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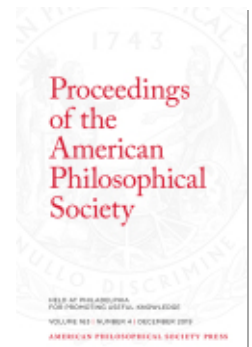
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The Past Is Never Dead. It's Not Even Past: The 1918 Influenza Pandemic and Its Lessons¹

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Thank you to symposium moderator Thomas E. Shenk for his introduction. I also want to thank one of the later speakers in this symposium, Peter Palese (published in this issue), for his help when I was working on my book, *The Great Influenza: The Story of the Deadliest Pandemic in History*. He was extremely helpful and deserves credit for what I got right when writing about the virology.

Periodically, at least 11 times in the last 300 years, a new influenza virus has jumped species from another animal into humans and caused a pandemic, most recently in 2009. But in the last 20 years an additional half dozen or so animal influenza viruses have also infected humans without—yet—causing a pandemic. Birds are the natural reservoir for all influenza viruses, and the most worrisome two viruses—the two most dangerous pandemic threats—are two bird viruses known as H5N1 and H7N9, which since 2004 have infected about 2,500 people and killed 1,500 people. That's a 60 percent mortality rate. So far, nearly all of the infected humans have been infected directly from close contact with birds, although there have been very few exceptions when close contact between family members spread disease. If either of those viruses were to acquire the ability to pass easily between humans, obviously we would have a problem. Such a pandemic almost certainly wouldn't have a 60 percent mortality rate, thankfully.

The reason these viruses are so lethal are the same reason they do not pass from person to person. Human influenza viruses, i.e., past pandemic viruses that have adapted to humans, bind to cells in the upper respiratory tract, which is why they transmit easily between people; these two viruses bind only to cells deep in the lung, so those infected start out with serious disease. To transmit disease easily between people, these viruses would have to acquire the ability to bind to cells in the upper respiratory tract, so in most cases the lungs would

1 Read 8 November 2019 as part of *The Next Influenza Pandemic* symposium.

not be infected or affected. The 1918 virus, however, did bind to upper respiratory tract cells, making it easily transmissible, while retaining the ability to bind to cells deep in the lung, making it deadly. This could of course happen again, and even a moderate pandemic could infect 60–100 million Americans, a couple of billion people worldwide, and cause millions of deaths. That's why when former CDC director Tom Frieden was asked what gave him nightmares, he said, "Influenza, it's always the worst-case scenario."

Something like a worst-case scenario did occur in 1918. Roughly two-thirds of the 50–100 million dead—and when you adjust for population that would be about 225–450 million people today—died in about 14 weeks beginning in late September. Normally, influenza kills the very young and the elderly. In 1918, the very young did suffer. Children under 5 died at a rate that would equal all-cause mortality in that age group today over a period of nearly 20 years. But the elderly escaped almost untouched—well over 90 percent of the excess mortality was in people under 65. Two-thirds of the deaths were adults aged roughly 18 to 45, and the peak age was 28. In virgin population areas that had never seen an influenza virus, things were much worse. In one village in Alaska, for example, 72 out of 80 people died in five days. In the Fiji Islands, 14 percent of the entire population died in 16 days.

The symptoms mimicked typhoid, cholera, and dengue. People could bleed not only from their nose and mouth but from their eyes and ears. Deaths could occur in 24 hours or less. To give you a more intimate sense of what it was like, I'll read you a letter that a doctor at Camp Devens in Massachusetts wrote to a colleague:

These men started with what appears to be an ordinary attack of influenza. When brought to the hospital they very rapidly developed the most vicious type of pneumonia that has ever been seen. A few hours after admission you can begin to see the cyanosis extending from the ears and spreading over the face until it is hard to distinguish the colored men from the white. It is only a matter of a few hours then until death comes. Pneumonia means in about all cases, death. We've been averaging 100 deaths per day. It takes special trains to take away the dead. For several days there were no coffins and the bodies piled up something fierce. It beats any sight they ever had in France after a battle. Goodbye old pal. God be with you till we meet again.

That was the disease.

Now, the course of every disease in an individual depends on the interaction between the etiological agent and the host. Similarly, the cause of any disease outbreak depends on the interaction between the

causative agent and the host society. In 1918, the host society was at war.

President Woodrow Wilson declared, “It isn’t an army we must shape and train for war, it is a nation . . . creatures of disloyalty, and anarchy must be crushed out.” Ralph Waldo Emerson said that an institution is the lengthened shadow of one man. Wilson’s shadow fell upon the government and in turn the country. Probably more than any other time in our history—more than the McCarthy period, more than World War II, more than the Civil War—the U.S. government demanded loyalty of its citizens.

Congress passed a law making it punishable by 20 years in prison to “utter, print, write or publish any disloyal, profane, scurrilous, or abusive language about the form of the government of the United States.” A U.S. Congressman was convicted and sentenced to 15 years in prison under that law. To enforce that law the Justice Department authorized a volunteer group called the American Protective League to carry badges identifying them as “Secret Service.” Nearly 200,000 people joined the group, spying on neighbors, investigating “food hoarders” and “slackers.” States outlawed the teaching of German. Sauerkraut was renamed “Liberty Cabbage.” Every day the *Providence Journal* carried a banner saying, “Every German or Austrian unless known by years of association should be treated as a spy.”

At the same time, concerned with keeping morale up, Wilson created something called the Committee for Public Information, and the architect of that committee said, “Truth and falsehood are arbitrary terms. There is nothing in experience to tell us that one is preferable to the other . . . The force of an idea lies in its inspirational value. It matters very little if it is true or false.” Soon they had 100,000 “four-minute men” who spoke before every public meeting—whether a gathering like this, a vaudeville show, a movie theater, or schoolboard meeting—and would give a brief talk designed to boost morale. At the same time, Army camps were banning anything that might depress morale, including songs like “I Wonder Who’s Kissing Her Now.” This was the societal host that the virus infected.

In September 1918 as it spread all across the country, public health leaders lied. The Surgeon General of the United States said, “There is no cause for alarm if proper precautions are observed.” Another national health official said, “The so-called Spanish influenza is nothing more or less than old-fashioned grippe.”

These pronouncements were echoed almost everywhere, and that same official position held forth no matter how bad circumstances got. Philadelphia was one of the hardest hit cities in the country—mass graves here in Philadelphia were being dug by steam shovels, while

priests were literally driving horse-drawn carts down the streets calling on people to bring out their dead. When the public health director finally closed schools, closed saloons, banned church services, cancelled sporting events, and banned all public gatherings, one of the newspapers here actually said, "This is not a public health measure. There is no cause for alarm." How stupid did they think people were?

With a neighbor or a spouse developing horrific symptoms, with people dying in less than a day, with bodies literally piling up, everyone certainly knew this was not an ordinary influenza by another name. As fear spread, as terror spread, as government and even public health leaders lied, trust in authority disintegrated. I think that ultimately society is based on trust, and without it you find only alienation and disintegration. That was compounded by the additional factors of fear and stress, always a potent combination. Society began to break apart.

In most disasters you see communities coming together. You see people behaving heroically and finding humanity in each other. In 1918, without any guidance from any authority as to what the true situation was or what to do, it became everyone for himself or herself. The head of volunteer efforts in a major city could find no one who volunteered. She said, "Hundreds of women had the vanity to imagine they were capable of great sacrifice. Nothing seems to rouse them now. They know families in which every member is ill and which children are actually starving because there's no one to give them food, still they hold back."

Now, this was occurring not only in large cities, but also in rural communities where family and community were supposed to be everything. As the Red Cross reported, "People starving to death, not from lack of food but because the well are afraid to go near the sick." And society began to break down. As one person put it, "The fear was so great people were actually afraid to leave their homes. It completely destroyed all family and community life. You couldn't play with your playmates, your classmates, your neighbors, you had no school life, you had no church life. People were afraid to kiss one another. Afraid to eat with one another. You were constantly afraid. You were quarantined by constant fear."

One of the slides that I showed was a picture of Manhattan with two city workers with masks in the foreground. It's a very undramatic picture until you start to think about it. There were cars parked on the curb but there was not a single car moving on the street. There was not a single pedestrian on the sidewalk.

Here in Philadelphia, Isaac Starr was a physician working in an emergency hospital 12 miles from his home. He saw so few cars on the road on his way home every night, he started counting them. One night

in a drive of 12 miles, in the third biggest city in the country, he didn't see a single other car on the road. He said, "The life of the city has almost stopped." Roughly the same time on the other side of the world in Wellington, New Zealand, a doctor stepped outside his emergency hospital at two in the afternoon and saw no one and nothing moving on the street except one ambulance. He said, "It's become a city of the dead."

Victor Vaughan, then head of Communicable Diseases for the Army, had been dean of the University of Michigan Medical School. He was a sober, serious scientist, not given to overstatement, but he said, "If the current rate of acceleration continues for a few more weeks, civilization could easily disappear from the face of the earth." Now, that of course didn't happen. The virus pretty much burned through all available fuel. There was another wave in the spring of 1919, lethal by any standard except the fall wave, but then it died down. That was 100 years ago. What's happened since? Where are we now?

For one thing, of course, we developed a vaccine. It's not a very good vaccine. Vaccines against some diseases, such as measles and yellow fever, can approach 99 percent effectiveness, but influenza vaccine effectiveness varies from year to year. It has ranged from the best-ever 60 percent effectiveness—meaning you are 60 percent less likely to get influenza than if you had not been vaccinated—down to 10 percent effectiveness. For the elderly on several occasions, unfortunately, it has at least once been measured as 0 percent effective.

We've also developed antivirals, which have very limited success or effectiveness. You could ask yourself, why is this the case? Why have we not accomplished more? The first reason is the difficulty the virus itself presents. You'll hear more about that later from other speakers. As a good friend of mine, an influenza expert, says, he knows much less about influenza today than he did 10 years ago. We just keep learning more about its complexity.

But the other reason is that for decades influenza was not taken seriously and did not get research dollars, nor did the vaccine manufacturers make money. Deaths from seasonal influenza in the United States have ranged from a low of under 10,000 to a high of over 60,000: a total of over 60,000 deaths from ordinary, seasonal influenza. The West Nile Virus in its worst year killed 283 Americans. Guess which disease got more funding from the Federal Government for Research? It was, of course, West Nile, or I wouldn't have said it. That was until 2004.

In 2003 and 2004, H5N1—one of the two bird viruses I mentioned earlier—resurfaced with a vengeance, and all of a sudden influenza was

taken very, very seriously by governments around the world. Since then in the United States alone there has been about \$4 billion invested in influenza. The bulk of that money actually went to infrastructure, such things as improving vaccine manufacturing technology and creating more U.S.-based vaccine plants, because most of the vaccines were imported. We also invested in surveillance of new viruses—for example, in 2004 alone the United States spent \$34 million helping China improve its surveillance—stockpiling antivirals and making and stockpiling vaccines against potential pandemic viruses. All those things help some, but they’re definitely not the answer. Unfortunately, the running clock prevents me from explaining why.

The second area of investment is one I’ve been personally involved in, and that’s trying to figure out what public health measures to take to mitigate a pandemic. They are referred to as “nonpharmaceutical interventions,” known in the trade as NPIs—what you do when you don’t have drugs. Most of these relate to social distancing, which is self-explanatory. I support these measures. I was part of the effort that came up with the recommendations, but I’m much less optimistic than most other people about how effective they’re going to be. I look at the real-world data in 1918, when many cities took aggressive measure, and the results are not reassuring. I think some of the positive results that have been attributed to public health measures in 1918 have better explanations. Modelers often point to St. Louis as a place where these measures—closing schools, theaters, churches, and so forth—had a significant impact on the course of the disease. But New York City and Chicago took absolutely no such measures at all and also had a relatively benign experience—if you can call 33,000 deaths in New York City benign. We know Chicago and New York had a significant spring outbreak during the first wave of the disease and we know spring exposure provided significant immune protection against the lethal second wave. I suspect but don’t know that St. Louis also experienced a spring wave. There is also very good but unpublished data from Army camps comparing those which imposed isolation and quarantine and those which did not; this is a sample of several million people, and quarantine had no statistically significant effect on the course of the disease in those camps. None. However, a qualitative study found that in the few camps—so few they did not register at all statistically—that rigidly enforced these measures and sustained that enforcement week after week after week, there was benefit. That analysis speaks to the difficulty of sustaining compliance with public health measures—if it’s so difficult in a military camp in wartime, how will a civilian community perform in peacetime.

For another thing, the effectiveness of any measure is going to depend on risk communication to gain compliance. Without compliance it's not any good. And that compliance has to be sustained for weeks. If you look at Mexico in 2009, the government recommended masks on public transit. I don't think they are much use anyway, but regardless they gave them away for free at subway stops and bus stops and so forth. Compliance peaked at 65 percent three days after the announcement, but four days later compliance was at 27 percent—four days. Obviously, this was not sustained compliance, yet sustained compliance is necessary if any NPI is to be successful because it's going to be a period of weeks that a virus is moving through a community. In fact, the most important lesson in my view from 1918 in terms of public health involves *risk communication*, which is a phrase I don't much care for because it implies management of the truth. I don't think you manage the truth; I think you tell the truth.

Earlier I had suggested that telling the truth would have kept society cohesive, integrated, and functioning. That hypothesis is actually supported by what turned out to be an almost perfect control in 1918. San Francisco, unlike practically every other city in the country, took it seriously. The mayor, city council, business leaders, and labor leaders all put their names on a big, full-page ad in the newspaper, in huge print: *Wear a mask and save your life*. Now again, the mask didn't do any good,² but that's a very different message than “this is ordinary influenza by another name,” and San Francisco functioned; when they closed schools, the teachers volunteered for everything from ambulance drivers to telephone operators, wherever they were needed, blocks were organized, nobody starved, and so forth. So, I think that control supports the hypothesis. Incidentally, San Francisco did take aggressive public health measures and yet had the fourth highest number of excess deaths in the country.

Truth-telling is incorporated in every pandemic plan I know about—at federal, state, and local level—but even if you have a perfect message and a perfect plan, executing it, staying ahead of the Internet, and so forth will depend on some political leader making the right decision. Messaging and the messenger present a very serious challenge with even a moderate pandemic, much less a serious one.

In 2009 in Mexico, the National Emergency Management head, who had designed their pandemic influenza plan, was not even allowed

2 Even in 1918 scientists recognized that putting a mask on someone sick was effective in preventing transmission, but they did not find masks effective for use by the general public. The difference between then and today is that asymptomatic and pre-symptomatic transmission occurs often with COVID-19, while influenza has virtually no asymptomatic transmission and a much shorter period of pre-symptomatic transmission.

into the meetings where they were deciding what to do until the Pan American Health Organization (PAHO) insisted that they include that person, or they wouldn't get any help from PAHO. And I applaud Mexico for its transparency. Mexico actually performed pretty rationally in 2009. Many countries did not. It's impossible to keep influenza out of a country, yet the Chinese Health Minister said, "This is a foreign disease and we will keep it out of China," and the government imposed stringent control measures at its borders. China ended up with 208 million people infected. France wanted the European Union to cancel all flights to Mexico, Egypt slaughtered all pigs, and even our own CDC had a bit of an overreaction.

The third area of investment since 2004 is most promising. This involves research. I believe careful examination of events in the 1889 and 1918 pandemics challenge some of what we think we know about the disease's epidemiology—who spreads the disease. Again, time constraints prevent me from going into detail. Some of these questions require interdisciplinary approaches where even an historian might make some contribution, and other major questions involve the laboratory.

To sum up where are we now, a strong case can be made—unfortunately—that we're more vulnerable today to even a moderate pandemic than we used to be. The main reason for this vulnerability is *just in time inventory*. In 1918, you had 40 percent to 60 percent absenteeism; even if you cut that number in half, and you have production line workers, air traffic controllers, truck drivers, and so forth out sick, what happens to your just in time inventory? What happens to your supply chain? Healthcare is actually one of the most vulnerable areas. We import practically every drug, every hypodermic needle, every surgical gown, but every industry would be affected by major supply chain disruptions.

So, what is the answer? It rests really in the hands of the next several speakers. It rests in the laboratory, and that is in a universal vaccine, a vaccine that will work against almost every influenza virus. Now, if we had taken influenza seriously over the decades instead of spending money on West Nile, maybe we'd have one by now. I know that there is great optimism, and I share that optimism, and I leave it to the next speakers to take care of you all, and me.