in the nineteenth century, reformers sought ways to mitigate the public health problems created by overcrowded living conditions and lack of sanitation. Among the questions they asked: how could urban housing for the working class be improved and who was responsible for improving it?

Jewish philanthropists in the cities of Warsaw and Vilna addressed these questions by constructing apartment complexes that were among the most modern and innovative in the Tsarist Empire. In 1897, the Polish Jewish banker Hippolit Wawelberg created the Foundation for Inexpensive Housing to erect a set of three apartment blocks in Warsaw. This inspired the Jewish Colonization Association, a charitable organization headquartered in London and dedicated to aiding Russian Jews, to construct two similar structures in Vilna. The foundation also built a second development in Warsaw in 1927. Taken together, these projects housed about 3,000 residents, primarily artisans, factory workers, small merchants, and their families.

All of the buildings were located on the urban outskirts surrounded by gardens and open land, creating a green and healthy environment. Density within apartments was limited, with boarders and home manufacturing prohibited to further prevent overcrowding. Sanitary facilities included faucets, toilets, and garbage chutes, all rare amenities in working class housing at the turn of the century. Tenants were required to abide by regulations on cleanliness and to be vaccinated against smallpox. Each complex also featured a children's day care, medical clinic, bathhouse, and laundry—and isolation rooms for those who might contract an infectious disease.

While these measures were designed to promote public health, residents' social and cultural needs were met by reading rooms, lecture series, and "decent entertainment" such as dance evenings. These initiatives were in keeping with many reformers' view of the connection among education, moral health, and physical wellbeing. In addition, Wawelberg believed that daily interactions among residents of different backgrounds would promote tolerance, so he mandated that the apartments be occupied by Jewish and Christian Poles in equal number.

Yet despite careful planning and expert advice, density rose over the intended level as large families crowded into the one-room apartments. The projects' initiators intended them to return a modest profit that would be reinvested in the buildings' upkeep. Construction and maintenance costs were higher than anticipated, however, limiting profits

and driving up rents. These high expenses eventually led the JCA to turn over control of the Vilna complex to the *kehillah*, the democratically elected representative body of Vilna Jewry, in 1933. The goal of diversity also proved elusive: Jews were reluctant to move to the relatively remote Warsaw buildings and hence their residents were overwhelmingly Christian, while the great majority of tenants in Vilna was Jewish. Nevertheless, the buildings did provide thousands of working class families with relatively affordable, modern housing in a healthful environment—and all continue to serve this function today.

The issues raised by these apartment complexes echo in contemporary discussions of the relationship among urban design, public health, and economics. As a recent *New York Times* article and exhibit at the Skyscraper Museum point out, and as the sponsors of these buildings discovered, urban density results both from choices about housing design and the socioeconomic factors that shape how individual homes are used. We have also seen how cultural factors have made certain groups more susceptible to the virus's impact, while de facto segregation along ethnic and racial lines has shaped the geography of its toll on American cities.

The construction projects in late Tsarist Russia were initiated as acts of private philanthropy but one became a kind of public housing, as Vilna Jewry recognized a communal responsibility to provide shelter for its neediest members. As the pandemic continues, we must ask ourselves who will take responsibility for addressing its health and economic impacts, and who will ensure the future wellbeing of American cities and their residents.

No. 53

Reflecting on and Responding to the Invisibility of Death: "Bard Mourns"

Nora Jacobsen Ben Hammed

The coronavirus pandemic, which some experts warn has only just begun, is disrupting sacred processes of death and mourning. Our loved ones are dying isolated and alone, surrounded by masked healthcare workers and medical machinery. Despite best efforts, bodies have accumulated faster than they can be processed—buried in mass graves, handled with forklifts, and deteriorating in parked trucks. These experiences of death will leave deep scars in our society, and just as we can only mitigate the death toll of the pandemic, we are also left to mitigate the psychological toll of massive, anonymous, and solitary deaths.

The invisibility of death and dying is not new to our society. On the one hand, the United States interventions in nations across the globe has produced mass death of devalued, "ungrievable" foreign lives, mortalities most often perceived purely as statistics, if perceived at all.[1] Within our borders, a deep imbalance between classes, formed along a racial divide, marks not only the way we live, but also the way that we die—a truth that the coronavirus is exaggerating, and laying bare.

Yet the unwillingness to apprehend the precariousness of certain lives is not the only way that death has become invisible in our society. In mainstream culture, we have forgotten how to mourn altogether. When did death become a taboo topic, its impingement upon our productivity and joviality an embarrassment? Geoffrey Gorer, an anthropologist who devoted his career to this question, posited that in the aftermath of the mass death of World War II, there was a break with the Victorian and Romantic culture celebrating death to one in which the expression of grief and mourning rituals became increasingly private. He went so far as to assert that grief had replaced sex as the taboo in the 20th century Western world, describing death as "pornographic" in the sense that a death of natural causes has replaced sex as that which is unmentionable due to "social prudery."[2]

Inspired by Gorer's work, Philippe Ariès's sweeping historical study, *The Hour of Our Death* (1980), analyzed attitudes towards death and dying in the West from the Middle Ages to the present day. Until World War I, "the death of a man still solemnly altered the space and time of a social group that could be extended to include the entire community."[3] A note of bereavement was posted on the door, the shutters were drawn, and final visits were made before the funeral and procession brought the community together in their grief. The burial was followed by a period of mourning signaled by clothes of black and violet during which the bereaved family would visit the grave, and friends and relatives would visit the family. Grief was open and communal, and death, in Ariès's estimation, still tamed. What followed, however, was a shift in "the most industrialized, urbanized, and technologically advanced areas of the Western world" into "an absolutely new type of dying." "Society has banished death," with no pause nor display when a member of a community dies.[4] Dying rarely takes place in the family's home, surrounded by loved ones; rather, it

has been relegated to hospitals and hospices through what Ariès terms "medicalization." Natural death has become invisible, and talk of death, and the display of mourning, obscene. In the midst of this transformation, "the bereaved is crushed between the weight of [their] grief and the weight of social prohibition."[5]

What is the root cause of this transformation from social to private mourning, from communal to solitary, "pornographic" grief? Perhaps it lies in the very unknowability of death in a society where reason reigns supreme and religion is restricted to the private sphere. In an age in which our sense of morality has come to be rooted in scientific virtues, and death as an "entry" has been reduced, as the philosopher and sociologist Zygmunt Bauman writes, to "an *exit* pure and simple," it is unsurprising that even speaking of death—or our own beliefs of what may come after death—becomes a source of embarrassment. Death is the "scandal of reason," both certain and absolute in its unfathomability, shocking us into silence without old coping mechanisms and traditional language rooted in the reassurances of religion.[6]

Unable to cope, we seek to deny the reality of death altogether. Yet death cannot be denied outright, so we deny individual cases of death by seeking to understand and control its specific instances. "We do not hear of people dying of mortality. They die only of individual causes; *because* there was an individual cause."[7] The coronavirus pandemic has illustrated to us, however, that our supposed control over death—established only in recent memory—is a fallacy. We are experiencing the true power of mortality known viscerally by human beings for thousands of generations before us. For most of us who have grown up in industrialized nations far from war, famine, and need, this comes as quite a shock. How will we cope with this new reality?[8] Given the ways in which the pandemic disrupts our already curtailed forms of dying and grieving, how will we witness each others' pain and help each other mourn fully, and heal? We are facing death on a scale that most of us have never experienced, and it is imperative that we forge a new way forward, and find ways to support the bereaved and mourn as a community.

As a small beginning, I have started an initiative called "Bard Mourns", which collects and publishes stories and photos of loved ones connected to Bard College who have died during the coronavirus pandemic. Those whose lives are celebrated and grieved on this site may have died of COVID-19, or may have simply passed away of other causes in a time when our health systems are flooded, funerals and mourning rituals are severely constrained, and mass death is being experienced globally. They could be Bard students, faculty, staff, or alumni, or the loved ones of members of Bard's community. This is a space for us to mourn, to commemorate, and to make our losses more visible in a time when statistics of deaths further exaggerate the invisibility of death and grief in our society.

Perhaps in the midst of so much loss, the coronavirus pandemic will help us to learn how to mourn better as a community, creating new rituals that recognize the loss of loved ones and allow space for public grief. Let us rise to the challenge of making invisible death visible once again, starting with our own small community of Bard College.

If you would like to submit a page commemorating a loss, please send your post and, optionally, photograph(s) to bardmourns@bard.edu.

1. On the notion of the ungrievable life, see Judith Butler, *Frames of War : When Is Life Grievable?* (London: Verso, 2009).
2. Geoffrey Gorer, "The Pornography of Death," *Encounter* 5 (July 1, 1955).
3. Philippe. Ariès, *The Hour of Our Death*, trans. Helen Weaver (New York: Knopf, 1981), 559.
4. Ibid., 560.
5. Ariès, *The Hour of Our Death*, 583.
6. Zygmunt Bauman, "Survival as a Social Construct," *Theory, Culture & Society* 9, no. 1 (February 1, 1992): 1.
7. Bauman, 5.
8. In a country with privatized health care and an ever-widening wealth gap, this reality will by no means be experienced equally. For those without insurance, a hospitalization for COVID-19 of six days costs an average of $73,300. With 27 million Americans still without insurance, this is a shocking status quo that will undoubtedly also translate into a higher mortality rate as sick uninsured or underinsured avoid treatment, or even testing. Further, the COVID-19 pandemic is already increasing the severity of other health crises concentrated in poor communities, such as the opioid epidemic.

No 54

The COVID Closet: A Social History of Hidden Morbidity

Kwame Holmes

For months epidemiologists believed that the first two people to die from COVID-19 in the United States were a Seattle couple who lost their lives on February 26. In late April though, researchers in Santa Clara, California, performed an autopsy on the bodies of two people who had died, in their homes, earlier that month. Those tests indicated a positive result for COVID-19. Santa Clara medical officials told the *New York Times* that the couple had not been in contact with medical institutions, which meant the virus "was probably around unrecognized for quite some time."[1]

The official in question, Santa Clara County Executive and MD Jeffrey V. Smith, likely meant that the virus' reproduction and transmission had been unrecognized by medical institutions. Still, his choice of language makes it possible for us to center questions of recognition, and here I mean the social and political recognition of individuals and groups, into our assessment of the nation's ability to reduce the spread of COVID-19 in the long-term. I write here from a place of partial expertise. Like so many of us, I have become a makeshift epidemiologist, consuming research about reproduction number, contact tracing, and flattening curves to give substance to my speculations into the hows and whens of a return to normal. What I do know, as an historian of Black, feminist, and queer social movements—and as someone who understands the HIV-AIDS epidemic as essential to the historiography of recent American history—is that social stigma profoundly impacts who seeks recognition from medical caregivers and those disparities distort our ability to know who has become sick, who has passed away, and when.

We can learn hard lessons about the impact of social stigma on death reporting from the history of the HIV/AIDS epidemic in American cities. While conducting research on queer politics and community in post-civil rights Washington, D.C., I encountered the same problem all historians of this era face, how to account for the impact of the epidemic upon urban life with an incomplete record of AIDS mortality. In 1981, D.C.'s Whitman Walker—now one of the most well-funded public health institutions in the country— was a gay men's health clinic operating out of the basement of a unitarian church in Georgetown. Like its peers, Whitman Walker used education to discourage suicide, treat alcoholism, and limit the spread of venereal disease, but were unprepared to respond to a life-threatening infection spread through sexual contact. Community clinics were decentralized by design and offered their clients anonymity at a time when public homosexuality remained taboo. Still, what offered anonymity also hindered the mass-aggregation of data necessary to mount a public health response to the AIDS epidemic. When clients became seriously ill, Whitman Walker could only make referrals to mainstream doctors who worked in a health system reluctant to keep track of what was suddenly afflicting gay men. As a result, though the CDC maintains a comprehensive database of infectious disease mortality, historians and epidemiologists studying the AIDS epidemic can only estimate the death rate prior to 1987. Here, homophobic stigma means we can never know the thousands of Americans who passed away from AIDS related complications before the systematization of CDC record-keeping.

1987 was also the first year that activists displayed the AIDS quilt on the national lawn, part of a culture of public memorialization that signaled increased awareness of white urban gay men who were dying of the disease. For other urban constituencies, intravenous drug users, sex workers, Black men who have sex with men (MSM) and Black women, the shift in CDC policy did little to slow infection and mortality rates. For these groups a different set of social stigmas and historic injuries discouraged them to seek testing and medical care. Sex workers and IV Drug users, for example, began contracting AIDS at the height of the War on Drugs. Many chose to die at-home rather than risk being reported to the police by hospital personnel should they seek out treatment. A shocking report by the *Washington Post* in 1987 found that 80% of recently arrested inmates in the city jail had tested positive for AIDS.[2] Unquestionably, many more individuals living among criminalized populations became sick and passed away in anonymity.

Even before AIDS, Black Americans' vexed relationship to death reporting took shape in response to competing interests; the historic impulse to expand Black representation in those official "counts" that organize the distribution of public resources and historic mistrust of medical (and medicalizing) institutions that have inadequately distributed care to the Black body.[3] AIDS exacerbated those tensions by forcing the integration of intraracial worlds that had been kept apart by dissemblance and discretion surrounding sexuality.

In the years between Stonewall and the AIDS epidemic, Black MSM differentiated from their white counterparts by forming an ambivalent relationship to the politics of recognition.[4] Whereas white gay men and lesbian activists directed their pursuit of liberation through the metaphor of the closet, Black queer urbanites—many of whom were not recent migrants to large cities—refused an absolute choice between "coming out" to a new chosen family and participation in their normative family life. *Blacklight,* one of the nation's first Black gay and lesbian publications, frequently chronicled Black Washingtonians who danced at Black gay bars on Saturday while attending church and post-church family meals on Sunday. Indeed, many Black MSM established a friendly deténte within their families, one predicated on nonrecognition and which asked all involved to maintain the public fiction of—if not heterosexuality—a kind of nonhomosexuality.

Unfortunately, however these arrangements made life livable for Black MSM, multiple kin networks presented an epidemiological challenge in death. When Black MSM Washingtonians died from AIDS, it could set off a battle over how the death would be recorded, with biological family seeking to withhold AIDS as a "cause of death" from death certificates and chosen kin seeking to report the truth of a victims life in their death.[5] As the epidemic spread to Black cis women mistrust of the medical system further discouraged accurate reporting. As a result, despite the fact that the D.C.'s Black population stood at 65% in the 1990 census, only 42% of death reports between 1987 and 1990 that were coded as "Human immunodeficiency virus infection" listed the race of the victim as Black.[6] There is then, as there is within the Middle Passage, the domestic slave trade, the lynching era, a gap; an unknowable and unrecognizable tally of Black death that hinders our attempts to apply rational historicist or epidemiological means of ascertaining the truth.

Many commenters have pointed out there are major differences between the AIDS epidemic and COVID-19. COVID-19 is not spread through socially stigmatized behaviors like IV drug use or sexual contact, nor is it relatively isolated to those communities that the majority believes are a moral hazard to "normal" society. Nonetheless, the same structural inequalities that slowed the nation's response to HIV-AIDS, particularly among communities of color, persists within this pandemic. For working class people of color today, a COVID-19 diagnosis could force them from work at a time when many Republican and Democratic governors plan to limit welfare benefits. There is then a

profound incentive to remain closeted, to refuse to seek out medical treatment, perhaps even to conceal evidence of a diagnosis as a survival strategy. We have seen the evidence of this in Black population centers all over the country, from New York to the Mississippi Delta. Where the healthcare system is overrun, there have been hundreds of deaths "at-home," and it is not conjecture to speculate that racial minorities are overrepresented among that number.

Because government agencies generate mortality statistics in collaboration with medical practitioners, their patients and bereaved families, those social hierarchies that disrupt healthy relation amongst individuals and between individuals and the state, can cripple the accuracy of death reporting amidst a pandemic. Our failure to recognize these dynamics places ever-more Americans at risk, and slows our ability to return to "normal."

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No. 55

Bobbins and Syllabi

Jean Churchill

Pleats and curves are needed when turning a flat piece of fabric into a three-dimensional face mask. Air needs to enter and then come out. As a choreographer, I had to learn to use a sewing machine. Now I remember the rules: the bobbin must "unwind counterclockwise;" drop the foot down before you begin; move the fabric under that ferocious needle with care, or your mask will be lumpy. These sewing rules are like my syllabus, containing details that are essential but insufficient. Creating a face mask out of a flat piece of fabric is like trying to create a real classroom or studio using Zoom.

For two months the Zoom interface faces have entered onto and disappeared from my screen like the Cheshire Cat. The experience has been paradoxically both bland and intense, with all of our mug shots arranged in a mathematically determined rectangular array that randomly repositions our images. The digital display of our "classroom" or "studio" is our own tea party. Moments of disjointed communication or even dancing can occur, but our bodies and voices are distorted, delayed, variable, and at times competing with each other. Who will speak? Who speaks next? The internet connections can cut out unexpectedly, sometimes disastrously for discussions or presentations. Our backgrounds and lighting sources are varied. Student work happens in a kitchen or a bedroom or a backyard. One could do a crossword puzzle while in the Zoom room and no one else would ever know. It is very easy for a student to just sit back. Any fears or shyness are fed and reinforced when they can (or must) self-mute and/or turn off the camera. Students can, without ceremony, simply drop out. Even when they are there, we can barely see them in an effort to take any measure of their engagement or states of mind or bodies.

I agree that the Zoom platform is "better than nothing" but we all know that better than nothing is saying very little. I hear that some of us have been successful on Zoom. However, while we each of us, and perhaps our students as well, need help negotiating the pandemic, we may be less able to manage in a two-dimensional studio any more than we can breathe through a two-dimensional mask. Truthfully, the subject at hand, no matter how compelling, can at any time be upstaged by the larger truth, that of this pandemic; all of us are, to varying degrees, terrified. Covid-19 has flattened and muted many of us, some for good.

"The true teacher is ahead of the students only in that he has more to learn than they: namely, the letting learn." (Heidegger) Our efforts to create an environment where learning can happen demand our awareness of each others' presence, in a supportive classroom or studio, where, possibly, can be found the courage to fail. Hopefully, "the having of wonderful ideas" (Eleanor Duckworth) may miraculously occur. We try to create an environment for wonderful ideas, where students can discover the courage to make a mistake; those moments are dearly created and dearly treasured. In our actual classrooms and studios, three-dimensional relationships are built where we can hear each other breathe, and can sense the subtle clues from each other while we are engaged and immersed in a

complicated experience. Some of the most extraordinary learning happens before a class, or after, in unscripted but important exchanges, which are a challenge to discover in any digital environment. But here we are. Can we make this flat-screen digital approximation of education more three dimensional? What combination of pleats or special tools are available to us as teachers with these hard surfaces between us and other human beings? I know we will get better at this, for sure, because we have to. My face masks are looking less lumpy.

We are in Wonderland. The Duchess Coronavirus is powerful, random, and cruel. We fell fast down that unforeseen hole, and we can find no obvious or simple path out. Down here are strange creatures reminding us of folks up above; they seem not really themselves and we seem not really ourselves. We finagle bobbins and syllabi: we reach for skills we thought we had. Our best intentions and pleats unfold; collaborations and seams unravel; scissors and arguments dull; personalities and stitches entangle; internet outages and family members interrupt; threads and equanimity snap.

We have come to the end of our semester. Taking painful leave of our students' programmed images, we create a farewell Zoom time although the abrupt physical leave-taking actually occurred more than two months ago. We thread the needle. We look at and wave at the little camera hole in our computer while our other hand takes the cursor down toward the red letters spelling "end meeting." Perhaps future digital classrooms will enable more three-dimensional moments, and all of us can take several deep, glorious breaths. However, sitting at table with the Mad Hatter and the Dormouse, and the Cheshire Cat floating near by, the human sharing of our mutual passions can be frustratingly elusive. And the White Rabbit pulls us, breathless, through a nightmare landscape about which we can be certain of very little, and from which we desperately yearn to escape.

No. 56

"Immeasurable Damage": Inequities of COVID-19 Statistics for Native Americans

Cynthia Cunningham

It's no secret that COVID-19 has disproportionately affected minority communities, particularly Black and Latino residents. These effects are, in part, due to structural factors that make it inherently more difficult for these communities to practice social distancing since they are disproportionately considered "essential workers" (i.e., retail/grocery workers, health-care workers, and custodial staff). Further, these "essential workers" tend to be members of residentially segregated neighborhoods and face health disparities linked to structural racism, manifesting in provider bias, lack of access to COVID tests, and higher rates of diseases such as high blood pressure and asthma, putting them at a higher risk of getting sick and/or dying of COVID-19. These facts have been recognized by key players such as the NYC Department of Health, the Centers for Disease Control and Prevention (CDC), and U.S. Surgeon General Jerome Adams; however, what has been lost even within this crisis has been COVID-19's effects on Native American communities.

To begin, of the 46 states that are reporting COVID-19 cases and mortality rates by race and ethnicity, only 27 are including Native Americans/Alaska Natives/Native Hawaiians in their data as reported by the National Academy for State Health Policy. These states are Alaska, Arizona, Arkansas, California, Colorado, Georgia, Hawaii, Idaho, Illinois, Kansas, Kentucky, Louisiana, Maine, Michigan, Minnesota, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, South Carolina, South Dakota, Utah, Vermont, Washington, Wisconsin, and Wyoming. While this may be unsurprising for some considering that the 2017 Census reported that Native Americans make up just 2.09% of the U.S. population, what this ultimately means is that Native Americans are left out of demographic data used to determine the impact of COVID-19. On smaller local and state levels, this can result in racial misclassification, but on a larger, national level, this results in an incomplete portrait of just how devastating COVID-19 has been.

For example, Valentina Blackhorse, a Navajo pageant winner, mother, and leader within the Navajo Nation, died from COVID-19 on April 23 after caring for her partner just days before. She was just 28 years old and one of 156 Native Americans to die from COVID-19 in the Navajo Nation. In contrast, Don Osceola, a decorated Vietnam War veteran and member of the Miccosukee tribe, became the first known Native American to die of COVID-19 in Florida on April 29. He was 77 years old. So, how is it that there have been 156 confirmed COVID-19 deaths of Native Americans within the Navajo Nation and just one within the entire state of Florida? One answer to this broad question is simple: The Navajo Nation spreads across parts of New Mexico, Arizona, and Utah, all of which are states that currently categorize Native Americans in their COVID-19 demographics, unlike Florida, which categorizes them as "Other" or "Unknown". This difference in demographic data, (which governments use to determine the need for new roads, schools, resources, etc., based on population needs) shows that states that do categorize Native Americans in the COVID-19 demographics have disproportionate rates of infection and death within these communities. To

further iterate this point, the Navajo Nation will be compared to New York City which, despite having the highest urban Native American population in the U.S, does not include them in the state's demographic data.

Using information from the 2010 Census, the Navajo Nation has an estimated population of 173,667. With 5,250 COVID-19 cases and 241 deaths confirmed by the Navajo Department of Health, as of May 31, the Nation has 3,023.02 cases of COVID-19 per 100,000 people. In contrast, New York City has 2,477.49 cases per 100,000 people based on the New York City Coronavirus Map and Case Count as of June 1. When we compare this data, it shows that the Navajo Nation has the highest per-capita COVID-19 infection rate in the U.S. It should be noted that these numbers have risen from 2,699.99 cases of COVID-19 per 100,000 people in the Navajo Nation and from 2,372.91 cases per 100,000 people in New York City since May 26 when this piece was originally written.

Given these figures, the question then becomes: How has COVID-19 managed to hit the largest Native American reservation so hard? The answer is multifaceted and mirrors a number of the structural factors previously mentioned, in that many residents live in multigenerational homes (making it impossible to practice social distancing), lack access to clean/running water (posing challenges to hand washing and other sanitization methods recommended by the CDC), and rely on a chronically underfunded healthcare system, Indian Health Services (IHS). It should be noted that while not all Native Americans access healthcare through IHS, it does serve 2.5 million tribal citizens, and the majority of IHS facilities do not provide care for critically ill patients (of the 46 hospitals, just five IHS and eight Tribal hospitals are Critical Access Hospitals). This makes it particularly difficult for IHS to accurately track patient hospitalization and mortality data. These numbers can also be attributed to the fact that, despite tribes being allocated $8 billion as part of the CARES ACT at the end of March, payments were not made until April 26 after a Congress-imposed deadline. Furthermore, it has been reported that 40% of the $8 billion will be withheld.

As of now, it may be too late to gauge just how devastating COVID-19 has been on Native Americans, given the limited data that has been reported. Thus, these communities will not receive the necessary aide or resources that they need to fully recover. However, as we look to future pandemics, we can start to prepare by addressing racial and ethnic inconsistencies in state and federal data parameters, and including Native Americans in all future data reporting efforts.

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No. 57

Navigating the COVID-19 Infodemic

Alexa Murphy
Jeremy Hall

"Fake News" has become a hot topic since the 2016 presidential election. The surprising results of that election made us aware that globally-orchestrated campaigns to spread false information through social media are conducted to sow and deepen divisions, manipulate public opinion, and erode our trust in democratic institutions such as the free press. During the Covid-19 pandemic, this problem has only gotten worse and more dangerous. We find ourselves in an "infodemic" that comes from a lack of perspective, a lack of literacy skills, a lack of critical thinking, and disregard for scientific inquiry. Solving the pandemic has become not just a matter of science or debate about facts. The spread of misinformation has helped politicize data and science-based information, and deepen partisan divisions. UNESCO, the United Nations' educational arm, has been sounding the alarm on this, warning that so much amplification of disinformation may result in the marginalization of factual information.[1]

Disinformation is not a new phenomenon. It has long been weaponized as a political and social tool to obfuscate, coerce, and control. Plato's *Protagoras* dialogue states that "the masses. . .perceive nothing, but merely sing the tune their leaders announce" (317 a-b), and Aristotle warned in *Politics* about the "intemperance of demagogues" (Part V) sowing the seeds of political and societal unrest through division. Despite the intervening millennia, misinformation in its varied guises—from[2] disinformation and propaganda to conspiracy theories—are still being used by today's demagogues to manipulate the electorate. Our deeply partisan political climate, combined with the ubiquity of social media and the 24/7 news cycle, have enabled misinformation to spread rapidly, profoundly impacting all our lives as global citizens.

Coordinated Campaigns

Disinformation campaigns aim to manipulate public opinion by playing on "emotions, fears, prejudices, and ignorance" to create a false sense of "meaning and certainty" in a complex and constantly changing reality. The fact that we as a global society have not experienced something like this pandemic[3] in recent history breeds uncertainty, confusion, and a desire to find answers. It is this desire for answers that often gets manipulated through the deliberate dissemination of misinformation.

As with the 2016 election, there is evidence that much of the false information that is spreading during the pandemic is part of coordinated campaigns to spread or amplify disinformation. Researchers at Carnegie Mellon reported recently that nearly half of the Twitter accounts posting false information about Covid-19 are bots. In April, the *New York Times* reported that China and Russia are engaged in[4] spreading misinformation through websites and social media promoting conspiracy theories and discredited information aimed at both Western and non-Western audiences.[5]

This misinformation takes many forms—from unproven "cures" to conspiracy theories surrounding the origins of the virus—which proliferate across the Internet at a rapid-fire pace, sometimes even being broadcast by the President of the United States, making it difficult for people to follow the facts about the unfolding crisis. UNESCO says that the spread of false news about the virus is costing lives. For example, the recent "Plandemic" documentary makes several dangerous and false claims[6] about the virus—including a claim that wearing face coverings can "activate" the virus, and warning that any coming vaccine would be deadly. The documentary quickly went viral, amplified by celebrity[7] doctors and others, inciting "Reopen America" protest groups around the country, and potentially harming efforts to stop the spread of the virus around the globe. While the spread of misinformation[8] around global health issues is not a new phenomena (for example, the misinformation that circulated during the AIDS epidemic of the 1980s and 1990s), what we are currently witnessing is on an entirely different scale—and much of it is fueled by social media use.

The Power of Social Media

Social media—and our behavior on it—gives misinformation new power. According to the PEW Research Center, around 4 in 10 U.S. adults get their news from Facebook and about 1 in 5 get news from Twitter. PEW also reports that most Facebook users do not understand how the Facebook feed works—or why they see certain posts and not others. Why is this significant? Behind social media[9] "feeds" are algorithms that show you what the platform thinks you want to see based on your online behavior—the content you seek out and interact with, the pages you follow, and the things you shop for. This creates a **filter bubble** of information—-a situation where a user only encounters news and information that aligns with their interests, beliefs, and values (as interpreted by the algorithm). Most people do not even notice bias in their feeds because of **confirmation bias**—the tendency to seek out and believe information that confirms one's views, values, or beliefs. Essentially, we experience online media as "echo chambers," virtual spaces that reinforce our views and biases. These echo chambers[10] make us more likely to fall victim to misinformation and distrust information that does not conform to our beliefs. We are more likely to share "information" (which may come in the form of news stories, tweets, memes, screenshots, videos, or images) that advance our opinions, and discount contradictory information as unreliable or downright false.

Information Literacy

Information literacy can play a significant role in combating the power and sway of misinformation, especially during tumultuous times. The American Library Association defines information literacy as the ability to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information." In our current media environment, these[11] skills are more critical than ever before and are a necessary element of civic responsibility.

Unfortunately, recent studies evaluating young people's ability to evaluate information have yielded alarming results. A 2019 study by the Stanford History Education Group found that the overwhelming majority of high school students in the United States are unprepared to identify trustworthy information online. Most students could not distinguish advertisements from news stories, did not track down sources for videos and memes, and failed to look critically at information on websites. In the complex information world we now live in, clearly young people are not learning to[12] think critically about information. As citizens, we rely on online information to make decisions about who to vote for, what policies to support, and how to keep ourselves safe and healthy. The consequences of not prioritizing information literacy education are clearly seen in our current divisive political climate and the globally disparate responses to the pandemic itself.

What Can We Do?

The sheer volume of false information, the forces behind it, and the ease of its spread have become serious threats to democratic society, undermining elections and sabotaging our ability to respond to a global public health crisis. It is crucial that we push back against these forces and commit to the truth as information consumers and as citizens. The following suggestions are ways we can make an impact both in our individual interactions with media and on a broader level:

Check your emotional response. False information is designed to provoke strong emotions and tap into our fears, anxieties, and biases. If you find yourself reacting emotionally to information you come across, stop. Step back, take a deep breath, and do a little more research before you respond. Being responsible about information involves balancing science and expert advice with your own complicated feelings about what we are all going through. It is both global and personal at the same time.

Think critically and check facts. In *Web Literacy for Student Fact Checkers*, the author lays out four[13] strategies for making sure information you come across is reliable: 1) "Check for previous work" to see if the claims have already been fact-checked or proven inaccurate; 2) "Go upstream to the source" to look for the origins of the information and see if it is from a reputable source; 3) "Read laterally" to find out what others say about the publisher or the author—think of information as a network of nodes; and 4) "Circle back" if you get lost down the "rabbit hole" of information and need to find your way back. Making these practices a habit can make us less vulnerable to false information. (For a list of excellent fact-checking tools & tips, see our Fake News https://libguides.bard.edu/fakenews resource guide.)

Break out of your filter bubble. In order to understand all perspectives on events, consider the potential bias of the sources you turn to and look for perspectives outside that bubble. Websites such as Allsides.com https://www.allsides.com/unbiased-balanced-news can be useful tools to understand media bias and see the differences in reporting.

Advocate for information literacy education. Information literacy must be viewed as an essential part of civics education, and we cannot assume that digitally native generations have these skills. All educators have a responsibility to encourage students to think critically about information and learn to evaluate its quality. Librarians, as information professionals, are well positioned to support information literacy education at all levels. Here at Bard, we offer workshops on fake news and information evaluation, work with students individually to help them navigate the complicated world of information, and collaborate with faculty to incorporate information literacy into their courses.

Support and amplify quality journalism. The free press is a key democratic institution, and the "fake news" phenomenon has weakened the impact of professional reporting. Select news sources that adhere to professional journalism standards and ethics such as those of the Society of Professional Journalists. https://www.spj.org/ethicscode.asp

Conclusion

The "infodemic" of false information makes a challenging time even more challenging. Critical thinking skills can enable us to have a deeper and more profound understanding of our current situation. If we push hard to instill information literacy as an integral part of our civic responsibilities, we will come out of this moment as stronger and more capable citizens digging deeper for the truth in an increasingly complex and diverse world.

***For further reading about the problem of false information, and resources to fight it, see our Fake News resource guide:* libguides.bard.edu/fakenews.**

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No. 60

Flu and COVID-19

John Ferguson
James Rodewald ’82

Question:
I did some reading on flu vaccines recently, and I got to wondering what we know about what we might expect for next year? Particularly since experts have said they’d assumed the next pandemic would be set off by an influenza virus, what are some possible scenarios for next year’s flu season? It was pretty bad this year, which would seem to indicate that the vaccine was less effective than usual. From what I gather, the decision about strains for the vaccine should be made around now. Given that the season seems to have ended more abruptly than usual, and the worldwide isolation should mean a lot less flu virus to test after the season, will the guesswork around strains be even more complicated? (I imagine there might be data from the southern hemisphere, but I haven’t looked for it.) Has everyone who should be working on flu vaccines shifted to the novel coronavirus? Will all this isolation lower the flu risk for next year? I’ve always enjoyed Ferg’s flu vaccine reports. Maybe he’d like to weigh in?

James Rodewald ’82
Editor, Publications

Answer:
Well, you know what they say about predicting the future, particularly the future of complex systems. The influenza virus and the coronavirus are quite different, but share humans as hosts.

The influenza virus is notoriously unstable, genetically, with eight different RNA molecules comprising its genome; hence the new vaccine every year. Hosts for the influenza virus include waterfowl (mostly), people, pigs, and horses. You get a lot of crossover spillage wherever you find waterfowl, pigs, and people in close proximity. The cell surface receptor for influenza A is sialic acid, a sugar that decorates many cell surface proteins, so the virus is fairly catholic with regard to the cells it attacks. In waterfowl the virus is said to produce the symptoms of Montezuma’s revenge, but in people it tends to invade the upper respiratory tract, sometimes progressing to the lungs, which is bad. Because of the high variability of the viruses, the composition of the annual vaccine is done by guesswork, and as Jimmy suggests, is often less than 50% effective.

SARS-CoV-2, the coronavirus du jour, is genetically more stable, but not THAT stable. There are several variant strains running around in humans now. Would one vaccine cover all of them, or would we need a different vaccine for each? The polio vaccines, for example, are mixtures of vaccines for each of the three strains of polio viruses. It looks like the most recent ancestor of SARS-CoV-2 was a bat virus, but SARS-CoV-2 seems very well adapted to reproducing in people. Are there any other nonhuman hosts out there? We don’t know. MAYBE humans picked up

the virus in a Wuhan "wet market," but the evidence is not compelling. The cell surface receptor for SARS-CoV-2 is the surface protein ACE2 (angiotensin-converting enzyme 2), so the virus is fairly fussy about what cells it invades. In people it tends to invade the upper respiratory tract, sometimes progressing to the lungs, which is bad.

SO. The two viruses are quite different genetically and structurally, so theoretically they shouldn't have anything to do with one another. BUT, they both happen to attack the human respiratory tract, sometimes fatally. This year, SARS-CoV-2 made the rounds towards the end of the usual winter influenza season. What will happen in the 2020–2021 flu season? It seems to me that both viruses transmit fairly easily, seemingly by the same mechanisms, and thus it seems to me entirely possible that both would move around independently in the human population, with some unlucky individuals contracting both viruses at the same time. The two viruses may have a synergistic effect, and that would be bad, real bad. But since they transmit by seemingly the same mechanisms, social distancing should reduce the incidence of both of them simultaneously, as well as reduce the incidence of coinfections. By the way, I know of some viral infections in bacteria that are enhanced by coinfection by a second virus (in one case the second virus is absolutely dependent on the presence of the first virus for successful infection), and I know of some viral infections in bacteria that are inhibited by coinfection by a second virus, so really anything is possible.

One wonders if this has been going on this year, to some extent. We test people for SARS-CoV-2, but we don't, to my knowledge, test them for influenza at the same time. If we did, we might see something interesting. Since there is no widespread testing for influenza, we don't really know the incidence of influenza in the population or its mortality. The latter is calculated on the basis of excess winter deaths, where we compare how many people die in a "low" influenza winter to how many die in a given winter, and ascribe all of the excess winter deaths in the given winter to influenza, a dicey calculation at best.

I hope this has answered some of your questions, but, I'm afraid, it may raise more questions than it answers.

John Ferguson
Professor Emeritus Biology

VIDEO LINKS

No. 3

Trickle-up Stimulus in Response to Economic Impact of COVID-19

Pavlina Tcherneva

https://drive.google.com/file/d/1YIojeik1No04CBxu7DxIZvRhrsDMUBOI/view

No. 17

Corona Numbers

Paul Cadden-Zimansky

https://drive.google.com/file/d/1vCk2818Y_5TraZgx7Mgmc2sYkhCH_NfY/view

No. 28

Why We Need a Federal Jobs Guarantee NOW

Pavlina Tcherneva

https://www.youtube.com/watch?v=y9vrJGuMJ6c&feature=emb_logo
https://www.congress.gov/116/bills/hr748/BILLS-116hr748enr.pdf

No. 40

Pandemics Past and Present

Myra Young Armstead
Leon Botstein

https://www.youtube.com/watch?v=A6ncpRAmEIk&feature=emb_logo

No. 43

Listening for Repetition in Moments of Interruption

Whitney Slaten
Leon Botstein

https://www.youtube.com/watch?time_continue=5&v=N7fQvkVU9IY&feature=emb_logo

WEBSITE LINKS

No. 38

How to Reopen the Economy

Pavlina Tcherneva

https://www.newyorker.com/business/currency/how-will-we-reopen-the-economy-after-the-coronavirus-crisis

No. 42

Pandemic and Public Trust

Sanjib Baruah

https://indianexpress.com/article/opinion/columns/coronavirus-covid-19-pandemic-india-lockdown-south-korea-sanjib-baruah-6392263/

No. 44

Economic Response to COVID-19

Levy Economics Institute of Bard College
Multiple Authors

Preserving Communities and Our Jobs: A Path to Ending Mass Unemployment
Flavia Dantas and L. Randall Wray
May 8, 2020
https://nonprofitquarterly.org/preserving-communities-and-our-jobs-a-path-to-ending-mass-unemployment/

Public Policy Brief No. 149
April 2020
Pandemic of Inequality
Luiza Nassif-Pires, Laura de Lima Xavier, Thomas Masterson, Michalis Nikiforos, and Fernando Rios-Avila
http://www.levyinstitute.org/publications/pandemic-of-inequality

Policy Note 2020/1
When Two Minskyan Processes Meet A Large Shock: The Economic Implications of the Pandemic
Michalis Nikiforos
http://www.levyinstitute.org/publications/when-two-minskyan-processes-meet-a-large-shock-the-economic-implications-of-the-pandemic

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Policy Note 2020/3
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No. 58

Society Needs to Regain Moral Compass

Sanjib Baruah

https://indianexpress.com/article/opinion/columns/india-coronavirus-lockdown-migrants-jobless-covid-19-pandemic-sanjib-baruah-6430302/

No. 59

A Masterpiece Born of the Black Death

Joseph Luzzi

https://theamericanscholar.org/a-masterpiece-born-of-the-black-death/#.Xx4rqfhKgy_

Fishkill Landing: 'A great many cases of sickness'

Myra Young Armstead

https://www.poughkeepsiejournal.com/story/news/2014/02/06/fishkill-landing-a-great-many-cases-of-sickness/5230307/

COMMENTARY

U.S. Response to COVID-19

Helen Epstein

Greetings all,

I'm writing to follow up on Felicia's sobering essay on the statistical projections of COVID-19 cases in the US. Using straightforward methods, she finds that up to 100 million Americans, roughly one third of the total population, could be infected by July. Modest measures that reduce transmission by 20% would reduce that number to 4 million, but that's hardly acceptable given that around 1%, or 40,000 people, would die and our ICUs would be overwhelmed. Public health officials are currently struggling to figure out what to do to reduce transmission even more. Today, scientists at University College London released a paper describing a set of likely epidemic scenarios that would follow from different sets of interventions. Let's pray that governments around the world, especially those in Western Europe and North America, read this paper carefully and heed its recommendations.

The UCL researchers compare two strategies: MITIGATION and SUPPRESSION.

MITIGATION means "home isolation of suspect cases, home quarantine of those living in the same household as suspect cases, and social distancing of the elderly and others at most risk of severe disease." This is similar to what UK Prime Minister Boris Johnson has proposed. It's a risky and some say, foolhardy strategy. In this case, the epidemic would be expected to slow, the surge of hospitalizations would be delayed, and hospitals would be better able to handle it. As cases spread through younger members of the population, herd immunity would develop so that the total population of susceptible people would be too small and dispersed to sustain rapid transmission. This assumes that people who contract C19 can't contract it again, which is something we don't know. There appear to have been several cases of reinfection in Asia. If confirmed, this does not bode well for the MITIGATION approach, nor for the prospects for a vaccine.

According to the UCL scientists, MITIGATION could potentially halve the number of deaths, but would still result in eight times more demand for critical care beds than is available in either the UK or US.

Even Prime Minister Johnson admitted that under the UK's MITIGATION scheme, "more families, many more families, are going to lose loved ones before their time.'"

SUPPRESSION means social distancing of the entire population, through the closure of schools, restaurants, and offices and the cancellation of conferences, weddings, etc. plus home isolation of cases and household quarantine of their family members. If implemented for five months, the researchers find that deaths could be reduced by 20-fold or more. However, the epidemic would rebound as soon as the measures were relaxed. So, after the initial five-month clampdown, the measures would have to be reinstated every two months or so to keep the numbers low.

In other words, neither MITIGATION nor SUPPRESSION will get us out of this mess.

What the US and UK should have been doing all along, but failed to do, is old-fashioned case identification and contact tracing, which have worked extraordinarily well in Asia for C19 and have also been deployed to tackle HIV, Ebola, and many other epidemics.

Yesterday, there were only 21 new cases of C19 in all of China, down from 2,400 cases per day in mid-January. Most new cases in China are imported, and don't result from spread within the country. The key to success appears to be mass screening for the virus in the general population so the authorities can see where the epidemic is, isolating infected people either in their homes or in special fever clinics and quarantining their relatives and other close contacts for two weeks. This is called active surveillance. In Wuhan alone, more than 10,000 assistant epidemiologists have been fanning out throughout the city each day to do case finding and contact tracing.

Of course, the Chinese were also able to track citizens' cellphones to enforce quarantine, and the authorities deployed local community agents that the Communist Party has long deployed to control citizens. But cases are also falling rapidly in South Korea, Taiwan, Hong Kong, and Singapore, which all emphasized mass testing, case identification, and quarantining of contacts, without the same system of political and social control. In all these countries various suppression and mitigation measures were implemented too, but progress has been so rapid that these measures may soon be relaxed.

This testing and contact tracing approach is being heavily stressed by World Health Organization Director General Tedros Adhanom Ghebreyesus. So, why is the US not (so far) doing it? The reasons aren't clear, but it's not that our public health officials don't understand epidemiology. This approach is basic public health and the CDC deployed similar measures to bring Ebola under control in West Africa in 2014–15.

At present, the US and UK have been relying on passive surveillance, which is essentially counting up cases based on doctors' reports as the sick turn up at clinics and hospitals. Passive surveillance misses many mild cases, which may nevertheless be very infectious and endanger others. Our current administration, which has not shown much concern for public health generally must take the blame for this disastrous policy, but something seems to have happened within the Centers for Disease Control itself, which at present can only be speculated about. Since 2005, the agency has been developing and implementing so called "Pandemic Preparedness" programs to respond to another big influenza epidemic. While CDC has experienced cuts in funding and staff in recent years, it's puzzling that so little institutional memory has been brought to bear on the current crisis. The true story will come out eventually, I suspect.

The CDC's most serious error may have been to reject the first C19 tests, developed by German scientists and recommended by WHO back in mid-January. Instead, they chose to develop their own probes for the virus, then made mistakes in the manufacturing, and only now are beginning to produce the tests in quantity. I don't know why this decision was made. However, it's worth noting that during the early years of the AIDS crisis, the US FDA delayed approving a French HIV test for months while awaiting one developed by US researchers. The US application was approved first, even though it was submitted later. But the early version of the American test turned out to be less accurate than the French one, and some bad batches of blood and serum slipped through the screening process, with

tragic results. There is a lot of money to be made on tests deployed on such a wide scale for public health purposes, and I would not be surprised if this had something to do with these unfortunate decisions.

Whatever the CDC's reasons, because of their fumbling of the testing program, we really have little idea how widespread the virus is at present and where prevention efforts should be concentrated. There is no doubt that this delay cost lives and forced us to take the extreme blunt measures of mass personal isolation and school and business closures, from which the economy may never recover. Such measures would probably have been necessary anyway on some scale, even if a vigorous testing program had been implemented earlier, but at least we'd know roughly how long they'd have to last, and they might not have been necessary everywhere. Instead, we are all in suspense, waiting to see what happens next, while our institutions flounder and livelihoods collapse. I wish I had better news.

1. Interestingly, stopping mass gatherings isn't even included in their models because the effect was found to be minimal. Bear in mind this is a model, so could be wrong, but that's interesting. The reason could be that mass gatherings tend to be brief, and involve short periods of exposure. [It's possible that people would be more at risk from getting to such gatherings, by touching subway poles, staying in unclean hotels, than by being at the meetings themselves.]

Immune System and COVID-19

Michael Tibbetts

Recent reports have suggested that COVID-19 disease is associated with a low number of B cells and T cells.[1,2] Why is this important?

The body's immune response to viruses:
The immune system's response to viruses is primarily mediated by two classes of cells, T cells and B cells. These cells produce proteins that recognize the virus and either target the virus directly, or identify cells infected with the virus and eliminate them.

What are B cells:
B cells are antibody producing cells, each able to produce one kind of antibody that recognizes one foreign substance (antigen). When we become infected with a virus, the B cells that make antibodies recognizing that virus get signals to divide and to secrete antibodies. This results in a large number of cells all pumping virus-specific antibodies into the system. Antibodies bind to the virus and can subvert its action in two ways. Their binding may get in the way of the virus' ability to bind molecules on cell surfaces, blocking them from infecting the cells. The antibodies attached to the viruses also act as flags that are recognized by other kinds of immune cells, which consume and dismantle the virus.

What are T cells:
There are two general classes of T cells, CD4+ and CD8+ that have distinct, important roles in an immune response. Like B cells they each carry their own specific antigen recognizing molecule, called a T cell receptor. Also, like B cells, each T cell carries a T cell receptor that can recognize one and only one antigen.

The CD4+ T cells are needed to mount a robust antibody response. B cells will not proliferate or start secreting antibodies unless there is also a CD4+ T cell that recognizes the virus. Think of this as a crosscheck to prevent an antibody response to one's own molecules (an autoimmune response).

The second class of T cells, CD8+, are responsible for identifying cells infected with the virus. While still inside a host cell, (initially, the epithelial cells of the lungs, in the case of SARS-CoV-2) viruses are invisible to antibodies. Antibodies exist outside of cells and can only bind to substances in the extracellular spaces and fluids of the body. If a CD8+ T cell recognizes a cell infected with a virus, it gives that cell a signal which causes it to dismantle itself from within, in an organized way. This process of apoptosis (cellular suicide) helps eliminate cells that have become virus producing factories.

Reduced numbers of T cells and B cells in COVID-19 patients:
Scientists don't yet know if the virus causes the reduced numbers of T cells and B cells in COVID-19 patients, or if people with already reduced T cell and B cell numbers are simply the ones that show the most significant clinical symptoms; the elderly and people with preexisting conditions. What we do know is the reduction in these cells is worse in people with severe cases. However, in most cases, the immune response is still active enough to ultimately clear the virus.

Based on these observations, at least one group of researchers is recommending the use of drugs that stimulate the immune system as a COVID-19 treatment.[3]

The reduced number of immune cells may also have implications for the ability of someone to develop lasting immunity to the virus, after having the disease. Typically, when one has a viral infection a strong B cell response is generated, and after the virus has been cleared some fraction of those proliferated B cells remain in our bodies as "memory" B cells. Since there are now more B cells that recognize this specific virus, if we become reinfected, the time it takes for the immune system to "see" and respond to the infection is drastically reduced. In ideal circumstances, shortened to the point that we never even realize we were infected.

For reasons that are still poorly understood, some viruses are better at generating lasting immunity than others. In the case of COVID-19, we just do not know either the degree of immunity or how long immunity lasts once someone has been infected with the virus. However, reduced numbers of B cells in people with the disease may mean that there are fewer memory B cells postinfection. The good news is that this should not have any effect on our ability to create a vaccine for the virus. Theoretically, since it is not accompanied by viral production, vaccination should simply create a surge in B cells, including memory B cells.

1. Qin C, et al. Dysregulation of Immune Response in Patients With COVID-19 in Wuhan, China. *Clin Infect Dis.* 2020. Mar 12 [Online ahead of print]
2. Chen G, et al. Clinical and Immunologic Features in Severe and Moderate Coronavirus Disease 2019. *J Clin Invest.* 2020. Mar 27 [Online ahead of print]
3. Lin L, et al. Hypothesis for potential pathogenesis of SARS-CoV-2 infection–a review of immune changes in patients with viral pneumonia. *Emerg Microbes Infect.* 2020. 9(1), 727-732.

Anthony Fauci's Petri Dish

Bruce Chilton

In 1987, Dean Stuart Levine together with Professor John Fout asked me to found and chair the Committee on AIDS, which reported regularly to meetings of the Faculty. It was a rewarding project, especially when it came to teaching accredited courses with the likes of Professor Jean Churchill. Many other faculty became involved, notably in dormitory settings; Professor Ethan Bloch was one of the most effective in that regard.

The chief challenge, apart from the logistics of providing good information and accessible prophylactics, was one of attitude. HIV provoked both unfounded fears as to how it might be contracted and resistance to admitting the actual means of contagion.

Although the Committee on AIDS acted across a broad front, the pivotal moment of its work, in my view, came with a visit to campus from Dr Anthony Fauci, who already directed the National Institute of Allergy and Infectious Diseases. Pelted with a series of questions during a public meeting, one inquirer asked whether you could become infected with HIV from working in a laboratory. Dr Fauci, with just a moment's hesitation, replied, "Only if you have sex in the Petri dish." He was and is an extraordinary communicator, as well as a fine scientist. That was a great teaching moment, one of those changes of intellectual and emotional rhythm that are felt long after the event.

Even as our minds are rightly preoccupied with when the peak of the COVID-19 outbreak will be reached, we will meet our students non-virtually again after that, possibly in the midst of new health advisories in regard to a range of behaviors, from travel to dealing with sinus infections. Even before then, they will continue to seek guidance from us; irrational fears and overconfidence still come naturally. So, it is wonderful to see these forums, and the prospect they bring of well-informed decisions.

I hope they will continue well beyond the peak that is soon to reach our area, because after that there will be continued challenges to our community, and far worse prospects in communities less privileged than ours, as in the case of AIDS today. Throughout, we might look for equivalents of Anthony Fauci's Petri dish, to convey where concern is rightly directed. Bard College is equipped to do that with unique effectiveness.