

- Female: Welcome to Conversations on Health Care with Mark Masselli and Margaret Flinter. A show where we speak to the top thought leaders in health innovation, health policy, care delivery and the great minds who are shaping the health care of the future.
- This week Mark and Margaret speak with Dr. Nicholas Christakis, Director of the Human Nature Lab at Yale, an author of *Apollo's Arrow* which examines the enduring impact COVID-19 will have on our future. Dr. Christakis is an expert on how social networks drive human behavior and health and breaks down how multiple systems including social media amplified misinformation yielding deadly results.
- Lori Robertson also checks in, the Managing Editor of FactCheck.org looks at misstatements spoken about health policy in the public domain, separating the fake from the facts. We end with a bright idea that's improving health and wellbeing in everyday lives. If you have comments please email us at chcradio@chc1.com or find us on Facebook, Twitter, or wherever you listen to podcast. You can also hear us by asking Alexa to play Conversations on Health Care. Now, stay tuned for our interview with Yale's Dr. Nicholas Christakis here on Conversations on Health Care.
- Mark Masselli: We're speaking today with Yale's Sociologist and Epidemiologist Dr. Nicholas Christakis, Director of the Human Nature Lab and Co-Director of Yale Institute for Network Science. He's Sterling Professor of Social and Natural science at Yale University.
- Margaret Flinter: His research is focused on how human health and biology are impacted by social networks. He's written over 200 articles and several books, including his latest *Apollo's Arrow: The profound and Enduring Impact of Coronavirus on the Way We Live*. Dr. Christakis, we welcome you back to Conversations on Health Care today.
- Dr. Christakis: Thank you, Margaret and thank you, Mark.
- Mark Masselli: All right, Nicholas, and what a great read *Apollo's Arrow* and you wrote it right at the height of the pandemic. It seemed to have provided you a fertile testing ground for many of the theories that you've expounded upon on social networks and health. You said that you were appalled and ashamed by how badly our country did in the crisis. What surprised and captivating you most about the behaviors you witnessed as the pandemic rolled over our shores?
- Dr. Christakis: Well, I think it's very important to understand that these respiratory pandemics come every 10 or 20 years, and serious ones come every 50 or 100 years. This way we've come to live right now feels very alien and unnatural, but it's none of those things. I mean, plagues are an ancient part of human experience. They're in the Bible. They're in the alien, you know, and one of the oldest works of western literature

that we have. They're, they're in Shakespeare. They're in Cervantes.

We have expertise in our society. We have medical historians, we have epidemiologist. Tony Fauci was writing about respiratory pandemics when I was in high school, so there's a lot of knowledge and tradition about this. Plagues are not new to our species, they're just new to us, so we think this is crazy what's happening to us, but it's not, so they come. These pandemics have rightly been seen as national security threats for decades by Republican and Democratic administrations, and so you would think we would have been better prepared. I don't think anyone looking at the American response would say that we've done a good job.

Margaret Flinter: Well, I guess they do come every 50 to a 100 years, but having been in health care all my adult life, it still was a little bit of a surprise to me how things played out. Maybe I shouldn't have been surprised that not all people are inclined to act for the public good. We really saw this play out with masking. I think you described this in your book, I wear a mask to protect you, you wear a mask to protect me, therefore, we all wear mask. We have a life saving vaccine, still a lot of people refusing it or worse convincing others not to get it. You've made the point that, maybe altruism needs to be enforced in a crisis of this magnitude. What do you mean by that, and can you ever enforce altruism?

Dr. Christakis: Well, I know that sounds oxymoronic and the title for that was picked, you're referring to an article I published in The Atlantic, but the gist of the idea is, is that plague is a collective threat. There's certain kinds of threats that we, our species confronts that are collective in nature, for example, being attacked by an invading army, or we're trying to bring down in our evolutionary past we're trying to kill a mastodon right takes like 20 people working together, otherwise, they get --- mastodon can squash any one of us acting alone. We evolved a set of tools in our evolutionary past to cope with these types of collective challenges. These tools include sort of lights pressure that we pose on each other.

One of the examples I give is, is that when we leave our house in the morning, we all put on our clothes because of social norms. Those are examples of light pressure by which we work together to create a kind of collective kind of society that we want to live in. But we've also evolved capacities to up the ante, for example, we've evolved the capacity for punishment. Think about the times, for example, when you've seen someone act poorly on a highway and you beep your horn, you're kind of administering a small admonition, of course, we've evolved all kinds of other ways to if people act in an antisocial way, we sanction them. We've all to have leaders and to like a little bit of leadership, not too much. But we'd also don't like complete

egalitarianism, either these desires for policing, these capacities for punishment, these taste for conformity, which can also be bad by the way. These are all tools, we evolved to try to get us to work together in order to confront very particular kinds of threats that threaten us as a whole.

A plague is such a threat. So your failure to wear a mask or your failure to be vaccinated can harm me, it's not just something about your choices, and therefore that is a collective threat. Therefore, we are want to use some of our --- these ancient tools that we evolved to kind of get us to work together to confront the threat. Coping with a plague requires a certain amount of cooperation, and to the extent that we don't cooperate, our responses inadequate to our individual and collective detriment.

Mark Masselli: It seems to me what fed the threats certainly added to the threat was this some bad actors and misinformation that were going on at the same time, right. What seems to be different this time is that the misinformation had a force multiplier in its spread, called Facebook, which as we know, is currently being scrutinized for allowing false information about the pandemic and vaccine, really to thrive on that platform. How would you apply the lens of what we now know about Facebook as you think about the history of this? What's your sense about the role that Facebook played in compromising our response to the pandemic?

Dr. Christakis: Well, I'm glad you brought that up again, because your first question was actually a question about how our response was inadequate. One of the ways it was inadequate is, is that as a nation, both our leaders and our citizenry happily engaged in denial. Now, denial and misinformation are ancient features and plagues. We have accounts going back hundreds of years, thousands of years of people spreading rumors, lie, superstitions, the emergence of quack doctors selling all kinds of nostrums that don't work have been described for thousands of years.

There's a wonderful account, I think it was the Plague of Justinian 1500 years ago where a commentator says, you know, the rumors have spread in the city that if you throw pots from the second floor of your house, and the pots crash on the street, it will ward off the danger, the plague. This observer said, now he goes because of his crazy superstition, it's more dangerous to walk through the city for fear of being hit by a pot than it is because of the plague.

Margaret Flinter: Keeps everybody inside.

Dr. Christakis: Yes. But the point is, is that people have been spreading superstitions and rumors about plagues and also engaged in denial. Denial is a normal human psychological defense. But here's the problem, our

denial was, first of all, in our lies about the plague were facilitated by these online media, which I'll come back to, but relatedly or distinctly, we had another problem, which was our leaders lie to us. I understand the fact that lies are a part of plagues. In fact, I do write about it, but you would expect the White House as the plague was bearing down on us not to engage in denial. Other leaders of other wealthy democracies also were incompetence, although not all were. Angela Merkel did a good job. Jacinda Ardern did a good job in New Zealand, there were leaders of rich democracies that did good jobs. It's not an excuse. In my view, I expect more from the United States. I expect more from the President.

I understand that there's a normal human desire to deny what's happening, but not from the President. The President was saying it'll go away, it will go away. When there were five cases it will go away. When there are 500 cases, it will go away. When there are 5000 cases it will go away. It never went away. He kept saying it would go away. Just to be clear, so this is --- I'm not seeing as overly political, there were also Democratic governors who were incompetent and weren't taking this threat seriously. But the White House is the White House and we now know the White House was capably advised by the NSA and the CDC about the nature of this threat.

I and my epidemiologist colleagues knew that this was going to be a serious pandemic by the end of January 2020. And if I knew that, it is quite reasonable to expect that the President of the United States would have more information than me. This, we now know this to be true, and this was ignored to our great peril.

Let me be clear, from the moment this virus leaped into our species and started spreading, a certain amount of our fate was sealed. Hundreds of thousands of Americans were going to die. This is a bad pathogen that killed many people. I said that between half a million and a million Americans would die. We're now at 750,000 and we'll probably approach a million which was the upper limit of what I had said would happened. It was possible to know what was going to happen in this situation, and we rightly would have expected the White House to act accordingly and to prepare our country for this to provide for PPE, to get ventilators, to get testing to work, to prepare the American people with facts and information for the shared challenge that we would face, and for the need for sacrifice. We would have to sacrifice some of our liberties. We would have to sacrifice some of our money. This is not going to be easy.

Instead, from the moment the virus was loose, we were going to lose a couple of 100,000 lives. But if we had acted better, we would not have lost as many lives. We have, in my view, lost several 100,000 more Americans than we needed to have lose had we acted with

greater alacrity and prudence and sagacity.

Margaret Flinter: We've been following your work for quite a while. We remember the very interesting work at Harvard that you did a few years ago on social networks and how things spread through social networks. I think you've looked at both happiness and influenza. That data provides insights into how we could do better at predictive surveillance. We know we have a much greater capacity to collect data from all sorts of sources. But we didn't really leverage those tools to get out in front of the COVID crisis. Maybe we hadn't felt the need to do that before. What are your thoughts? How do we build a better working data surveillance system for future disease outbreaks? What do you think about that?

Dr. Christakis: Let me give a two part answer, if I might to that. One is a sort of a geeky answer to the paper you're alluding to which I think some cool ideas there. The first part of my answer on the geeky part, the state of epidemic monitoring in our country, in the past, for example, annual influenza monitoring was typically that there were reporting laboratories around the country. They would, as people were tested for influenza or other diseases, would send those reports to the CDC where they would be aggregated, such that with some lag four to six weeks from now, the CDC might have a sense of what was happening in the country today. Four to six weeks from now, we might know what was happening in our country today.

But 10 or 15 years ago, now, Larry Brilliant, and his colleagues published a paper that influenced people a lot on using big data techniques. For example, using searches for flu symptoms on Google to be able to instantly know based on the aggregate observation in real time of people's behavior where the epidemic is today. We could use real time monitoring of some kind of data, whether it's search behavior, whether it's human mobility data, something my lab has done, to get a sense of where an epidemic is today. But we published a paper that you're alluding to about 10 years ago that showed that it was possible to use certain tricks to predict where the epidemic would be in the future.

If you imagine a social network, you should have the intuition that some people will be in the middle of the network, they'll have many friends and their friends will have many friends. If we can identify people who are in the center of the network, you should have the intuition that something that's spreading in the network, whether it's a germ, or gossip, will reach the popular people in the middle of the network sooner earlier in the course of the epidemic. Anything that spreads, the network's going to reach them quickly and soon, whereas the average person will be reached at the average time, and the peripheral person will be reached by the germ late in the course

of the epidemic.

Our innovation was to say, if you could identify such central people in networks and passively monitor them, they would forecast the course of the epidemic. In fact, this is why early in COVID-19, all these movie stars, and politicians were getting sick, because they are popular. They are interacting with lots of people. They are shaking lots of hands. It's not just that they were celebrities, and so we heard about their COVID, they actually were more likely to get sick. Monitoring popular people is a way to predict like a canary in the coal mine, where the epidemic will be in the future.

In fact, my laboratory has been working on some techniques of this kind that allow such forecasting not only for epidemics, but also for product adoption, for what are going to be popular toys or ideas in the future. But the more serious part now that we've been taught a lesson, so to speak. Keep in mind that the plague we just had is a kind of plague light. This pathogen is a serious pathogen, it kills 1% of the people that it infects, but only 1%. Things like smallpox or cholera or Bubonic plague or Ebola kill huge fractions of the people they infect. We should count ourselves lucky that we are dealing with this pathogen, this pathogen could have been so much worse. There's no god given reason this pathogen doesn't kill 10% or 30% of the people that it infects. Like in the movie Contagion, that pathogen killed about one out of three people that it infected. We could have been facing that.

I don't think the American people yet realize the full extent of damage done by this plague and the extent of damage that causes could have been done by this plague had the pathogen been a little bit worse genetically, nor do they realize how much damage could be done by other plagues in the future. Here is what I can say about that. Other scientists have been studying the frequency with which new pathogens move from wild animals into our species. HIV was such a disease these are called zoonotic diseases, diseases of animals that come to humans.

HIV, Zika, a SARS-1 in 2003, now the SARS-2 that we've had, influenza from 1918, the Great Influenza, these are all diseases that started in animals spread to humans. There's evidence that these diseases are rising, even in our lifetimes you're reading more reports of these diseases, partly because of climate change and population growth. We're coming into greater contact with wild animals and we're getting their diseases.

Second point, there's evidence that respiratory pandemics as a subset of all plagues are also increasing in frequency that the duration between them is shortening. All of this should give us tremendous concern that although we're putting the COVID-19 pandemic behind

us within a year or two or three, new ones might be on the horizon so we need to prepare our public health infrastructure and ourselves for this possibility.

Margaret Flinter: Absolutely.

Mark Masselli: We're feeding today with Yale sociologists and epidemiologist Dr. Nicholas Christakis, Director of the Human Nature Lab and Co-Director of Yale Institute for Network Science. He's the author of *Apollo's Arrow*. Dr. Christakis talk a little bit about the during ways the pandemic will continue impact our lives. Vaccine science and research has exploded the new mRNA platform being utilized so effectively, and we saw this boom in telehealth as well. What changes do you think our hope for will endure beyond this phase of the pandemic, strengthening the infrastructure, both nationally and internationally. Look into your crystal ball and tell us what might be coming about.

Dr. Christakis: First, on an overarching level, this pathogen is going to become endemic, right, it's going to be with us forever, it's going to enter into the background risks that we all face. Look, what's going to happen now is every person on the planet with few exceptions, a small percentage of lucky people, either will be infected by the virus, or will get vaccinated, those are your choices. If you get infected with a virus, you run a 1% chance of death. If you get vaccinated, you have like a one in a million chance. It's obvious you should get vaccinated just from a point --- that point of view, and that's --- and we're going to all have to wait until we reach a very high percentage of people that have been acquired immunity till we reach the so called herd immunity threshold. At that point, the epidemic growth phase of the virus will stop. There will just be a few cases in the background just like we think of measles. None of us are worried about epidemic measles. There's an occasional case of measles in this country every year. But it's really not something we're worried about because enough of us have been immunized. That's sort of what's going to happen with COVID, it's going to eventually become endemic.

Second point, you can think of the pandemic as having three phases, the immediate phase, which is when we're feeling the biological and epidemiological shock of the virus, as the virus rips through our species. That's going to last until 2022 when we reach this herd immunity threshold. Then we're going to put the epidemic phase of the virus behind us but we're going to have to clean up the mess. We're going to have to cope with the clinical psychological, social and economic aftershocks of the virus during the intermediate phase, and that will take until 2024 judging from past pandemics.

Then we will enter the post-pandemic phase, which I think it's going to be a little bit of a party. It's like a tsunami washed ashore, devastated the countryside. Finally the waters recede, but we've got a

big mess to clean up. If you think about it, one thing that's not getting enough conversation is the fact that probably five times as many people as die of the germ will become disabled. I'm not talking about short or long COVID, I'm saying you've recovered, but your body has been harmed. You've got pulmonary fibrosis, cardiac problems, renal insufficiency, a neurologic or psychiatric deficits, pancreatic problems. We know that this pathogen can affect many organ systems. We estimate that probably five times as many people as die of this pathogen will have some kind of long term disability.

If a million Americans die, that's five million Americans are going to need the care of the health care system. This will cost money, it will be a burden to our system. Keep in mind as a benchmark we have 750,000 Americans with end stage renal disease, so five million more Americans with disability is not a joke. We're going to have to cope with that during this intermediate phase. We're going to have to get care for these people.

We're going to have to cope with a psychological aftershocks. People will be grieving the loss of their loved ones. Millions of children have missed school. Millions of workers have lost their jobs. These people have psychological deficits as a result of this. Economic problems we're going to have to deal with. We're borrowing trillions of dollars from the future. Right now, Larry Summers and David Cutler, Health Economist at Harvard, published a paper that called this the \$16 trillion virus. \$8 trillion in economic damage, and \$8 trillion in the loss of life, disability and illness. This is a economic catastrophe that surpasses the Great Depression, and people don't see it yet because we're borrowing money from the future to cover up right now, what's happening. This is as if the homes of tens of millions of Americans had just been burned to the ground, the destruction of wealth caused by this virus, in addition to the structure of life is huge. People, I don't think quite get it yet.

But eventually, we will enter the post pandemic phase, we will put all this behind us because life does return to normal. Plagues always end. I think that period of time will be like any other period, when humans go through a crisis, like a war, or an earthquake or a famine, people will rejoice. We will be greatly relieved to see the other side of it. I think that will be a little bit like the roaring 20s of the 20th century after the 19 pandemic. I think we're going to see all kinds of changes in our political life. I think we're going to see an entrepreneurship, a kind of boom in entrepreneurship. I think this mRNA platform, and the Zoom technology that you mentioned are here to stay and are going to change our lives. I think the hospitality industry is eventually going to recover. But in the short term, I think we're going to see a lot of changes in how people use hotels, and in restaurants in airports. There are going to be some changes in the way we live over the next

five years or 10 years. But eventually it will end.

I need to say one other thing. There's this joke, I don't know if you guys know it. Surgeons have this joke, bleeding during surgery is very stressful for surgeons, and finding what's bleeding is very stressful. The bleeding is very bad for the patient. The surgeons have a kind of a riddle saying, which is that all bleeding stops, eventually. Eventually, you got a control of the bleeding, and if you don't, the patient dies and then it stops anyway. The application to plagues is that all plagues and eventually what we really care about is how does it end? Like what do we do between now and that end? That is ideal from our perspective that minimizes the loss of life and the disruption that is being caused to us by this infinitesimal thing?

Margaret Flinter: How does it end, and also what do we do next, I can't resist asking you to just apply. It seems historically these major disasters like plagues also precipitate changes in our health care system, how we adjust to deal with it. Certainly 2020 and 2021 shone a very bright light on health disparities and health inequity. At the same time that millions of people probably had the experience for the first time in their adult lives of getting a health care service in the form of a vaccine without having to show an insurance card or a citizenship card or put money on the table. If you look forward with your kind of forecasting, do you see any major changes in our health care system or public health infrastructure that will be the legacy in a positive way?

Dr. Christakis: After the 1918 pandemic, there was huge improvements in microbiology, the science of microbiology got a big boost. Public health investments got a big boost. People treated infectious diseases differently. Of course, there was a ton of research on antibiotics that began in the 1930s with the discovery of many of the sulfonamides and then the penicillin antibiotics. I think and as you already alluded to, there's this mRNA vaccine technology plus the adenovirus vaccine technology, plus the recognition of the importance of testing in a public health system. I think money will be redirected in these rational ways.

I think we've already talked about some of the pragmatics, people are going to begin to question why are so many health care services tied to insurance -- practices are tied to insurance. You don't really need to see the doctor personally for a prescription refill. Why don't you just do a Zoom call or many things can be done by Zoom more efficiently benefiting the doctor and the patient. Licensing regulations, you know, all those were suspended. I have licensed, I have my medical license in a couple of states, Massachusetts and Connecticut, really Why? Why do I have to be remain licensed in two states? I mean, this is a relic of a time when there was a lot of quack doctors and states

were trying to keep unqualified doctors out from --- we don't have that system anymore. We don't need to stick with state based licensure. There should be rest, just like your driver's license.

I think there are going to be a lot of these I would call them intermediate kind of impacts, the bigger impacts, I think, will have to do with how the health care system is perceived. Like if there are political changes in our country, and often plagues lead to a kind of leftward tilt in politics with the proviso that the government has to be competent, but things like that I think worker demands rise after plagues. I think this as you alluded to this demonstration that hey, I could get free health care, that was pretty nice, maybe other things should be free to not just things related to contagious diseases. Maybe that will provide some political oomph and demands by the citizenry for a different way of covering the expense of health care. Yes, I think some of these things may happen. I do think there will be a legacy of this plague on our health care system and not just on the health of the public.

Mark Masselli: We've been speaking today with Yale's Sociologists and Epidemiologist Dr. Nicholas Christakis, Director of the Human Nature Lab and Co-Director of Yale Institute for Network Science. He's the author of *Apollo's Arrow: The Profound and Enduring Impact on Coronavirus on the Way We Live*. You can learn more about his groundbreaking work by going to www.humannaturelab.net and you can follow him on Twitter @NACChristakis. Nicholas, we want to thank you for your deep intellectual curiosity for providing insights into what drives the human behaviors around health and for joining us today on Conversations on Health Care

Dr. Christakis: Mark and Margaret, thank you so much for having me.

[Music]

Mark Masselli: At Conversations in Health Care, we want our audience to be truly in the know when it comes to the facts about health care reform and policy. Lori Robertson is an award winning journalist and Managing Editor of FactCheck.org, a nonpartisan, nonprofit consumer advocate for voters that aim to reduce the level of deception in US politics. Lori, what have you got for us this week?

Lori Robertson: In early September, President Joe Biden announced a plan for vaccination mandates for some employers, the specifics haven't been determined yet. But misleading claims about which employers will be exempt have been circulating online. One viral version of the claim list 11 businesses, government branches or federal agencies as being, "exempt." That list includes a mixture of entities that are actually covered under the mandates, some that are not covered, and some that might be covered, but it's unclear without more guidance about

the directives.

A taskforce is developing guidance on implementing Biden's executive order requiring federal employees to be vaccinated. Separately, the Occupational Safety and Health Administration or OSHA is tasked with developing a rule for employers with 100 or more workers that would require employees to get vaccinated or get tested at least once a week.

Employees at the White House and in agencies within the Department of Health and Human Services are subject to Biden's executive order requiring vaccination. That means employees at the Centers for Disease Control and Prevention, the Food and Drug Administration and the National Institute of Allergy and Infectious Diseases are required to be vaccinated. The order only applies to executive branch employees.

Claims circulating on social media also falsely say employees at Pfizer and Moderna are exempt. Both companies already require their employees to be vaccinated. That's my fat check for this week. I'm Lori Robertson, Managing Editor of FactCheck.org.

Margaret Flinter: FactCheck.org is committed to factual accuracy from the country's major political players and is a project of the Annenberg Public Policy Center at the University of Pennsylvania. If you have a fact that you'd like checked, email us at chcradio.com, we'll have FactCheck.org's Lori Robertson check it out for you here on Conversations on Health Care.

[Music]

Margaret Flinter: Each week conversations highlights a bright idea about how to make wellness a part of our communities and everyday lives. Mosquitoes are considered one of the deadliest animals on earth, leading to hundreds of millions of illnesses and some 2.7 million deaths per year globally. Diseases such as malaria, dengue fever, and Zika are on the rise.

Dr. Scott O'Neill: There is this one mosquito called *Aedes Aegypti* that transmits a range of different viruses to people. Viruses like yellow fever, dengue fever, Zika, and the consequences can be very dire.

Margaret Flinter: Dr. Scott O'Neill is the director of the World Mosquito Program, which has developed an innovative approach to eradicating the threat.

Dr. Scott O'Neill: I was particularly interested in this bacterium called Wolbachia. This bacteria is present in up to 50% of insects naturally, but not this one mosquito that transmits all these viruses. When we put the bacterium into the mosquito the viruses couldn't grow any longer in the mosquito. We're seeding populations of mosquitoes with our own, mosquitoes that contain Wolbachia. We're able to spread the

Nicholas Christakis

mosquitoes across very large areas very quickly. Once the mosquitoes have it, they're protected from being able to transmit viruses.

Margaret Flinter: Dr. O'Neill's team released the genetically modified mosquitoes into a targeted area and the results showed a dramatic reduction in human infections.

Dr. Scott O'Neill: In Northern Australia we deployed the Wolbachia over quite large areas, entire cities, and we've seen essentially a complete elimination, 96% reduction in dengue in those cities. We believe if we can scale this intervention across entire cities, we can completely prevent the transmission of diseases like dengue, Chikungunya, and Zika.

We're hoping that over the next five years, we could bring this technology to protect 75 to even a 100 million people. We would hope that within 10 years we could bring this intervention to 500 million people.

Margaret Flinter: The World Mosquito Program, an effective targeted genetic engineering approach to eradicating the threat of deadly mosquito borne pathogens, leading to a dramatic reduction in harm to public health, now that's a bright idea.

[Music]

Mark Masselli: You've been listening to Conversations on Health Care. I'm Mark Masselli.

Margaret Flinter: And I'm Margaret Flinter.

Mark Masselli: Peace and Health

[Music]

Female: Conversations on Health Care is recorded at WESU at Wesleyan University, streaming live at www.chcradio.com, iTunes, or wherever you listen to podcasts. If you have comments, please email us at www.chcradio@chc1.com or find us on Facebook or Twitter. We love hearing from you. This show is brought to you by the Community Health Center.