EXPOSURE NOTIFICATION AND CONTACT TRACING: HOW AI HELPS LOCALITIES REOPEN SAFELY AND RESEARCHERS FIND A CURE

VIRTUAL HEARING

BEFORE THE

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WITNESSES

WEDNESDAY, JULY 8, 2020

APPENDIX

EXPOSURE NOTIFICATION AND CONTACT TRACING: HOW AI HELPS LOCALITIES REOPEN SAFELY AND RESEARCHERS FIND A CURE

Wednesday, July 8, 2020

U.S. HOUSE OF REPRESENTATIVES,
TASK FORCE ON ARTIFICIAL INTELLIGENCE,
COMMITTEE ON FINANCIAL SERVICES,
Washington, D.C.

The task force met, pursuant to notice, at 12 p.m., via Webex, Hon. Bill Foster [chairman of the task force] presiding.

Members present: Representatives Foster, Porter, Casten, Adams, Garcia of Texas; Loudermilk, Budd, Hollingsworth, Taylor, and Gonzalez of Ohio.

Ex officio present: Representative Waters.

Also present: Representative Himes.

Chairman FOSTER. The Task Force on Artificial Intelligence will now come to order. Without objection, the Chair is authorized to declare a recess of the task force at any time.

Also, without objection, members of the full Financial Services Committee who are not members of this task force are authorized to participate in today's hearing.

Members are reminded to keep their video function on at all times, even when they are not being recognized by the Chair. Members are also responsible for muting and unmuting themselves, and for muting themselves after they have finished speaking.

Consistent with regulations accompanying H. Res 965, staff will only mute members and witnesses as appropriate when not being recognized by the Chair to avoid inadvertent background noise. Also, all House Rules related to order and decorum apply to this remote hearing.

Today's hearing is entitled, "Exposure Notification and Contact Tracing: How AI Helps Localities Reopen Safely and Researchers Find a Cure."

I will now recognize myself for 4 minutes to give an opening statement.

Good morning. Today's hearing will focus on the essential tradeoff incumbent upon us to make between life, liberty, privacy, and the pursuit of happiness. And the role that technology, financial transaction data, contact tracing apps, and artificial intelligence, in particular, may be able to play to improve that essential tradeoff. And there will be a tradeoff.

Americans have come to see privacy as an essential part of liberty, and the tradeoffs between privacy and State interests are something that we struggle with continually on the Financial Services Committee. If one's only concern were life and the pursuit of happiness, and crushing the COVID-19 virus as quickly as possible, one can imagine setting up a dystopian surveillance state where every credit card purchase, every web search query, and the exact locations of every cell phone were continuously monitored, and where AI-powered facial recognition cameras would record one's every move, and not only when you are buying groceries at Whole Foods, but everywhere you went.

This would be an epidemiologist's dream and would likely allow whatever country implemented that to very rapidly crush the coronavirus pandemic. Whenever someone tested positive, their credit card purchases, their cell phone data, all of their financial data, and other data would be immediately analyzed. And, in fact, some press reports indicate that Korea, an otherwise apparently free country, finds credit card data to be a key component in effective contact tracing.

This aggressive approach would allow for faster scientific understanding of the spreading mechanisms as well. AI learning algorithms might rapidly learn that you are, for example, much more likely to spread the disease if you happen to buy three beers at the bar than if you bought only one. And cell phone location data would indicate to whom you were likely to have spread it. Such an AI-enabled pandemic surveillance state would correctly identify in real-time, for example, that superspreader individuals almost never wore masks in public. And that churches and sports events were especially dangerous places to congregate. But a surveillance state like that would automatically warn Black Lives Matter protesters to disburse, and there are a huge number of worries along those lines.

And this is not science fiction. It is essentially the same technology that has protesters in Hong Kong fighting for their liberty. Such surveillance societies might well save lives and maximize life, and arguably, even part of the pursuit of happiness, and perhaps it would even maximize economic liberty by opening our economy sooner, but this would come at a tremendous cost to individual privacy and liberty.

The tradeoffs that we make responding to COVID-19 have real financial and economic impacts. A recent study by Goldman Sachs quantified the tradeoff between mandatory masking policies, which are unquestionably an infringement on personal liberty, and economic growth. They found, unsurprisingly to scientists, that mandatory masking policies have a negative impact on the spread of COVID-19 but a positive impact on economic growth.

This allowed countries with mandatory masking policies to reopen their economies sooner, while maintaining acceptable COVID-19 infection rates, thereby successfully, in that case, trading off the loss of liberty for mandatory masking for an increase in economic liberty from early reopening of their retail economy.

Contact tracing apps together with back-end AI that combines the raw data from cell phone tracking in various forms with other data sources, including financial data that COVID-positive patients

might opt into on a voluntary basis, has the potential to capture some of the health and economic benefits of much more intrusive [inaudible] Privacy for those who opt in.

At this hearing, we have expert practitioners experienced in the development of privacy-preserving contact tracing software in real-life tracing in pandemic situations and reducing discrimination in technology.

So, I look forward to hearing from our witnesses, and I now recognize the ranking member of the subcommittee, Mr. Loudermilk, for 5 minutes.

Mr. LOUDERMILK. Thank you, Mr. Chairman. And a special thank you to our witnesses for being part of this hearing today.

Today, we will discuss how local, State, and Federal Governments, as well as businesses, schools, and other organizations can take advantage of modern technology to help [inaudible] Technology could be useful is in contact tracing.

The manual method of contact tracing involves public health officials speaking with individuals who have the virus to identify people with whom they had close contact during the time they have been infectious, notifying those people of their exposure and referring them for testing.

In a nation with about 330 million people, it is difficult to do manual contact tracing on a mass scale. However, there are encouraging technologies that can enable contact tracing to be done with smartphones, including Bluetooth or other location data to track peoples' movements and match them to the movements of others who have been exposed to the virus.

In order for digital contact tracing to work, it must have strong participation from citizens. Experts estimate that 40 to 60 percent of the population in a given area would need to participate in a contact tracing system for it to be effective. This means in the United States, where participation and contact tracing is voluntary, and should be, and is handled primarily by State and local public health officials, citizens will need to trust the apps that they are using and feel confident their privacy will not be violated.

In order to have that trust, it is critical that citizens understand what data will be collected, who will have access to the data, and how the data will be used. [inaudible] For digital contact tracing have been low in the United States and in other parts of the world. Recent polling indicates that about two-thirds of Americans would not trust a contact tracing app developed by a Big Tech company or the Federal Government. And in some European countries where their federal government has released a contact tracing app, less than 3 percent of the population is using the app.

Some authoritarian countries, like China, have increased participation by making contact tracing apps mandatory and have used digital payments and social media platforms to track citizens' movements. Needless to say, that will not and should not happen in the United States.

Given that privacy will be paramount, a major limiting factor in our ability to implement nationwide digital contact tracing is that we do not have a Federal consumer data privacy law, nor do we have a national data security and breach notification standard. Contact tracing is operating under a patchwork of State laws, and

the circumstances we are dealing with today only increase the need for a national standard.

Committee Republicans have been working diligently to develop a consumer data privacy proposal without a national consumer data privacy protection law. This issue is best left up to the States. Another limiting factor is that the accuracy of digital contact tracing apps has been questionable and could result in false positives or false negatives.

The CDC stated in its guidelines that more data is needed to assess the true public health value of digital contact tracing. Criminals have also been posing as contact tracers to ask consumers to share their Social Security numbers or bank account numbers, which can subject consumers to fraud and further reduce the public's trust in contact tracing.

Another challenge is that low-income and homeless individuals who have been disproportionately affected by the virus often do not have a smartphone, which limits the effectiveness of digital contact tracing in those populations. While these are important topics to address, they generally are not Financial Services Committee issues. It is best to have the appropriate committee address them, and the Energy and Commerce Committee will have a hearing on some of these issues tomorrow.

I look forward to hearing from our witnesses, and I yield back.

Chairman FOSTER. Thank you. The Chair will now recognize the Chair of the Full Committee, Chairwoman Waters.

Chairwoman WATERS. Thank you very much, Chairman Foster. I thank you for holding this hearing. Containing and preventing the further spread of the coronavirus is essential to protecting our economy.

While last week's employment figures demonstrated a slight rebound, the number of coronavirus cases is sharply increasing, and State reopenings have halted or reversed. Contact tracing and limiting the period of the coronavirus is critical for all aspects of our economy, including financial institutions that may bring workers back to the workplace.

I look forward to hearing our expert panel discuss how artificial intelligence and other technologies can be used in an inclusive manner to help contain the coronavirus, and ultimately, keep people safe.

I want to thank you, and I yield back the balance of my time.

Chairman FOSTER. Thank you.

Today, we welcome the testimony of, first, Brian McClendon, the CEO and co-founder of the CVKey project, which is building a suite of privacy-first open-source applications to help communities reopen responsibly without compromising privacy. Previously, he was vice president and co-founder of Google Earth and Street View and vice president of mapping at Uber.

Second, Dr. Krutika Kuppalli, an infectious diseases physician, who has previously worked on the front lines of various humanitarian responses, including the 2014 West Africa Ebola outbreak and the current DRC Ebola outbreak and novel coronavirus outbreak.

Third, Andre M. Perry, a fellow at the Metropolitan Policy Program of the Brookings Institution, whose research is focused on

race, structural inequality, education, economic inclusion, and, since the onset of the COVID-19 pandemic, the underlying causes of the outsized number of coronavirus-related deaths in Black communities.

And finally, Ramesh Raskar, a professor at MIT Media Lab, where he focuses on machine learning and imaging for health and sustainability. He is also the founder of the PathCheck Foundation, a global nonprofit, building open-source software and standards for digital contact tracing and exposure notification to stop COVID-19.

Witnesses are reminded that your oral testimony will be limited to 5 minutes. A chime will go off at the end of your time, and I ask that you respect the Members' and other witnesses' time by wrapping up your oral testimony as scheduled.

And without objection, your written statements will be made a part of the record.

Mr. McClendon, you are now recognized for 5 minutes to give an oral presentation of your testimony.

STATEMENT OF BRIAN MCCLENDON, CEO, CVKEY PROJECT

Mr. MCCLENDON. Chairman Foster, Ranking Member Loudermilk, and members of the task force, my name is Brian McClendon, and I am the CEO of CVKey Project, and also a research professor at the University of Kansas. Previously, I spent 10 years leading the teams that built Google Maps and Google Earth, Street View, and many other georelated services. Thank you for giving me the chance to speak before the task force today.

In my testimony I will describe how privacy, disclosure, and opt-in data collection impact our ability to identify, locate, and isolate those who have been exposed to or infected by COVID-19.

CVKey Project is a 501(c)(3) focused on helping America reopen responsibly given the ongoing pandemic. Together with my team of world-class engineers and product developers, we built that user data privacy into a key app called CVKey, and we are focused on getting that adopted around the country today.

It focuses on individual symptom checking, policy communications across communities, and access control into venues such as universities, workplaces, and schools. As we have recently seen in the media, there is a significant need to improve communication of policies if we hope to operate at anywhere near close to normal for the next 18 months.

Artificial intelligence and machine learning require large amounts of data collection for training purposes. This ground truth data helps algorithms figure out how to make better predictions. The most valuable data to combat COVID-19 can actually be found in the contact tracing interviews of infected and exposed people. Early detection, reporting, and testing leads to quick self-isolation and quarantine, and can shut down the spread of the virus faster than any other method, but only if it is resourced sufficiently and executed well.

The phone calls that contact tracers make are often not answered because most people don't pick up from unknown numbers these days. When the contact tracer does reach a potential case, they have to make a decision about whether to ask the person to quar-

antine based on what they learn [inaudible] Information from the infected or exposed, the virus is quietly spreading.

What exposure notification apps provide is a way to use cell phone data to detect after the fact whether you are near someone who later tests positive for COVID-19 by notifying you and informing you of next steps, which are usually to contact the contact tracing team or get tested or quarantined.

These new apps offer a way to help contact tracing scale with less effort, more accuracy, and more coverage than is otherwise possible. There are two ways, at least, to do this. The first is using GPS information logs to compare where the infected person was relative to everyone else.

The first problem with this is that GPS locations are not accurate enough [inaudible] For 10 minutes. The other, more serious problem with location data is it contains personally identifiable information that can be impossible to algorithmically remove. If I can guess where someone works and lives, I can easily figure out who that person is, usually by pulling additional data from commercially available data sources like Equifax.

Naive implementations of this method were deployed in the U.K., North Dakota, and Utah, and did not meet with success for multiple reasons. The biggest one was fear that either Big Gov or Big Tech was tracking anyone who installed it. Next, always-on GPS location has a material impact on phone battery life, so folks turned it off or uninstalled it.

Finally, early implementations did upload everyone's location to the government, and without sufficient protections, that data can then be exposed/stolen by others even if it wasn't misused by their government. A better solution is to use low-energy Bluetooth signals to allow phones to record when they are near other phones. A naive implementation can still allow tracking, but luckily Apple and Google have come to agreement on a privacy-protecting method called the Google/Apple Exposure Notification method, and it was developed to work on both Android and IOS.

They have asked countries' health agencies to build and release apps using this tech. In the United States, they weren't delusional enough to assume that a single Federal institution could be adopted, so, they are working with one group per State.

Like Dr. Raskar's Safepaths group, my team is building the app using this tech, and we believe that it preserves privacy better and works better than GPS solutions. The goal would be to get as many people as possible in the State to download this app, but the challenge, of course, is that even if we could only get 40 percent installed uniform across the group, we will only have 16 percent of exposures detected, so we need to find better ways to market the app.

The privacy is much better than GPS because the data that eventually gets uploaded in a rare case where you have been infected is a set of random numbers that have no personally identifiable information. And then, when the other phones download this random number set, they notify their users without doing any cloud work at all and tell the user that they have been exposed and recommend that they call the contact tracing team.

I believe that privacy is critical to marketing these apps to Americans, because I think they are very worried about what these apps could do, and we need to get and install a base for these apps.

[The prepared statement of Mr. McClendon can be found on page 49 of the appendix.]

Chairman FOSTER. Thank you.

Dr. Kuppalli, you are now recognized for 5 minutes.

STATEMENT OF KRUTIKA KUPPALLI, INFECTIOUS DISEASES AND GLOBAL HEALTH PHYSICIAN

Dr. KUPPALLI. Thank you, Chairman Foster, Ranking Member Loudermilk, and distinguished members of the task force for the opportunity to testify before you today.

I am extremely grateful for your interest and commitment towards helping the support of the novel coronavirus disease efforts in the United States as we attempt to control the deadly pandemic.

I am an infectious disease physician by training and have extensive experience in global health and health security. My clinical and research interests focus on health systems strengthening in resource-limited settings, outbreak preparedness and response, research and clinical care of emerging infections, and healthcare policy.

As the COVID-19 pandemic continues to spread across the United States, I hope to give you a greater understanding of the threat this has to the global and economic security of the United States. I will discuss challenges facing public health experts and researchers leading COVID-19 efforts domestically, and will explain how we may better leverage available resources and tools to improve our response capacity and provide examples of other countries who have successfully implemented policies to control COVID-19.

During this unprecedented time, it is vital for the United States to collaborate with the global community so we can learn from each other and develop best practices to ensure that science informs policy.

In early 2020, as the world watched COVID-19 sweep over Wuhan, and spread through China, other countries recognized that COVID-19 posed an unprecedented risk to the physical and economic health of their countries and activated pandemic preparedness plans. The three most common components of successful plans are: one, the development of a comprehensive national plan led by science; two, rapid scaling up of testing capacity; and three, prioritization and implementation of contact tracing.

The United States accounts for approximately 4 percent of the global population, but 25 percent of COVID-19 cases and fatalities globally. More concerning is that, as lockdowns have been lifted over the past month, there has been a record increase of COVID-19 cases, with over 45,000 cases per day since July 1st, and a record 60,000 cases in the last 24 hours, leading to the halting or reversal of business openings across the country.

With coronavirus cases surging across the United States, it is imperative we adopt essential elements of an outbreak response, which should include a national cohesive plan led by science. The

cornerstone of such a plan should be to test, isolate, and contact trace cases so we can contain this pandemic.

Contact tracing, often called the linchpin of an outbreak response, is critical to identifying those who have potentially been exposed. The hiring of contact tracers, and additional Federal resources, infrastructure, and training will be required to ensure that we have a sufficient and well-coordinated workforce to provide this vital task.

Based on current population and data, experts estimate each case requires 10 to 25 contacts to be traced. That is requiring at least 300,000 contact tracers. Another vital component of successful contact tracing is leveraging new and innovative technologies to promote efficient and broad implementation strategies.

Although technologies are increasingly used, it is important to remember the ethics of public health information: data protection and data privacy when using any of these technologies. South Korea is an example of a country that has successfully contained COVID-19 and used technology to assist in their contact tracing efforts.

In the aftermath of the 2015 MERS outbreak, South Korea invested resources in training healthcare personnel, and developing response systems, infrastructure, and laboratory capacity for future infectious disease outbreaks. When the 2019 outbreak took off in South Korea, in addition to using standard methods of contact tracing, they also used medical records, GPS systems, credit card transactions, and closed circuit transactions to utilize a more robust contact tracing system.

It was thought that this information provided more accurate information on individuals' location, duration [inaudible] Exposure might not be able to call or confirm. Considerations and protocols for privacy were taken into account to ensure only information related to infectious diseases is [inaudible] This social, health, and economic threat of our generation, and how we choose to manage it will be our legacy. Until we have a vaccine, control will rely on using surveillance, testing, contact tracing, and isolation to prevent transmission.

Given the United States' prominent global role in technology, it can leverage this expertise as an opportunity to take a leadership role in developing a world-class contact tracing system to contain this outbreak, using information technologies to develop integrated systems to enhance our ability to prevent, detect, and respond to future outbreaks before they become national or global epidemics.

Thank you, again, for the opportunity to testify before you, and I look forward to your questions.

[The prepared statement of Dr. Kuppalli can be found on page 30 of the appendix.]

Chairman FOSTER. Mr. Perry, you are now recognized for 5 minutes.

STATEMENT OF ANDRE M. PERRY, FELLOW, METROPOLITAN POLICY PROGRAM, THE BROOKINGS INSTITUTION

Mr. PERRY. Chairman Foster, Ranking Member Loudermilk, and members of the task force, thank you for inviting me to testify

today on this extremely important issue affecting millions of people across the country.

The COVID-19 pandemic will continue to take significantly more lives than the approximately 130,000 it has already claimed if the United States Government does not invest in tools that are proven to combat the spread of the virus, including strategies that aim to dismantle structural racism.

According to an analysis published July 5th by the New York Times, Latino or Black or Hispanic and Black residents in the U.S. are 3 times as likely to become infected as their White neighbors. Higher COVID-19 mortality rates among Black and Brown communities reflect the historic devaluation and disenfranchisement of their lives, properties, and communities.

Structural racism is the preexisting condition that must be accounted for in our battle with the coronavirus. It is hard to calculate the damage that the lack of coordinated comprehensive Federal response has caused families in terms of lives, jobs, and businesses. Those losses will even be more severe if there is not sizeable investment in infection testing, social distancing, extended paid leave, supplemental employment insurance, hazard pay, and contact tracing.

However, the universal application of these preventive tools won't eradicate the substandard housing, poverty, limited job opportunities, and other conditions of structural racism that underlie the racial health inequities. My written testimony presents three general concerns regarding artificial intelligence in contact tracing as it pertains to structural racism and racial bias.

First, contact tracing and exposure notification are not necessarily remedies for structural racism. Contact tracing and other public health tools are not neutral. They can exacerbate or mitigate the impacts of structural racism.

A second concern taken up by my testimony revolves around representation. Contact tracing systems should include the people from the communities that have historically been excluded from other systems that generate better health and economic outcome. From the tech tools that are developed to the contact [inaudible] Be included in any effort to expand contact tracing. Manual contact tracers rely on the skills of interpersonal communication and empathy in order to build trust and receive and interpret information.

If we hire an army of White tracers to track the spread of the virus, we should expect unequal or even negative results in Black communities. In addition, if we do not hire local Black and Brown people to serve those neighborhoods, we exacerbate the racial wealth gap which also serves as a barrier of protection against infection. Hiring Black and Brown manual tracers offers an opportunity to add jobs to the neighborhoods that are experiencing higher levels of unemployment.

Third, AI tools in health pose the same risk that they do in other fields. AI is only as good as [inaudible] And their biases can ultimately lead to flaws in the technology and amplify biases in the real world. Our expedition into digital tools must demand greater recruitment and investment in Black and Brown tech firms, rigorous reviews and testing for racial biases, and more engagement

and involvement from local communities before we deploy AI technology to communities en masse.

Systemic racism and discrimination are already embedded in our health, housing, and educational systems. Developers must intentionally build AI systems through a lens of racial equity if the technology is not going to generate outcomes that reflect the biases of the developers.

As more Black and Brown people are exposed to these racial inequities, more will die from COVID. The proliferation of the coronavirus forces us to see our inherent connections in a way that our public policy has not always recognized. Individual recovery is contingent upon how much we collectively live by the principle of all being in this together.

If undocumented residents are sick, the country's citizens will be as well. If Black and Latino or Hispanic people suffer from COVID-19's effects, so will Asian American and White people. But being aware of our vulnerability is not the main problem. The trap of racism and structural inequality is.

Thank you.

[The prepared statement of Mr. Perry can be found on page 53 of the appendix.]

Chairman FOSTER. Thank you.

And, Mr. Raskar, you are now recognized for 5 minutes.

STATEMENT OF RAMESH RASKAR, ASSOCIATE PROFESSOR, MIT, AND FOUNDER AND CHIEF SCIENTIST, PATHCHECK FOUNDATION

Mr. RASKAR. Thank you, Chairman Foster and Ranking Member Loudermilk, and to the members of the task force and the Full Committee for the opportunity to testify today. It is an honor and a privilege to be here today.

Let us compare how we use AI and technology for weather forecasting versus a pandemic. The National Weather Service can analyze and predict by collecting data every day. However, responding to the dynamics of a hurricane is different from responding to a pandemic, as pandemics are about people being at risk because of other innocent people.

We need real-time participation from people, and that is why smartphone apps can play a big role. Given this is a social problem, I want to emphasize three things: first, how to augment top-down manual contact tracing with bottom-up apps used by people; second, how to make sure that apps are trustworthy by obviously preserving inclusive and built by open source and nonprofits; and third, how we may create a [inaudible] National weather—we have this national AI platform that leverages this privacy-preserving apps.

I come to this question having spent much of my last decade working at MIT in AI digital health and algorithms for privacy. We built privacy-preserving global AI, a distributed machine learning method called split learning that can build AI without accessing any raw, identifiable data from individuals. And other teams have built wonderful techniques, such as federated learning and differential privacy that is going to be used in the U.S. Census 2020.

In March, our team at MIT created one of the first privacy-preserving smartphone apps, which led to the creation of PathCheck Foundation, a charitable nonprofit organization dedicated to building free, open-source and industry standards that assist U.S. States, nations, and private sector organizations.

And our nonprofit is already building exposure notification and case management apps back in servers and dashboards for various U.S. States and nations. And, frankly, it has been a humbling experience to work on this complex challenge over the last few months. And based on our learning so far, let me address concerns and also present some recommendations.

First, Congress should require that public health authorities augment their manual contact tracing solution with digital apps for solutions, and this should be privacy first, because assuring trust is key to public acceptance, and public acceptance of these digital apps will let the country solve the tracing problem cheaply, quickly, and at scale. At PathCheck Foundations, we are working very actively on this hybrid approach by combining exposure notification, personal guidance, and case management, and we hope such apps can augment and simplify manual contact tracing.

Second, Congress should set out a series of requirements to ensure that contact tracing apps are built transparently as open source, ideally by nonprofits, and just like other public utilities, are open for scrutiny by the public.

And, obviously, this app should be inclusive across socioeconomic disparity, and not exclude those who don't have the latest technology.

So, while at PathCheck Foundation, we are very proud to deploy Google, Apple Bluetooth API, we also want to support local solutions, such as QR codes, WiFi, and so on, and we continue to work with communities and employers and schools to improve the inclusion and innovation.

And then, finally, the National Pandemic Response Service, based on a smartphone app. We need a national pandemic response that will allow us to take micro and macro aggregation of analyses and predictions. Instead of creating a surveillance state and a top-down system, let's build a bottom-up smartphone-based solution. We need a new AI that relies on the information stored on peoples' phones, and what we have learned through our work at MIT privacy-preserving AI is that we can truly create this decentralized AI and orchestrate the socioeconomic interactions between governments, businesses, individuals, and even vulnerable communities without creating a surveillance state.

Our analysis shows that a modest budget of $100 million to $150 million that creates a public-private partnership can provide a data-ready national service for a national pandemic response. At the same time, this national service can help us be ready for a nasty flu season in the future, boost data solutions for public health, and be prepared for the next pandemic.

To conclude, the need of the hour is augmentation of [inaudible] Apps inclusive, open source, and trustworthy, and [inaudible] Built on aggregation of data from these privacy-preserving apps.

Thank you.

[The prepared statement of Mr. Raskar can be found on page 61 of the appendix.]

Chairman FOSTER. Thank you.

And I will now recognize myself for 5 minutes for questions.

Mr. McClendon, you mentioned the necessity of maximizing adoption of contact tracing apps in order to maximize their effectiveness. Businesses may well have a role here. According to a PricewaterhouseCoopers' survey conducted in April, 32 percent of businesses use contact tracing to help protect their workforce. This raises a number of questions as financial services and other companies continue to bring back workers to offices over the next few months. How can contact tracing effectively fit into their plans? Are there problems in making the use of contact tracing apps a condition of employment?

And, in particular, does contact tracing offer benefits over, for example, performing frequent COVID tests and temperature checks?

Mr. MCCLENDON. I don't know if I can speak about whether frequent checks will do better or worse, but I do believe that digital contact tracing, deployed widely, will help.

So, I was speaking about the coverage problem: 40 percent of uniform population jobs, only 16 percent of exposures are notified. So, we need a bigger percentage. We need 60, 70 percent adoption. And one of the best ways to do that is to work with employers, universities, schools, and populations that feel a sense of community and want to protect each other by installing this app. It is really a marketing challenge, and similar to how the Waze app was deployed in cities, and how Uber installed its app and got sufficient penetration to be interesting.

If there isn't enough penetration in a community, these apps will not be successful. So having employers do it, I think, is a valid way to increase the penetration, but it should not be mandatory. It just should be strongly recommended, and you should use the fact that if we don't get these exposures detected, a company might then become a hot spot, have an outbreak, and it might have to shut down again.

And I think that everybody is now very aware of what happens during a shutdown, and so preventing the shutdown by keeping your community safe is a pretty strong motivation.

Chairman FOSTER. Dr. Kuppalli, do you have any thoughts from your perspective on this?

Dr. KUPPALLI. Yes, thank you. Going to your question about temperature checks versus testing, I would say that one of the challenges with doing things like temperature checks is that we know that up to, at least right now, 40 percent of transmissions occur in the asymptomatic or pre-symptomatic state, so transmissions occur when patients don't even know that they are infected.

Relying on things like that is really challenging in this particular infection in terms of trying to understand, maybe who you have been in contact with, or who might be infected. And I think that is something we need to think about as we are thinking about employing these types of applications.

Chairman FOSTER. Thank you.

Mr. Raskar, you note in your testimony that you have been working on how to create machine learning methods that can build AI

without accessing the raw data. This sounds a lot like the homomorphic encryption that we had a previous hearing on, which is, to me, just a fascinating technology, but I had a simple question of how this can work when the number of contacts is small.

For example, if you are by yourself all day for a whole week, and then you go out and you meet one person and then get notified that you have been exposed, you pretty much know which one person that is. So, what are the limits to these privacy-preserving techniques that may be important for people to know about?

Mr. RASKAR. Congressman, given your background in physics, I would love to have a discussion about encryption with you, but to the question of privacy, we ought to, first of all, think about how data production has different layers. Those three things are very different.

In a public health scenario, actually today we only care about confidentiality, not as much anonymity or privacy, because eventually, you do have to meet a doctor. It is not like a cryptocurrency where [inaudible]. The challenge that if you met only one person and you got an exposure notification, you would know where that person is, is a classic example that our goal here is to serve the public health purpose as well.

So, in that sense, although exposure notification based on Bluetooth serves some purpose, which is whether you got an exposure notification or not, a bigger challenge here for public health is understanding the context of that encounter.

And for the context—

Chairman FOSTER. I will attempt to treat myself fairly and gavel myself quiet here, and recognize the ranking member for 5 minutes for questions.

Mr. RASKAR. Sure.

Mr. LOUDERMILK. Thank you, Mr. Chairman. The information that we have received so far has been very interesting.

My first question is going to be to Mr. McClendon.

I do appreciate your focus on data privacy and security when it comes to the contact tracing, and coming from an IT background using the Bluetooth technology and your cooperation with different businesses is, I think, a unique approach and may have some validity there, but if we were to implement a Federal contact tracing system, how would you be able to reassure the citizens that they are able to know exactly what data is going to be used or collected and who has access to that data and how that data is going to be used?

I think those are three critical areas that if you are going to get buy-in by the general public and get their confidence in this, that they do need to know those three things: one, exactly what data is going to be collected; two, who is going to have access to that data; and three, how it is going to be used?

Mr. MCCLENDON. Right. As I said, I feel like it is a marketing challenge. It is communicating how things work and explaining it to users. And so, for the data that is being collected in the Bluetooth Apple/Google gain solution, that data is random and completely stored on the phone until the user who is infected opts in to uploading those random numbers to the server.

It requires a second opt-in. So, from a control perspective, you are putting your control in the hands of the user. Their data is never going to be pulled out from under them. It is always going to be in their control, and I think that is a very strong message for folks.

As far as what happens when you get an exposure notification, the other innovation in this technology is that the notification determination is made entirely on the phone and then the communication of what message is sent to the user is provided by the State or, in some cases, the country.

And so you have the opportunity to communicate to an exposed user, "Here are the things you should do," but we don't know who that user is until, again, they opt-in by calling in to the manual contact tracing team. And these inbound phone calls are going to be much easier to handle because the contact tracing team won't spend a ton of time making dead phone calls.

These will be inbound, and they will be users who are interested in learning more about what this exposure means.

Mr. LOUDERMILK. Let me make sure I understand the situation. So, for instance, I may have tested positive. I have this app. I go to a store. I am wearing my mask, doing everything. So, if someone else gets near me, my phone, through the app, captures their number, and then I choose whether to upload that? Is that the scenario? Or does it automatically notify the person that, "Hey, you just got in contact or in close proximity to somebody who has it?"

Mr. MCCLENDON. The general system is that, after you test positive, you are staying at home, let's hope. The goal, though, is that prior to you testing, for 2 weeks of data, prior to you testing positive, your phone has been broadcasting these random numbers and has been collecting the data on your own phone of who else you have seen. And on the day that you test positive, the contact tracing team calls you up on the phone to talk about your positive test because they were notified, and this is all part of the standard process. They ask you to upload your data, and give you a unique one-time password to upload that data into the cloud, but the data that is uploaded is random numbers, no identifying information at all.

And at that time, all of the other phones download the data, and see if in the last 2 weeks, they were near you. And if they were, they get an exposure notification, but it is only that they were exposed and they have to call the manual contact tracing team to learn more.

Mr. LOUDERMILK. So the only numbers that are uploaded are numbers of people who are using the app, or all numbers?

Mr. MCCLENDON. The only numbers that are uploaded are of the infected person if they were using the app during the last 2 weeks.

Mr. LOUDERMILK. Does that create a problem where the person with the app is then determining if the information—let's say, if I was around someone who had been infected and got tested, then that person is determining if my phone number is going to be uploaded or not?

Mr. MCCLENDON. No. The data that you upload, uploads only those random numbers that they receive out, not receive in.

Mr. LOUDERMILK. Okay.

Mr. MCCLENDON. So, literally, only your information. Everybody else compares whether they ever saw your number in the phone. And so, again, it is only if each of the parties is participating in the app.

If somebody's app is not—if somebody's phone does not have the app installed, then they are not part of this situation at all. They won't get notified. And if they are infected, there is nothing for them to upload.

Mr. LOUDERMILK. Okay. Thank you.

I yield back.

Chairman FOSTER. Thank you for that, Mr. Ranking Member.

And I would now like to recognize the gentlewoman from California, the Chair of the Full Committee, Chairwoman Waters.

Chairwoman WATERS. Thank you very much. I want to first turn to Mr. Perry. You have reminded us through your research that historically, Black and Brown people have already been socially distanced through segregated housing policy, systemic racism, limited and inadequate and unsafe living areas, more polluted neighborhoods, and fewer job opportunities. So, in addition to strengthening our response to the pandemic, policymakers must make sure that our response does not perpetuate these structural inequalities.

Mr. Perry, what consideration should a digital contract tracing program take to ensure that minority communities are served well by these app-based solutions? Do you have other suggestions on how technology can be utilized in the coronavirus crisis response to ensure that communities of color are not further disadvantaged?

Mr. PERRY. I have a couple of responses to that. One, whenever we have a crisis, it presents an opportunity to build capacity in areas that we currently don't have. One of the weaknesses of many AI-enabled technologies is that they have not been tested, vetted, or created by founders of color, leading to all kinds of gaps and lapses, but it is clear that we do need, in Black communities, levels of a technology because we are disproportionately impacted.

The problem is that Black people, in particular, and Brown people, are caught between a rock and a hard place. When they do find out that they may have been exposed, they are disproportionately in jobs and in occupations where they can't take off 2 weeks from work, and they are unable to socially distance for periods of time.

As I indicated in my written testimony, we see how intergenerational housing concentrations in Cities like New Orleans, Detroit, Birmingham, and all of these places where Black people are concentrated, we know that there will be exposure because of the underlying conditions that lead to the rapid spread of the virus.

And so, for me, I am looking at this from a structural perspective. Yes, we still need to maximize manual tracing and use technological tools to help them along, but manual tracing also relies on the quality of the tracing mechanisms; there is a lot to be gained from still leaning on the manual tracing. But I have to emphasize that when we are ultimately investing in tech companies, firms, innovations, we need to use this as an opportunity to build wealth, because that is the reason why or the lack thereof of those things are the reason that we see rapid spread in Black communities.

So, for me, it is not to say that it is too late to deploy technology in a way that makes sense for Black communities, but it is to say

that if we don't advance manual tracing and if we don't build capacity, then in the next inevitable crisis, we will be right back in the same situation we are in today where we can't respond to technology in a way that the alerts want us to, and we won't build capacity in areas where we need it built.

Chairwoman WATERS. Thank you very much.

I yield back.

Chairman FOSTER. Thank you.

The gentleman from North Carolina, Mr. Budd, is recognized for 5 minutes.

Mr. BUDD. This hearing is fascinating, and very timely.

Professor Raskar, this question is for you.

We have now seen several countries use contact tracing as a means to combat the spread of COVID-19. Is there any credible evidence to show that these methods have had a practical impact on mitigating the spread of the disease?

Mr. RASKAR. Yes. We understand this is still very early data, inventing this whole field of digital contact tracing. We do know that manual contact tracing works for small outbreaks, but for an outbreak of this scale, many experts have shown that manual contact tracing simply doesn't scale. In fact, it disproportionately affects people who are vulnerable because they cannot be reached.

Digital solutions has some hope that they can get—I think in some countries, we have seen an option of 10 to 15 percent in just a matter of weeks, which is good news, and as Brian McClendon explained very beautifully, that if these technologies are truly deployed by tech players as tools and APIs, in fact, they could be out there in many ways.

So my assumption is that, if we use a bottom-up as well as a top-down solution—a top-down solution that will be like how we respond to hurricanes. So, manual contact tracing would be like a top-down solution. We tried to do the best we can, but this storm is really about people interacting with people, so we need a bottom-up solution as well where the participants, in this case, people who are innocent, but could be spreading diseases to others are participating in the system, and if the infected and exposed individuals are willing to participate in the system, then we can, in fact, combine this top-down and bottom-up approach.

And right now in the U.S., we have 70 percent smartphone penetration in the age group of 18 to 64. If 90 percent cell-phone penetration [inaudible] Estimates up to 70 percent of the world [inaudible] Manual contact tracing could be off-loaded to the people who have smartphones.

Mr. BUDD. Thank you. Continuing on with you, Professor, these contact tracing apps pose an interesting dilemma. Digital contact tracing involves a level of surveillance that can make a lot of people uncomfortable, especially given the involvement of large technology companies with spotty records on privacy.

What steps are developers taking to ensure these privacy concerns are being addressed? I think some of you mentioned earlier the low-energy Bluetooth, the Apple/Google protocols and standards. I just wanted to see what is being done to address these privacy concerns?

Mr. RASKAR. That is a very good question. I think it is a fantastic development, and I am glad the technology company knows they should not be in the business of creating solutions that could interfere with their for-profit business. So, as great as that Apple/Google protocol is, if another technology company tries to provide a solution which is already for-profit, even if the exposure notification is not-for-profit, simply the IP address of the same user can be used by the for-profit company in multiple ways.

That comes into conflict with the original intention that Apple and Google and PathCheck Foundation have. So we believe that to make it trustworthy and inclusive, it should definitely be open source available for everybody to scrutinize and also collaborate. And ideally, it should be built by companies that are nonprofit or have no other related for-profit businesses.

I think if we do that and create a national grid of this app because we are going to see a mushrooming of these apps, but at PathCheck Foundation we believe that we can all work together in creation of a national grid, and that will also be part of this National Pandemic Response System.

Mr. BUDD. Thank you.

Just following up, I have been supportive of a robust Federal data privacy standard to replace the confusing patchwork of States' regulations and laws. Would the implementation of a national standard be beneficial for the States and for the consumers alike, who are trying to protect their own data privacy?

Mr. RASKAR. Definitely. I think that is necessary, but just to be sure, we have to go well beyond GDPR or CCPU, one level above that for privacy, which means that even the app company doesn't know anything about the user.

Mr. BUDD. Very good.

And I have a few seconds left, but I will yield back to the Chair.

Thank you.

Chairman FOSTER. Thank you.

And the Chair will now recognize the gentleman from Illinois, Mr. Casten, for 5 minutes.

Mr. CASTEN. Thank you, Mr. Chairman. And thank you so much to all of our witnesses.

Really building on Mr. Budd's comments. I would love to hear from Dr. Kuppalli. We have, globally, such a wide range of how contact tracing is being done. Is it being done by cities? Is it being done by counties? Is it being done by States? Is it being done by countries? People, of course, move across borders, but there is a logistical challenge with scaling this up at the highest level.

Dr. Kuppalli, purely from an epidemiological perspective, where do you think is the ideal level in government to coordinate a contact tracing strategy?

Dr. KUPPALLI. That is a wonderful question. Thank you very much. So, as I said in both my written testimony and in my oral testimony, I really think that we need a national plan to help coordinate this entire response, and the linchpin of that is contact tracing.

And when it comes to contact tracing, I think the important thing would be to be have some sort of Federal plan for that, that is then farmed down to the State and local governments.

And as we have all talked about, and especially in an epidemic like this where the transmissibility of the disease is so much and, like I said, for every contact, there are about 10 to 25 contacts that need to be traced, and that is just not something a manual contact tracer can do, it is important that we rely on our technologies to be able to augment what manual contact tracers are doing. And I think that it is important that it is a coordinated effort between our local and State and Federal Governments, while leveraging our technology.

Mr. CASTEN. Thank you,

Shifting to Mr. McClendon, if I am following right, all of the apps that we are talking about developing are essentially backwards-looking. We are going to know who you were in contact with. If we find out you had a positive test, we are going to go back, and we are going to look through this historical record.

But in the context of artificial intelligence, so many of the really cool things we do with AI right now are predictive, whether it is Waze predicting where the traffic is going to be at 4:00 today as I tried to get to downtown Chicago, or the stuff that we spend a lot of time with on this committee of algorithmic trading, predicting what stock is going to be surging or where there is going to be a short sale next week.

Is anybody thinking about what could be done on a predictive level if you had these contact tracing tools? Could you start predicting that this is a high-risk place to go, where we should be going? Is anybody thinking there, or are these purely backwards-looking apps at this point in the scope of people's ambition?

Mr. MCCLENDON. I think the challenge right now is that the only way to really predict the future is to understand the past pretty well. And so, manual contact tracing interviews, where the contact tracing team interviews the infected or exposed person, where that person has been, what they have done, that is the kind of data that would be great to send into a machine learning algorithm to then predict where hot spots might be in the future.

But right now that data is obviously siloed due to privacy issues, siloed due to county tools and State tools that are not compatible with each other, and it is also not normalized.

To Dr. Kuppalli's comment, I think that there does need to be a Federal guidance on how we should do things. I don't think the Federal Government should own this problem, but I think there should be clear leadership about, here are the tools and processes that we recommend that States do and that counties do and that contact tracing teams do to collect data effectively, and then using data analysis that retains privacy and differential privacy, we can start to generate these predictive models.

Large-scale data collection is being used for predictive things. If you look at the University of Washington's Institute for Health Metrics and Evaluation (IHME) models, they are using a large collection of data, including things like mobility reports and when different States and counties have implemented mask rules or lockdown or some of the other aspects.

They are able to see the effect of different policies and are now predicting that if a State implements a mask requirement today, they can save this many lives. For example, in Kansas, if we all

follow a mask mandate, we will save 250 lives by November 1st. That is the projection, and that projection is made using data that has been collected over the last several months.

Mr. CASTEN. Thank you. I have a lot more questions, but I see I am out of time, so I yield back. Thank you so much for your time.

Chairman FOSTER. Thank you. And I now recognize the gentleman from Indiana, Mr. Hollingsworth, for 5 minutes.

Mr. HOLLINGSWORTH. Good afternoon, everybody. I am really excited about the discussion that we have had already on this panel, and I look forward to talking more about it and hearing more about it.

My questions are for Dr. Kuppalli. Just more on the biological, epidemiological level, here is what I want to know: Given where we are today, what does a realistic success, achievable success look like in the United States pre-vaccine? And then I am going to ask you what it looks like post-vaccine. What is achievable for where we are, given the number of infections that we have today?

Dr. KUPPALLI. That is a great question. Thank you for that. Given where we are right now, we are not in a great place, right? As I said, yesterday, we had 60,000 new infections in the United States.

And I think one of the things that has been challenging with this particular infection in the United States is that we have what we like to call a patchwork type of system. Every State, every local municipality is doing its own thing, and that is making things very challenging in terms of trying to contain this outbreak.

Additionally, we are still having challenges with things that we were having challenges with 5 months ago. Testing is still a problem. Contact tracing is still a problem. Isolation and quarantine is still a problem. If we don't get those things fixed, we are not going to get this outbreak under control. So, we need to fix those things.

In terms of where we are today and where we are going, we need to work on fixing those things. We need to work on really advocating for the public health interventions for which we have been advocating.

Mr. HOLLINGSWORTH. To be more specific, sorry, are we to the point, given the number of infections that we have had, where we are basically managing down the number of infections and the rate of infections to the hospital capacity system until we get to the point of a vaccine, or is there a realistic hope, even given where we are, that we can bring infections to a grinding, very slow, very small number?

That is what I am trying to understand. I read a lot of epidemiological studies that say, given where we are today, the best we can hope for is managing infections down, managing hospital capacity, until we get to a vaccine, not trying to stop an outbreak in and of itself.

Dr. KUPPALLI. I think, again, it is going to depend on how well we uptake these public health interventions. We know these public health interventions, what we call the nonpharmaceutical interventions, we know they work. It depends on how well we can get communities to buy into them in terms of how well the outbreak is going to be contained.

And then, even going forward, once we have a vaccine, it is going to not just depend on the efficacy of the vaccine, it is also going to depend on how well we can get people to uptake the vaccine. Studies I have been involved with have shown that there is a lot of work to be done in trying to convince people to take the vaccine. So, we can't say we are going to have the vaccine, and this will be over.

Mr. HOLLINGSWORTH. I agree. I think that is right. And I think that, frankly, at least in Indiana—I am not sure what is happening elsewhere—people's desire to take significant steps based on COVID-19 is declining, not increasing, given the fear that they felt in March and April. And at least, we haven't seen a significant resurgence, so there is a less palpable fear.

I wanted to get to two other quick questions. I only have a minute-and-a-half left. One, there is an obsession with kind of the total number of infections since January 20th, this 2 million infections number. That to me seems strange, Dr. Kuppalli, because I think what we care about are current symptomatic or communicable infections at the present point, right?

What matters is how many people have this today, either know about it or don't know about it, either are symptomatic or asymptomatic, but can transmit the disease to others, not those who got it on January 20th and recovered February 15th and no longer transmit the disease.

Are we tracking the right number in thinking about total number of cases since genesis, or should we be thinking more about, as you articulated, the number of infections per day and the number of recoveries per day, to better understand the evolution at present?

Dr. KUPPALLI. I think all of those numbers are important. I think we need to understand the total number of infections that we see in our society, but we definitely need to understand what is going on, on a day-to-day basis, right?

And so now particularly, we are not just seeing the numbers go up, but we are seeing the percent positivity in the number of cases going up. And that is really important, and also looking at what is going on in the hospitals and the hospitals being at capacity.

Mr. HOLLINGSWORTH. Perfect. Can you clearly tell me, what is the clinical definition of "recovered" in this infection with COVID-19? Is it the lack of communicability? Is it not showing symptoms? What does "recovered" mean, explicitly?

Dr. KUPPALLI. According to the current guidelines and criteria, "recovered" means that you no longer have symptoms.

Mr. HOLLINGSWORTH. Okay. Thank you so much.

Dr. KUPPALLI. Thank you.

Chairman FOSTER. Thank you.

The gentlewoman from North Carolina, Ms. Adams, is recognized for 5 minutes.

Ms. ADAMS. Thank you, Mr. Chairman. And thank you to our witnesses today.

According to a 2019 Pew Research study, 81 percent of Americans owned a smartphone, up significantly from just 35 percent in 2011. The same study found that while Whites, Blacks, and Hispanics own smartphones at roughly the same rate overall,

smartphone ownership rates are significantly lower for older and low-income Americans. These communities of color have also been disproportionately impacted by the pandemic, and they are at greater risk of contracting COVID-19 and have a much higher likelihood of being unable to recover.

So, Mr. McClendon, what is the benefit of a voluntary app-based digital contact tracing system when the most vulnerable at-risk populations are also the least likely to be able to engage with the technology?

Mr. MCCLENDON. That is a very fair question. With some of the apps in question, you have a non-tech participation capability, but this digital contact detection is one where you really do need a phone, preferably a smartphone, to participate.

And I think the only argument that can be made is that if we deploy these widely, the infection rate overall will go down, and there will be much less opportunity for anyone to get infected.

To the question about—we are in the second wave right now, and contact tracing is going to be very hard to solve the problems that we are seeing as in many States it ramps up quite high. But if we can get the disease down to a slow enough level, we can actually drive it down so, effectively, there is little to no exposure for anyone, and digital contact tracing can really help with that.

And I think it is important to understand that, to the prior question, wearing a mask can greatly reduce the transmission. And by itself, a single app can, I think, reduce the R-factor from well above one to below one and eventually negate the disease. Masks are something that everybody can participate in, and I am a strong believer that we should be promoting masks more effectively.

Ms. ADAMS. With the amount of data being collected and potentially analyzed by AI, what type of privacy and exposure notification and contact notification is there?

Mr. MCCLENDON. In the case of this specific Google/Apple implementation, it is extremely private. There is no information exposed at all unless you are infected and unless you choose then to provide data to a service. And even then, that is not part of the analysis.

The only interesting data to analyze is who then talks to the contact tracers, what that interview yields as far as number of contacts they have made, what kind of symptoms are they showing, what is the progress of their disease, and monitoring those people.

So, the manual contact tracing team has a lot of work to do. And just to reiterate what everybody else has said, we need more and better staffing and we need people in the local community to work, because it is an empathetic, communicative experience, and we need the best data we can collect, and for that we need people of the community.

Ms. ADAMS. Okay. Thank you.

Mr. Perry, do you foresee any risk for misuse of the mass collection of health data on low-income people of color in the future, and how important is it for us to limit data collection, if you think that?

Mr. PERRY. Oh, yes, we should be prepared for racial bias that will negatively impact Black and Brown communities. We have already seen the risk of use-biased algorithms in healthcare. United Health, using a medical algorithm, steered Black patients away from getting higher-quality care. And criminal justice software

used to forecast the risk of reoffending incorrectly marks Black defendants as future criminals at twice the rate of White defendants.

So, again, what I said early in my verbal testimony was that the AI for contact tracing runs the same risk if we do not thoroughly vet these products that are going out. And so we don't know necessarily, but the way I hedge that not knowing is through inclusion.

We have to bring in, one, contact tracers, as was mentioned, from the community, because if you don't establish trust, these products will not work well. But more importantly, we have to invest in Black and Brown firms, because they are just more sensitive to the algorithms and functions that often lead to a bad outcome.

Ms. ADAMS. Thank you.

Dr. Kuppalli, what does meeting the mitigation rate versus meeting the suppression goal rate for testing mean in terms of empowering States, municipalities, and localities to safely reopen? What does meeting those rates mean in terms of opening?

Dr. KUPPALLI. That is a great question. Meeting the mitigation rates—

Chairman FOSTER. Go quickly, please. We are at the time limit.

Dr. KUPPALLI. Okay. So, basically, there are different rates that we look at for when we are in different phases of the epidemic, and we need to scale up testing quite a bit to meet those rates.

Ms. ADAMS. I yield back, Mr. Chairman.

Chairman FOSTER. Thank you.

The gentleman from the Lone Star State, Mr. Taylor, is recognized for 5 minutes.

Mr. TAYLOR. Thank you, Mr. Chairman. I appreciate that. I appreciate being here with all of you. I think this is an important conversation. And I think this epidemic has certainly brought up to me the importance of having consistency in our vital statistics accounting. We have had—I see some heads nodding.

I served in the State legislature for 8 years before I came to Congress, and we came into problems around counting data. We would have different counties counting flu deaths at different rates. And when we kind of dug down and started figuring it out, we realized, well, one JP was doing it one way; another JP was doing it another way. And so, we started working on trying to come up with a State standard.

If you can believe it, in 2020, there is not a Federal national standard for collecting vital statistics. And that, in turn, is leading to disparate answers in terms of the way localities and then, in turn, States are reporting.

And then we, as Federal policymakers, are trying to figure out, how do I deploy assets? Where are my problems? And because the data is being collected differently, you might not realize you have a problem somewhere where you do have a problem. You might think you have a problem somewhere that you don't have a problem.

And so I am working, on a bipartisan basis, with Congresswoman Shalala, my colleague from Florida, to work on the beginnings of a study—an appropriations bill, so we will see this, members, hopefully later this month—to start to study a national standard for vital statistics collection.

And I will just share one issue that I will just take it home to Collin County, where I live. We were not counting—we were actually originally counting people who were serologically positive as a COVID case, and then we were told, don't count that as a COVID case when you report your accounting.

Mr. Perry, I see you nodding and smiling, so maybe you have a reaction to what I am talking about or maybe you have seen this in the field yourself.

Mr. PERRY. No. I will just say, as a person who works at a think tank, we need consistent, reliable data, and that often is not had because there is a lack of standards.

So I would fully support any kind of legislation that led to standardizing these vital records because, without it, we really don't have the information to address the problem well. I can't really add much more, but we need consistent reporting on these issues.

Mr. RASKAR. If I could add to that, Mr. Taylor, I think data is so important, as Andre said. At the same time, data is valuable only if it can be triangulated from multiple sources so that it is really valid.

Like you said, if you just do the collection in a top-down manner, you don't know if it is going in the right way. So, if it is also bottom-up, citizens are participating, counties are participating, communities are participating in it in some other way, then the data becomes more valuable and more accurate.

Mr. TAYLOR. Sure. Another example: At home, we originally, if we had a husband and wife and the husband tested positive and the wife had symptoms, we would assume that they were COVID positive, but we wouldn't report them as COVID-positive because we didn't want to use a test on them unnecessarily unless they needed hospitalization.

The County was then told by the State of Texas, actually, start counting that person as a COVID-positive, report that as a positive case. So, my County then showed a spike in cases because they took a bunch of people who had previously not been reported as positive and then reported them as positive.

But, again, this was a County decision that was then overridden by a State decision. And what I would like to see is a consistency in the reporting of data.

And I am glad to see so many people nodding as a sign that it is—when I talked to Congresswoman Shalala, Secretary of Health and Human Services, she immediately understood that, wow, I need consistent vital statistics. We need to have a national standard so that my county is not guessing on what to do; every county knows what to do, and it is a standard. Anybody else want to comment on that?

Mr. RASKAR. The point you are making about a national standard is useful not just for hindsight, what has happened in the past, but also for insight, what is going on right now, and to the point made earlier about the prediction, about the foresight as well. And again, for that, we need a triangulation of data.

Because if we do have the development of a national weather service here, it will look at not just the past hurricanes, what is going on today, but use models to start predicting them going forward.

For this virus, now we have heard that different mutations are virulent in different ways. And responding to them in old-fashioned ways, like the mechanisms we used a week ago or a month ago are not as useful as what we would see them a month or even 6 months from now.

So, whether it applies to the common cold or other public health challenges or dealing with this pandemic, I totally agree that a national standard of that kind would be extremely valuable.

Mr. PERRY. May I just add one very brief—Ramesh is absolutely correct. This is an opportunity for us to really rally behind the data. If you really want to get people involved in a very mass way, you have them participate in the collection. And so this is just an opportunity to really exercise that principle that we are all in this together.

Mr. TAYLOR. Sure.

Thank you, Mr. Chairman. I yield back.

Chairman FOSTER. Thank you.

And I will abuse my chairman's prerogative to point out that also in the upcoming appropriations will be to once again have the House hopefully vote to repeal the ban on a unique patient identifier. This is simply a database key that would allow you to uniquely identify medical records, which is a very important issue. And I was very proud we got a strong bipartisan vote to repeal that ban in the House. And, of course, the Senate did what the Senate does, which is nothing.

But I will just flag that for Members. It is an important thing, really, the starting point in getting consistent national records is to just be able to identify who this person was.

And now, the Chair will recognize Representative Garcia of Texas for 5 minutes.

Ms. GARCIA. Also, from the Lone Star State, Mr. Chairman.

Chairman FOSTER. Also from—I am sorry to have missed that. Well, you don't have the flag behind you, right?

Ms. GARCIA OF TEXAS. I guess I have that set up downstairs when I do videos, not when I am here on calls.

But thank you for this very important hearing at such a critical time because, as some people have noted, it is really not just about what we need to do today, but in terms of standards and requirements or guidance, depending on which we choose to operate under. It is about future pandemics, future events, so that we can be better prepared. So, thank you very much.

And I want to start with Mr. McClendon. I just want to make sure I understood when you were responding to the ranking member on his question about who uses the app and what information is picked up, everybody else has to be using the app for anything to talk to from your app, correct?

Mr. MCCLENDON. Yes, that is correct. Only data from participants who have installed the app and opted in will have their data recorded within the phones or, in the case of an infected person, uploaded. If they don't have the app installed, they are completely outside the system.

Ms. GARCIA OF TEXAS. So, for this to really work, sort of like masks, everybody has to wear a mask, everybody has to use the app, correct?

Mr. MCCLENDON. I would like for that to happen, and I will endeavor very hard to market that message to convince communities and States to do that.

Ms. GARCIA OF TEXAS. I just wanted to make sure that I was clear on that because now I want to switch to the good doctor.

Dr. Kuppalli, it has just been so hard to get everybody to wear a mask. I have some of my own colleagues on one of my committees who all refuse to wear a mask, except two who are now wearing them. It has become politicized.

How are we going to convince people to sign up to an app when we have not been able to convince them to wear a mask? That really is the reality.

Dr. KUPPALLI. I think that is a great question. I think that, first off, we need to stop politicizing this pandemic, and we really need to let the science lead the way. We are talking about human lives.

Second, I think that we need to really be clear about the privacy safety that we are going to have when it comes to using these apps. I think that is really important. And I think that, as we have seen in other places that have been able to successfully contain COVID, one of those things is also people having good trust with not just the people who are doing the work, but also in terms of the governments and the people who are working on this work.

I think that is all really important. One of the things that is extremely important that we need to continue to work on is also engagement, right? And so, engagement is going to be important. Trust is going to be important, and making sure we protect people's privacy is going to be important in getting people to uptake these types of things.

Ms. GARCIA OF TEXAS. Mr. Raskar, I wanted to ask you a question related to that. I have been struck that you have used the word several times that it should be a "nonprofit" or that it should—and also, it should be available inclusively to all communities.

Tell me about that. Why would you suggest that it needs to be an app that would be distributed through a nonprofit rather than a for-profit?

Mr. RASKAR. I think that we have great companies, Big Technology companies doing great work. I worked at Facebook for 2 years. I was on an Apple privacy team last year. And all of these companies have great intentions, but derivative companies out of that use the metadata in nefarious ways. You may not realize that every time you go to—

Ms. GARCIA OF TEXAS. No, I realize that. I just want to hear you say it for the rest of the world to hear it.

Mr. RASKAR. Exactly.

Ms. GARCIA OF TEXAS. But I just want to focus on this particular app. Do you think it is critical that it be done through distribution of sorts through a nonprofit?

Mr. RASKAR. Yes, exactly.

Ms. GARCIA OF TEXAS. Make sure everybody can get it?

Mr. RASKAR. Yes. It should be done by a nonprofit. It should be open source. And just like public utilities, it should be audited any time in a trustworthy manner. And make sure it is inclusive.

And the challenge is that if it is not done by a nonprofit, if it is done by a for-profit, they can use the metadata. Even with the Google/Apple exposure notification app, they can use the metadata from that app on their servers and they could be tempted to use that in other ways.

So, if the same company has two apps, one app that is used for contact tracing, which is supposedly private, and another app that is doing something else, those two apps collectively can create a much bigger picture of the user. And that is why we think a nonprofit, which is committed to the mission, committed to being open source, committed to collaboration, committed to being audited, should be the only ones deploying such solutions.

Ms. GARCIA OF TEXAS. And it has to be just to augment the use of community people, or in my community, people who are used to doing the community health work neighborhood by neighborhood.

Mr. RASKAR. Exactly. And the important part of that is the development of the app, not just how the app works right now. It should also be driven by the mission, which is, as Brian McClendon said, getting the exposure notification is just the beginning.

The case management, the interviews, the monitoring, the support is what we do at PathCheck Foundation. That is why we don't use a hybrid approach where we can offload a lot of the work for manual contact tracing through the app that is 70 percent of the population, but then the rest of the process still requires manual contact tracing operations.

Ms. GARCIA OF TEXAS. Great. Mr. Chairman, I see that I have run out of time. I did have a question for Mr. Perry, but I will submit it in writing. Thank you so much. I yield back.

Chairman FOSTER. Thank you.

The Chair now recognizes the gentleman from the Buckeye State, Mr. Gonzalez, for 5 minutes.

Mr. GONZALEZ OF OHIO. Thank you, Mr. Chairman. And thank you for recognizing the great Buckeye State. And thanks for this important hearing, on a very interesting topic certainly, and one that I think we are all still trying to wrestle with, frankly.

I want to start my questions with Mr. McClendon. You have stated—and I agree—that it is a marketing challenge, but I would argue that it is an enormous marketing challenge, asking sort of everyday Americans to trust two entities, Big Tech and Government, that naturally we don't trust, and I think for good reason, unfortunately.

My first question is, and you have sort of alluded to it, but what is the minimum amount of adoption you could get and still have an impact, knowing I don't believe you can get anywhere near perfect. You are not going to get 100 percent. People are just not going to opt in.

So, tell me a little bit about that, please.

Mr. MCCLENDON. Right. So, if it was perfect, according to the statistic I just heard, 18- to 65-year-olds have 90 percent penetration. So, in that category, even if it were perfect, we would only discover 81 percent of exposures, because both parties have to have it installed.

The square problem is a big deal. So, 40 percent only gets you 16 percent of exposures. I am hoping for 50 to 60 percent where

we discover 25 to 36 percent of exposures, and those become those inbound phone calls.

And, as far as how to do that, I think we really need to get communities' buy-in. Whether it is the State that is the official agency that publishes the app, we need every town and university and church and synagogue to convince their members to participate in this process, because if you get densities of installed base, that works, right?

If you could get 80 percent of a university community to install this app, then that works within the community. All of the exposures that occur within the university will be discovered much more quickly, and the ones that happen in the rest of the town, maybe not so much.

But I think there is an opportunity for individual communities to bring their members in and convince them to install the app. We really need this to be—like wearing masks, it should be a community response.

Mr. GONZALEZ OF OHIO. I think you are right, it is going to be community by community. I can just tell you for a fact that my most rural counties are not in. They are not going to go for contact tracing, signing up for the app. And I don't blame them, frankly. So, I think a different strategy would probably make sense for them.

Mr. Perry, I want to shift to you. You mentioned something that I think is really important, which is, look, we talk about who is most vulnerable here. My fear from the beginning with this virus is that it would accentuate our biggest inequalities, and I think it has. It has shined a light on the fact that those who are most vulnerable are having the worst outcomes with the virus, I think.

And when I think of how we can get ahead of that as the outbreak continues, I think of sort of how do we protect our low-income wage workers, our minority populations, those who can't socially distance, either at work or in the home.

I am Hispanic. My family was born in Cuba. This beautiful lady here over my shoulder was my grandmother, who lived with us basically until she passed away. So, multigenerational households don't distance as well, just by nature of the living conditions.

With that in mind, one thing that I have started working on that we are going to drop here soon would be a grant program which would allow hotels, on a voluntary basis, to convert to sort of COVID housing places, so that if you then get the virus and you can't distance at home, you have an option of checking into a hotel, which would be picked up by the government.

Just as a general concept, I would love to just get your thoughts on that as a way to help our communities who can't distance for a variety of reasons, giving them an option if they pick up the virus to self-quarantine in a way that is safe and won't affect the whole family.

Mr. PERRY. As was mentioned, contact tracing must be paired with other social supports. And if they are not, you are really minimizing the impact of them.

And so, I agree that there are a couple of areas that are critical. We need a housing response, and we need an employer response.

Mr. GONZALEZ OF OHIO. Yes.

Mr. PERRY. And if we are not talking about unemployment insurance, if we are not talking about some type of workforce housing, housing for the sick, housing for the vulnerable, then the contact tracing mechanisms really will be limited in scope.

Mr. GONZALEZ OF OHIO. Thank you, and I yield back.

Chairman FOSTER. Thank you.

And I would like to thank all of our witnesses for their testimony today.

The Chair notes that some Members may have additional questions for this panel, which they may wish to submit in writing. Without objection, the hearing record will remain open for 5 legislative days for Members to submit written questions to these witnesses and to place their responses in the record. Also, without objection, Members will have 5 legislative days to submit extraneous materials to the Chair for inclusion in the record.

This hearing is now adjourned.

[Whereupon, at 1:27 p.m., the hearing was adjourned.]

A P P E N D I X

July 8, 2020

Dr. Krutika Kuppalli

Infectious Diseases and Global Health Physician

Testimony Submitted to United States House of Representatives Committee on Financial Services Task Force on Artificial Intelligence

Exposure Notification and Contact Tracing: How AI Helps Localities Reopen Safely and Researchers Find a Cure

July 8, 2020

Thank you Chairman Foster, Ranking Member Loudermilk and distinguished members of the Task Force for the opportunity to testify before you today. I am extremely grateful for your interest and commitment towards helping support the novel Coronavirus Disease 2019 (COVID-19) efforts in the United Sates as we attempt to control this deadly pandemic. I am an Infectious Diseases physician by training and have extensive experience in global health and health security. I have considerable experience developing, operationalizing programs, and treating patients working on the frontlines of numbers infectious diseases outbreaks across the world. My clinical and research interests focuses on health systems strengthening in resource limited settings, outbreak preparedness and response, research and clinical care of emerging infections, and healthcare policy.

As the COVID-19 pandemic continues to spread across the United States, I hope to give you a greater understanding of the threat this and other emerging infections have to the global and economic security of the United States. I will discuss challenges facing public health experts and researchers leading COVID-19 efforts domestically. I will explain how we may better leverage available resources and tools to improve our response capacity, lessons we can learn from prior infectious diseases outbreaks, and examples of other countries who have successfully implemented policies and procedures to control COVID-19. During this unprecedented time, it is vital for the United States to collaborate with the global community so we can learn from each other and develop best practices to ensure that science informs policy.

Global Infectious Diseases Threats

Pandemics have repeatedly reshaped the course of civilizations resulting in significant human suffering and death along with substantial economic costs. The Black Death killed approximately 60% of the European population between 1347 and 1351.[1,2] European settlers introduced smallpox, measles, plague, typhus and syphilis that led to the death of up to 90% of the indigenous American population[2]. In the 1990s, a multi-

drug resistant tuberculosis outbreak in New York City cost over $1 billion, the bovine spongiform encephalitis ("mad cow") disease outbreak in the 1990s cost the United Kingdom $39 billion; and in 2003 SARS across Asia cost approximately $30 billion.[3,4] Most recently, the 2014-2016 West Africa Ebola outbreak led to over 28,000 cases, 11,000 fatalities and an estimated cost of $53.19 billion.[5] These statistics don't account for the intangible losses that occur during epidemics- families torn apart, children left as orphans, survivors treated as outcasts, hospitals unable to function, loss of critical healthcare workers, and so much more which all combine for a large unquantifiable human, economic, and social expense. According to the World Bank, the current COVID-19 pandemic is estimated to cause a contraction in the global GDP by 5.2% in 2020 leading to the deepest recession in decades.[6]

Severe Acute Respiratory Syndrome Coronavirus-2 (SARS CoV-2) the virus responsible for novel Coronavirus Disease-2019 (COVID-19) it the latest in a series of emerging and re-emerging infectious diseases with pandemic potential that have occurred with increasing frequency and severity. Over the past 40 years, there has been a four-fold increase in the number of emerging pathogens such as extensively drug resistant Tuberculosis (XDR TB), SARS, pandemic H1N1, MERS-CoV, Nipah, Zika, and Ebola.[7] Public health threats, and infectious diseases respect neither boundaries nor barriers and 70% of the world is underprepared to prevent, detect, and respond quickly and effectively. In short, we must do better. In this era of increasingly mobile and connected populations it is possible for an infection to spread around the world in 24-48 hours due to urbanization, human behaviors, and rapid transportation networks.

The world is constantly changing. We have altered how we live, the way we live and the planet on which we live, including the way we interface with nature and built environments and with animals, the way we travel, and our climate. This creates both the key ingredients for infectious diseases outbreaks and unprecedented opportunities to prevent and respond. Simultaneously, advances in biomedical and information technologies as well as analytic capacities have dramatically accelerated our ability to identify these emerging pathogens, sequence their genomes, develop diagnostic tests, drugs and vaccines, and share data across the globe. It is critical we work together as a global community so we can move forward with addressing COVID-19 and prepare for future emerging infectious diseases threats

The COVID-19 Pandemic

On December 31, 2019 cases of atypical pneumonia of unidentified etiology were reported in people in Wuhan, China.[8] By January 7, 2020 the pathogen was identified as SARS CoV-2 the virus responsible for COVID-19. Since then it has been declared a Public Health Emergency of International Concern (PHEIC) by the World Health Organization (WHO) and has infected more than 11 million individuals globally and caused over 500,000 fatalities.[9]

As the world watched COVID-19 sweep over Wuhan and spread through China, countries prepared for the inevitable. Many governments realized COVID-19 posed a

unprecedented risk to the physical and economic health of their countries and activated pandemic preparedness plans. Singapore and Taiwan with fresh memories of SARS (2003) and South Korea with MERS-CoV (2015), implemented preparedness plans and ramped up testing and contact tracing.[10,11] Alternatively countries such as New Zealand (who didn't ban travel from China until February 3, 2020- a day after the United States) took a hard stance and let science lead their response.[12] They instituted a mandatory quarantine for all visitors on March 15, 2020 when they only had 6 cases and 10 days later, instituted a countrywide lockdown including a moratorium on domestic travel.[12] These restrictions, despite being stringent were embraced because the message and plan to "eliminate COVID-19" were clearly communicated in daily briefings.

Countries who have managed to contain COVID-19 have a few things in common:

1. Science led the response plan
2. They developed a strong comprehensive national plan
3. Action was quick and coordinated
4. Communication about goals was clear
5. Community engagement was a priority
6. Case identification and testing scaled up quickly
7. Testing and care of sick patients was a priority
8. Contact tracing was prioritized and implemented
9. Lifting of public health measures has been step-wise and guarded
10. The public trusts their leaders

Challenges to COVID-19 in the United States

The first case of COVID-19 was detected in the United States on January 20, 2020 in a returning traveler from Wuhan, China.[13] In the 5 ½ months since this patient was detected, cases and fatalities in the United States have risen disproportionately compared to the rest of the world. As of July 7, 2020 the United States accounts for approximately 4% of the global population, but for 25% (2.9 million) of COVID-19 cases and 24.2% (130,000) of fatalities worldwide. More concerning is that as lockdowns have been lifted over the past month there have been a record increase in COVID-19 cases.[9,14] With over 45,000 cases/day since July 1st, there has been a halting and reversal of business openings across the country.[14]

The virus is expected to spread until a critical mass of the population, about 70%, develops immunity. As of May, an estimated 5-6% of people in the U.S. had been infected and it is still unclear how long immunity will last.[15] Thus, to control COVID-19, we must break the chain of human-to-human transmission. The fundamental principles of managing an infectious diseases outbreak are (1) Community Engagement (2) Case Identification (3) Testing and Care (4) Contact Tracing and (5) Isolation and Quarantine.

In addition to the significant health repercussions, the COVID-19 pandemic has had a large toll on the overall life of Americans. It has led to adverse physical and mental health outcomes, affected all aspects of daily life and society, resulted in emergency global lockdowns, and negatively impacted businesses and global trade. Over 40 million

people have filed unemployment claims, small businesses have closed their doors, and cities have implemented eviction moratoriums to protect renters which will have downstream repercussions for decades to come.[16] The adverse consequences are exacerbated by lifting public health measures only to halt and reverse re-openings which exacerbates the long-term economic repercussions of this pandemic.

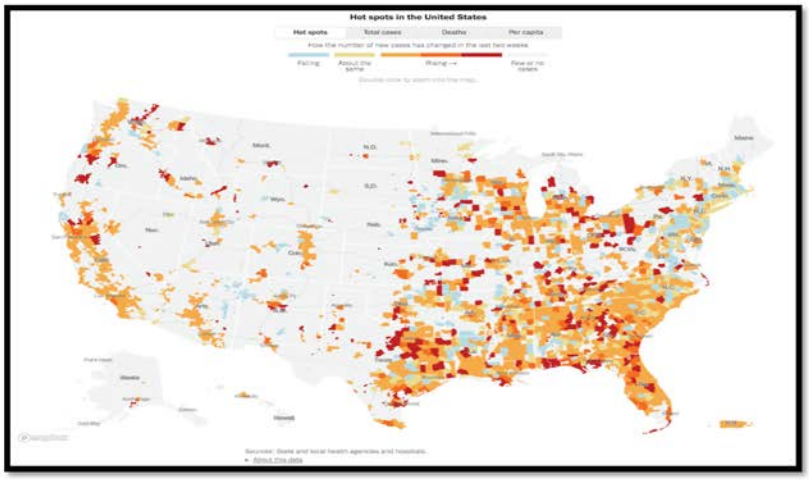

Figure 1: Map illustrating current COVID-19 hotspots throughout the United States

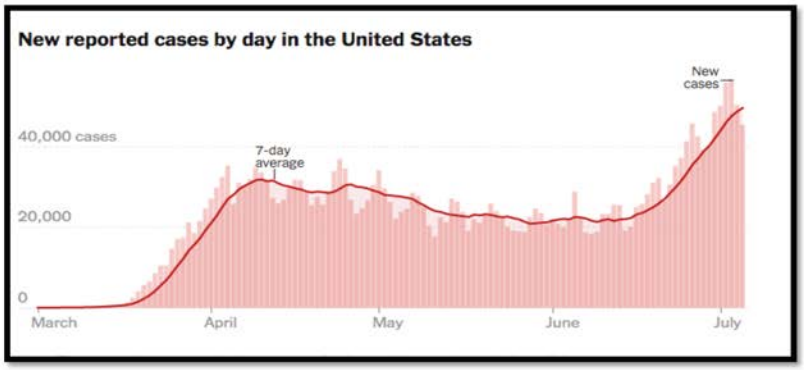

Figure 2: COVID-19 cases reported by day in the United States through July 6, 2020

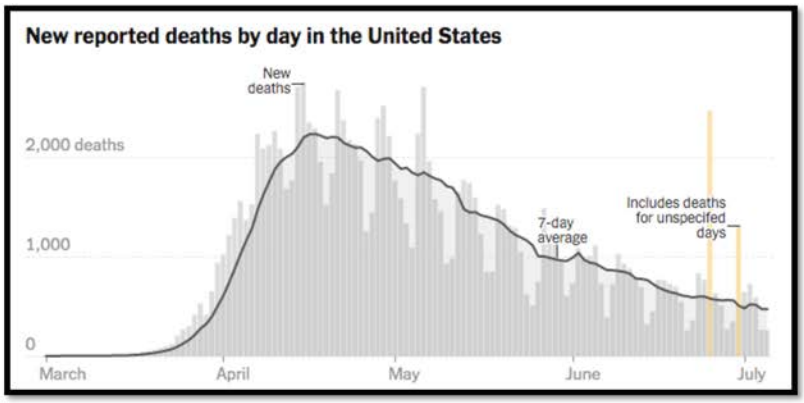

Figure 3: COVID-19 fatalities reported by day in the United States through July 6, 2020

What can the United States do?
With coronavirus cases surging across the United States, we must take bold steps to improve both the short-term and long-term health and economic recovery of our country. The longer this uncontrolled outbreak persists the greater the devastation and more significant the consequences. It is imperative to adopt the essential elements of outbreak response as follows:

(1) A National Plan

Many elements of a national plan are included in the Infectious Diseases Society of America COVID-19 Recommendations to Prepare for a Fall Surge that I had the privilege to advise on. Currently, the lack of a national plan limits understanding of the purpose of public health measures such as lockdowns which subsequently diminishes adherence. In addition, a regional, rather than a cohesive national approach, sends mixed messages to our citizens making it difficult for them to understand who to listen to and what guidance to follow, if any. Clear national goals are vital to success.

(2) Communication and Engagement

Along with communicating clear goals, it is important for our government and public health leaders to have clear and consistent messaging about evidence based recommendations to garner trust from the public. Trust, communication, and transparency are the keys to public endorsement or recommendations and guidance. Additionally, we must avoid the perception that the recommendations are inconsistently or unevenly applied in order to maintain strength and unity across the country.

(3) Personal Protective Equipment (PPE)

Despite ongoing efforts, an inadequate supply of PPE remain and increases the serious risk of infection primarily for healthcare professionals and secondarily for their colleagues, family members, and other patients.[17] The Centers for Disease Control and Prevention (CDC), reports that over 75,000 health care personnel have become infected with COVID-19, with over 400 deaths.[18] Frontline healthcare workers are forced to extend and reuse PPE, even in areas where cases are declining because we lack a long-term dependable supply of PPE. A strong supply of PPE is critical particularly now as healthcare facilities resume elective procedures and COVID-19 cases continue to surge. For example, at San Quentin prison in California is in the midst of a large COVID-19 outbreak among nearly 1,400 prisoners (1/3 of the prisoner population) and 165 employees, yet they lack adequate PPE and appropriate sanitation supplies.[19]

We need to develop and implement a long-term national strategy for PPE, including N95 respirators, powered air purifying respirators (PAPRs), Controlled Air-Purifying Respirators (CAPRs), masks, gloves, gowns, and face shields. Any strategy must emphasize the manufacture and distribution of PPE, including broader and continued utilization of the Defense Production Act. In addition clear communication between the federal, state and local government regarding the PPE supply and delivery chain is essential.[15]

(4) Testing

Five months after the first case of COVID-19 was detected in the U.S., testing continues to be one of the greatest challenges of this pandemic. The Kaiser Family Foundation compared models to calculate national-level testing capacity and determined a robust strategy would require about 1.25 million test/day or 8.75 million per/week, which is about 2.7% of the U.S. population tested weekly.[20] We continue to fall below these targets due to lack of swabs, reagents, and trained personnel. I have patients who are still unable to get tested for COVID-19. In some areas, patients wait 5-10 days for test results which diminishes the utility of testing from both a personal and public health perspective. During that 5-10 day wait time, the virus continues to spread and patients can decline clinically.

In addition to increased testing supply manufacturing and personnel training, the U.S. must have medium and long-term strategies that will allow us to adjust as needed. We need to consider developing a strategy that invests in developing adequate tests that are distributed equitably and expanding testing to locations that include all populations. We also need to streamline research for the development of tests that utilize alternate specimen sources (i.e. saliva), media (saline) and collection devices that will reduce PPE needs for testing. Finally we should focus on monitoring high-risk populations such as those living in congregate housing, incarcerated, homeless, and racial/ethnic minorities disproportionately affected by COVID-19.

(5) Facemasks

Until we have a vaccine or a preventative therapeutic, face coverings and physical distancing are the most effective public health measures we have to prevent COVID-19. A review of 172 observational studies across 16 countries and 6 continents found that transmission was lowered with distancing of at least one meter or more and that protection increased as you furthered your distance.[17]

Given the current widespread community transmission in the United States it is imperative that government and public health officials not only encourage but also personally demonstrate these measures to prevent onward transmission. Implementation of an evidence based public education campaign on the risk associated with different activities and how to reduce risk, and the importance of these tools to decrease the number of cases and facilitate the re-opening of society.

(6) Contact Tracing

Contact tracing often called the linchpin of an infectious diseases outbreak response, is critical to identifying those who have potentially been exposed and to halt onward transmission. Countries who have implemented robust testing and contact testing have been successful at containing COVID-19. While many states have hired contact tracers, additional federal resources, infrastructure, and training will be required to ensure we have a sufficient and well-coordinated work force to perform this vital task.[21] Based on the current population and data, experts estimate each case requires 10-25 contacts to be traced which requires at least 180,000-300,000 contact tracers.[15,22] Recognizing the importance of contact tracing, Johns Hopkins University has developed a free online course dedicated to training people in the principles of contact tracing https://coronavirus.jhu.edu/contact-tracing.

Given the growth of culturally diverse populations in the United States such as racial and ethnic minorities, members of tribal nations, immigrants, and refugees it is important that contact tracers mirror the U.S. populations and that case investigations are conducted in a culturally appropriate manner.[23] We are already witnessing what history has demonstrated; severe illness and death rates tend to be higher for racial and ethnic minority groups during public health emergencies. For this reason, it is important to engage representatives from affected communities and take into account the social and economic contexts in which these communities live and work (i.e. agricultural workers). In order to build trust, the CDC recommends that jurisdictions employ public health staff of the same racial and ethnic background as the affected community with fluency in their preferred language. Finally since minority populations are at increased risk for discrimination and stigma it is important to maintain privacy and confidentiality.[15,23]

One of the key components of a successful contact-tracing program is community participation and engagement. During the 2014 West Africa and 2018 North Kivu/Ituri DRC Ebola outbreaks community trust and engagement were barriers that had to be

overcome in order to effectively engage the community. The public thought Ebola was a myth, were wary of Ebola Treatment Units, and did not want to engage in safe burial practices because they conflicted with cultural norms. Through hard work of contact tracers who worked with community leaders and stakeholders a communication strategy was developed and focused on educating and engaging the community.[24] This took a lot of time and required tailored culturally sensitive messages to reach targeted populations however eventually they were able to dispel myths, gain community engagement, and drive the Ebola cases to zero allowing for the end to these epidemic.

Another vital component to successful contact tracing is leveraging new and innovative technologies to promote efficient and broad implementation strategies. The CDC and WHO provide guidance on the use of electronic tools and information technology for contact tracing and the WHO has developed their own software application called Go.Data.[25,26,27] Although different technologies are increasingly used, it is important to remember the ethics of public health information, data protection, and data privacy when using any of these technologies.

As such, the WHO has provided some items for consideration[25]

1. Safeguards must be in place to guarantee privacy and data protection in accordance with the legal frameworks of the countries where systems are implemented.
2. Everyone involved in contact tracing must adhere to the ethical principles of handling personal information, to ensure responsible data management and respect for privacy throughout the process.
3. How data will be handled, stored, and used needs to be communicated to those concerned in a clear and transparent manner. This is important for buy-in and engagement as well as to avoid misperceptions that could jeopardize the effectiveness of a contact-tracing program.
4. Digital tools used for contact tracing should be assessed before use to ensure safeguarding data protection according to national regulations.

Likewise, the CDC has identified some potential advantages, disadvantages, and implementation challenges with integrating technology use into contact tracing[27]

Advantages

1. Potentially higher likelihood of buy-in from patients and users by prioritizing individual trust.
2. Augments capacity of case investigator and contact tracer workforce (e.g., may decrease burden of manual contact elicitation, help to identify contacts in a timelier manner, facilitate communication with contacts, and help ensure rapid isolation of contacts to interrupt the chain of transmission).
3. Augments contact identification by identifying potentially unknown contacts.

4. Provides more comprehensive mobility history, which allows the contact to better detail their movements and provides public health authorities with more accurate information in the aggregate.
5. Provides granularity of proximity and associated temporal data that may be useful in stratifying contacts into different exposure risk categories that public health agencies can match with differing levels of tracing, notification and monitoring.

Disadvantages

1. Has inherent socioeconomic and technology literacy biases – requires that client and contacts have access to a smartphone, knowledge of how to install apps, and literacy to navigate app menus.
2. May not be effective until a "critical mass" of users in a community are using the apps.
3. Requires individuals to keep their smartphones on them at all times with the appropriate functions enabled and depends on users to elect to share their information with public health agency.
4. Disparate data formats from multiple apps may not be interoperable and could add burden on public health agency for integrating data seamlessly into their case management and contact tracing systems and workflows.
5. Expansion of tool capabilities will require more consultation on the **ethical** and **legal** issues related to electronic tracking.
6. Hacking and other unauthorized access or use of data may compromise data security and confidentiality.

Implementation Challenges

1. Social mobilization and mass marketing media campaigns are required to gain a critical mass behind one or more application for broad public usage.
2. Building and sustaining public trust in public health agency's ability and intention to preserve the privacy of individuals is crucial to widespread adoption of new technologies.
3. Systems are needed to integrate disparate data streams into public health agency information systems without compromising the integrity of existing workflows and to safeguard against false-positive alerts.

As we continue to develop our contact-tracing workforce in the United States it is important to explore the pros, cons, and potential barriers toward using technology. It is understandable the public may be hesitant to share information which is why it is important to learn from countries such as Canada, the United Kingdom, and South Korea that have successfully implemented and used technologies such as medical records, GPS, financial services to understand how they have been implemented without compromising individual privacy concerns.[28,29]

(7) Vulnerable Populations

Infectious Diseases tend to disproportionately affect vulnerable and disenfranchised patient populations and the COVID-19 pandemic has amplified that. According to the CDC's COVIDview, Non-Hispanic Black and Non-Hispanic American Indian/Alaska Native populations have a hospitalization rate 4.5 times that of non-Hispanic Whites, and Hispanic/Latinos have rate 3.5 that of non-Hispanic Whites. When looking at data from 40 states, the mortality rate for COVID-19 in African American's is 2.4 times higher than for Whites and 2.2 times as high as the rate for Asians and Latinos.[15] Given these disparities, resources to address the disproportionate impact of COVID-19 on African Americans, LatinX and Native American communities should be considered along with strengthening the response to other vulnerable populations.

Another unintended consequences of the COVID-19 physical distancing restrictions has been the drop in early childhood immunization rates. During the week of April 5, 2020 the administration of MMR vaccine dropped 50%, diphtheria and pertussis vaccines dropped 42%, and HPV dropped 73%.[15] The steep decline in vaccination rates may lead to outbreaks of vaccine preventable diseases, such as measles and whooping cough. Additionally with concerns for a fall/winter COVID-19 surge high rates of influenza vaccination and pneumococcal vaccination (in those whom indicated) will be critical to prevent high levels of hospitalizations from these diseases from overwhelming our healthcare system.

It will be important to consider novel approaches to safely administer routine vaccines during the COVID-19 pandemic so we can reach underserved populations and individuals living in congregate settings. These may be things such as drive through clinics or mobile units and increased funding to support outreach to patients and families who are due or overdue for vaccines.

(8) Support

Living through the current COVID-19 pandemic is unlike any other time during modern history. This has caused a great amount of physical, emotional, and economic stress on individuals that continues to take a toll over time. It is important that we acknowledge these stresses and provide support for all individuals in our society to weather this crisis.

In particular if we want to break chains of transmission, we need to recognize and support the needs of people in isolation and quarantine. This may include a safe location to stay during this time (particularly for individuals who are homeless or living in settings where physical distancing is not possible). It could also mean emotional support as well as paid sick leave, food, and access to medical care. Recognizing that individuals have numerous needs during this challenging time is vital and it is incumbent on all of us as a society to come together and provide assistance.

Countries Who Have Successfully Controlled COVID-19

Since the start of the COVID-19 pandemic many countries have developed strategic plans, mobilized resources, invested in testing and contact tracing, and followed guidance of public health experts in the management of this health emergency. There are examples of countries from around the world that have successfully approached COVID-19 head on, containing viral transmission and minimizing the overall impact of the pandemic to the health and economy of their country.

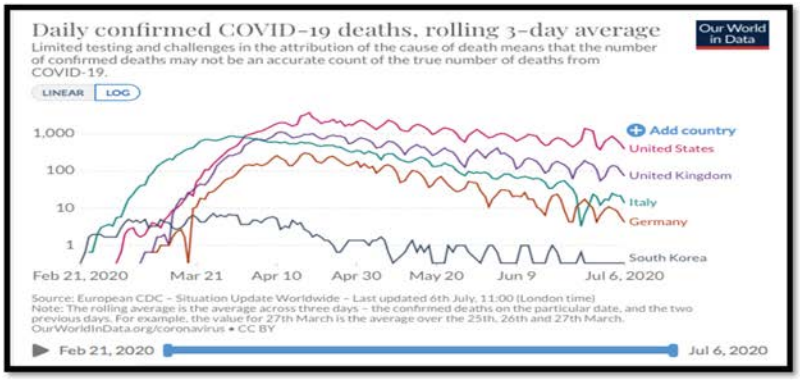

Figure 4: Daily confirmed cases from COVID-19 comparing the United States, EU, Germany, South Korea, and New Zealand through July 6, 2020

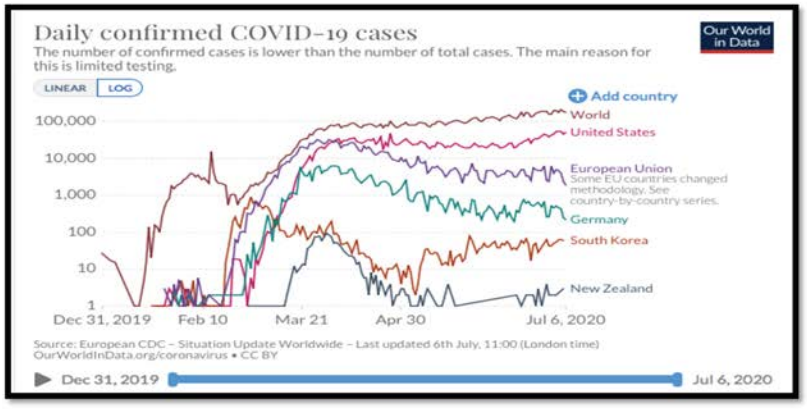

Figure 5: Daily confirmed fatalities from COVID-19 comparing the United States, UK, Italy, Germany and South Korea through July 6, 2020

1. South Korea

The United States and South Korea identified their first imported cases of COVID-19 on the same day, January 20, 2020. South Korea, with a population of 51.26 million people, has had 13,137 cases and 284 fatalities from COVID-19. In comparison the United States with 331 million people, has reported 2.9 million cases and over 130,000 fatalities.[9]

In 2015 South Korea was affected by the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) outbreak. In the aftermath of that outbreak S. Korea invested resources in training healthcare personnel, and developing response systems, infrastructure, and laboratory capacity for future infectious diseases outbreak. As a result, South Korea has been largely successful in containing this outbreak and is a country to look to for guidance as we continue to adjust our response. Their first case was identified during quarantine screening at the airport when a woman was identified with a fever. She was immediately tested and diagnosed with COVID-19.[30] Subsequently, cases imported from China and those linked to imported cases were traced by contact investigation until patient 29 was identified. Patient 29 was the first case that raised the possibility of community transmission. The outbreak took off in South Korea after a superspreading event linked to a religious group in Daegu that accounted for a majority of the positive cases. Despite this event the country was able to prevent further escalation in cases because the South Korean government along with the Korean Centers for Disease Control and Prevention (KCDC) quickly and efficiently implemented contact tracing, testing, quarantine and isolation, physical distancing, and school closures. The public health officials and government understood that the mortality from COVID-19 was higher than influenza, that symptoms could be mild even though transmissibility is high, and that a lack of effective therapeutic or vaccine created significant management challenges, so they reacted accordingly.[30]

Previous investment in outbreak response and preparedness allowed South Korea to quickly ramp up diagnostic testing for the entire country, perform mass screenings of patients, develop innovative methods to ensure people were tested, and developed policies to protect those at highest risk for infection (elderly, vulnerable populations, and healthcare workers).

In South Korea, in addition to quickly scaling up conventional methods of contact tracing, other methods were used to verify patient claims. Given the experience with the MERS-CoV in 2015 laws were revised to supplement areas that needed strengthening, which included contact tracing. In conjunction with routine contact tracing methods, medical records, global positioning system, credit card transactions, and closed circuit transactions were used when contact tracing was being performed.[28,29]

These methods were used because they provided more accurate information on a persons location, duration of exposure, and other details which may be relevant to the exposure that a patient may not be able to recall or confirm. Considerations for privacy were taken into account and protocols to protect privacy and ensure that patient

information unrelated to the communication regarding risk of infectious diseases must be protected by defining what information is important for public information up front.

Overall, lessons learned from the 2015 MERS-CoV outbreak made South Korea well prepared for the SARS-CoV-2 outbreak and able to be proactive in the face of a new infectious diseases threat. The public health and government officials responded early and quickly after the outbreak was detected in Wuhan by scaling up an organized plan that included testing, contact tracing, self isolation, physical distancing, and clear effective communication.

2. Scotland

Early on in the pandemic the Scottish government recognized the importance of working towards ending community transmission and moving towards a goal of elimination and led the push to "Zero COVID". This strategy has been largely successful and the last two weeks of June there was a decreasing number of cases, hospitalizations, and fatalities and the positivity rate has fallen to less than 0.5% on most days.[31]

Scotland entered lockdown on March 23, 2020 and the government released the Coronavirus (COVID-19): Framework for Decision Making a national plan made widely available to all citizens of the country which outlined and set forth steps required for a managed transition out of lockdown. It focused on the following principles.[32]

1. **Suppress** the virus through compliance with physical distancing and hygiene measures, ensuring that the reproduction number remains below 1 and that the National Health System remains within capacity.
2. **Care** for those who need it, whether infected by the virus or not.
3. **Support** people, business and organizations affected by the crisis.
4. **Recover** to a new normal, carefully easing restrictions when safe to do so while maintaining necessary measures and ensuring that transmission remains controlled, supported by developments in medicine and technology.
5. **Protect** against this and future pandemics, including through effective testing, contact tracing and isolation.
6. **Renew** our country, building a fairer and more sustainable economy and society.

In order to achieve the goals that had been developed, the Scottish government developed a system called "Test and Protect" focused on the principles of "test, trace, isolate, support" which has been effective at interrupting chains of transmission and containing SARS-CoV-2.[33] The "Test and Protect" system is illustrated below:

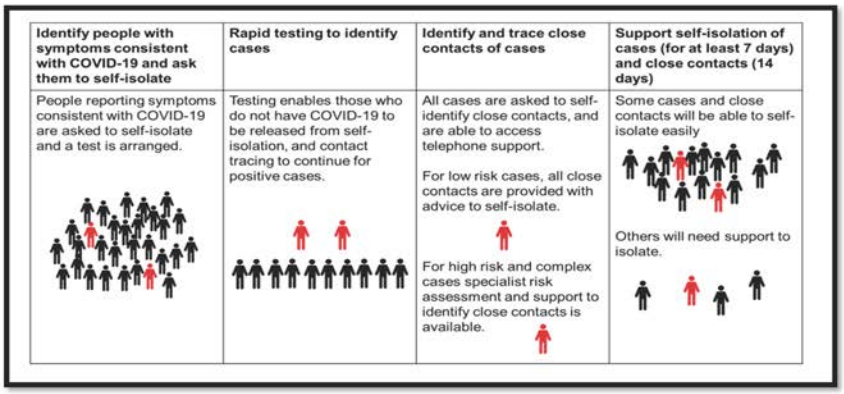

Figure 6: Schematic describing "Test and Protect"

"Test and Protect" was successful because it was combined with public health interventions that have been shown to be important to curbing transmission. These interventions included clear messaging to the public, physical distancing, the use of face coverings, and appropriate respiratory and hand hygiene.[33]

"Test and Protect" was initiated among priority groups and broadened to the general community. In order for the program work, disease prevalence needs to be low so management is possible. The five pillars of "Test and Protect: are

1. **Effective disease surveillance:** Recognizing it was essential to identify patterns of disease activity and local outbreaks.
2. **Early identification and isolation of possible cases:** Ensuring that everyone needs to be aware of COVID-19 symptoms and understand what they need to do to support the "Test and Protect" approach.
3. **Early and rapid testing of possible cases:** Working towards making sure that everyone who needs a test can get one. This included developing the ability to scale up testing as needed and which included working to expand testing for those living in remote areas.
4. **Early and effective tracing of close contacts of a confirmed case:** Involves people providing information about who they have been in close contact with, and supported by staff as required and technology while appropriate. It is understood that contact tracers are essential to the work force as they have in depth discussions with cases and contact while providing an in depth risk assessment.
   It was also recognized that enhancing existing digital infrastructure already used for tracing other infections could augment the work being done by contact tracers. The Digital Health and Care Institute is developing a secure web-based

tool for NHS Scotland that will be accessible on mobile devices and will allow individuals to input details of people they have been in contact with and send that information directly and securely to contact tracing teams. A UK government led project being developed by will support contact tracing through proximity tracking. This will use blue tooth technology to identify close contacts among other app users and will be useful for identifying people who are in close physical proximity but are unknown (i.e stranger on public transportation).

5. **Early, effective and supported isolation of close contacts:** Chains of transmission can only be broken if those who can transmit the disease to others are isolated and have support they need to maintain that isolation.

Another component to Scotland's success has been the slow, methodical and step-wise lifting of public health measures as the country has exited lockdown. This strategy has been a few weeks behind the rest of the UK but constant communication and messaging with citizens has been clear which has led to overall compliance with the paln.[31]

Finally, and likely the most component to Scotland's success in containing COVID-19 is the high confidence and trust the public has in the government. From the beginning, the government established an advisory group with complete transparency in the membership, meeting minutes which are published online, and daily briefings by First Minister Nicola Sturgeon to discuss the pandemic and answer questions from the media.

Overall the Scottish governments development of a methodical national plan with deliberate metrics that has been clearly communicated to the public while simultaneously building capacity for testing, tracing, and isolation has been paramount to their success in containing COVID-19.

Lessons from the 2014-2016 West Africa Ebola Outbreak

Public health experts have experience in managing outbreaks of not just highly communicable diseases, but doing so in challenging environments, with various patient populations, and at times dire situations. We should draw on their knowledge, background, and recommendations as policies and procedures are developed on how to best address the COVID-19 pandemic.

As an infectious diseases physician who worked on the frontlines of the 2014 Ebola epidemic in Sierra Leone at the director of an Ebola Treatment Unit, I witnessed first hand many challenges that arise during an outbreak. While not readily apparent, lessons from managing an outbreak in Africa can be applied to the current pandemic.

During the West Africa Ebola outbreak, there were over 28,000 cases and 11,000 fatalities in the three most heavily affected countries of Guinea, Liberia, and Sierra Leone. Given how Ebola spreads, the cornerstone of control is effective contact tracing to identify and monitor all individuals exposed to a confirmed case. Due to a lack of trained staff, stigma associated with having Ebola, community mistrust of contact

tracers, limited phone and internet, and difficulty traveling around due to the terrain in the context of having a high number of individuals to screen, innovative methods for contact tracing were developed.

In Sierra Leone a mobile health application was also developed to support public health officials and improve contact tracing. This proof of concept study demonstrated that an electronic system was more accurate, timely, complete, higher quality, and improved security. Additionally the use of the app allowed for real-time transfer of information to prevent communication delays and decreased data entry work. Most importantly, contact tracers preferred the use of the app over a paper based system despite limitations such as network and technical challenges, and short battery life of the phones.[34]

Overall lessons from initiating mobile technologies for contact tracing during the West Africa Ebola epidemic show promising results that could be applied in the context of the COVID-19 pandemic. Thus mobile apps can be leveraged by contact tracers to enhance efficiency and accuracy particularly when managing large numbers of contacts as in the COVID-19 pandemic.

Recommended Actions and Opportunities

The current pandemic is an unprecedented event of our lifetime and urgently requires a comprehensive national plan for the management of COVID-19. The United States is at a critical juncture in its struggle to manage the COVID-19 pandemic. It is clear that the current approach of local and state governments making decisions regarding implementing and lifting public health measures is not working. Until we have a vaccine, control of the outbreak will must rely on:

1. Identifying new cases by surveillance, testing, and isolation to prevent transmission
2. Tracking all contacts of cases and quarantine
3. Physical distancing ranging from 1-2 m, banning of mass gatherings, to imposing lockdowns
4. Travel restrictions to stop importation of infections
5. The use of face masks or cloth face coverings

A study by Kucharski and colleagues demonstrated the first three strategies are not competing but rather need to be combined to bring the epidemic under control. The lowest effective reproduction number was achieved with isolation, contact tracing, quarantine, and physical distancing.[22] While these measures are inconvenient we must adopt them particularly if we hope to re-open businesses in our country, have children return to school and adults return to work, and resume social activities. Without these measures, cases will continue to mount and eventually overwhelm hospitals, providers, and the healthcare system as was seen in Italy, Spain, and New York City. I fear what will happen in the United States if this happens again so many months of lockdown and subsequent economic hardship. This would only prolong and compound the devastating effect COVID-19 has had on the health of our economy and amplify hardships for all

Americans. In short, the sooner we unify to decreased COVID-19 cases, the sooner we will emerge from this, and can focus on building a stronger and more robust America. For that the happen, everyone has a part to play and must realize we are all in this together for the greater good of our society and country.

Looking Forward

COVID-19 is the greatest social, health, and economic threat of our generation and how we choose to manage it will be our legacy. One thing we know for certain is like SARS-CoV-2, there will continue to be infectious diseases threats to humans. Given our increasingly mobile and global populations it is impossible to prevent spread across national borders. The best we can do is invest in programs that aim to enhance surveillance systems and strengthen workforce, laboratory capacities, and healthcare systems, domestically and internationally at greatest risk for emergence of diseases with pandemic potential so we can respond to future outbreaks before they become national or global emergencies.

Thank you again for the opportunity to testify before you, and I look forward to answering your questions.

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Statement of Brian McClendon
Chief Executive Officer
CVKey Project

Privacy, Disclosure, and Opt-in Data collection in the age of COVID-19

Before the
Task Force on Artificial Intelligence
US House Committee on Financial Services
United States House of Representatives
July 8, 2020

Chairman Foster, Ranking Member Loudermilk, and Members of the Task Force, my name is Brian McClendon, and I'm the CEO of CVKey Project and a Research Professor at the University of Kansas. Previously, I spent 10 years leading the teams that built Google Maps, Google Earth, Streetview, and many other geo-related services. Thank you for giving me the chance to speak before the Task Force today. In my testimony, I will describe how privacy, disclosure, and opt-in data collection impact our ability to identify, locate, and isolate those who have been exposed or infected by COVID-19.

Since March of this year, I have been leading a 501(c)(3) called "**CVKey Project**", focused on helping America "re-open responsibly" given the on-going pandemic. Together with my team of world class engineers and product developers, we believe that user-data privacy is key to app adoption by Americans and our first app, CVKey focuses on individual's symptom checking, policy communication across communities, and access control into venues such as universities, workplaces, schools, and other venues. As we have recently seen in the media, there is significant need for improved policies and public communication if we have hope of operating at any where close to normal for the next 18 months.

Artificial Intelligence (AI) and Machine Learning (ML) require large amounts of data collected for training purposes. This "ground truth" data helps algorithms figure out how to make better predictions. The most valuable data to combat COVID-19 can be found in the contact-tracing interviews of infected and exposed people. Early detection, reporting, and testing leads to quick self-isolation and quarantine and can shut down the spread of the virus faster than any other method but only if it is resourced sufficiently and executed well.

The phone calls that contact-tracers make are often not answered because most people don't pick up from an unknown number these days. When the contact-tracer does reach a potential

"case", they have to make a decision about whether to ask the person to quarantine, based on what they learn about that person's risk during their conversation. Without quick information from the infected or exposed, the virus is quietly spreading.

What exposure notification provides is a way to use cellphone data to detect (after the fact) whether you were near someone who later tests positive for COVID-19. By notifying you, and informing you of next steps (usually to call the contact-tracing team, get tested, and/or quarantine), these new apps offer a way to help contact-tracing scale with less effort, more accuracy, and more coverage than is possible otherwise.

There are at least two ways these apps can work:

1. Using GPS location information logs to compare where the infected person was relative to everyone else. The first problem with this is that GPS locations are not accurate enough, even outdoors, to ensure that someone was really within 6' for 10 minutes. The other, more serious problem with location data is that it contains personally-identifiable-information (PII) that can be impossible to algorithmically remove. If I can guess where someone works and lives, I can easily figure out who that person is, usually by pulling additional data from commercially available data sources like Equifax. Naive implementations of this method were deployed in UK, North Dakota, and Utah and did not meet with much success for multiple reasons:
    a. The biggest one was fear that either "big gov" or "big tech" was tracking anyone who installed it.
    b. Always-on GPS location collection has a material impact on phone battery life, so folks turned off or uninstalled it.
    c. Early implementations **did** upload data to the government and without sufficient protection that data could then be exposed/stolen by others, even if it wasn't misused by the government.
2. A better solution is to use low-energy Bluetooth (BTLE) signals to allow phones to record when they are near other phones. A naive implementation could still allow tracking, but luckily Apple & Google came to an agreement and a privacy-protecting method called Google/Apple Exposure Notification (GAEN) was developed that worked between Android and iOS.
    a. Apple and Google then asked each country's public health agency to build/release and app using this tech. In the United States, they weren't delusional enough to assume a single federal solution, so they are working with one group per state.
    b. Like Dr. Raskar's Safepaths group, my team is building an app using this technology, which we believe preserves privacy **and** works better than GPS solutions.
    c. The goal would be to get as many people as possible in a state to download and install this app, opting-in to sending/receiving this data between phones.

d. It uses rotating random keys broadcast from each phone and recorded by other phones, to be the connecting data. Think of it as a private, low-power version of Bluetooth "pairing mode".
e. The data being recorded is **not** uploaded to the cloud or to Google or to Apple!
f. When a user of the app tests positive for COVID-19, they receive a call from the contact-tracing team. One of the action-items is to ask the infected person to upload their random keys to a state-run cloud server. **These keys contain no PII.** Even to upload the data, the infected person needs to **choose to opt-in again**.
g. Next, everyone else's app downloads those keys and compares them to what they have recorded. This comparison occurs on each person's phone. Ag**ain, nothing else is uploaded.** Based on adjustable algorithms, the app determines whether a possible exposure has occurred. If so, it provides and in-app notification to the user with the appropriate next steps which, again, could be:
    1. Call contact-tracing team
    2. Get tested
    3. Self-quarantine
h. By giving quick contact and information to the potentially exposed person, this system has the opportunity to greatly increase coverage and quality of contact tracing.
i. Alabama, South Carolina, Virginia, and the state of Washington have publicly announced they'll be deploying apps based on GAEN technology. North Dakota is switching their app to use GAEN.

As with any app, but even more so here, the challenge is to get enough people to install and opt-in. These apps only work when both parties have it installed, so even if a uniform 40% of people install it, only 16% of exposures will be identified. Targeting specific audiences like universities, specific towns, or military bases with well-worded motivations to install could get a much higher penetration and, therefore, coverage.

Again, the message the user's data is private to their phone and anything more will require an additional opt-in, is a very strong marketing message for Americans.

Thank you.

---------- end of spoken ----------

COVID-19 Top priorities should be:

- Sufficient testing so that every symptomatic person and most exposed people can get tested, with results back in less than 24 hours
- Sufficient staffing of contact-tracing teams
- Quick self-isolation of the infected, quick quarantine of those exposed
- Everyone wears a mask indoors
- Match reopening policies in a county to the current risk of spread in that county using science and metrics

Legislative Recommendations:

- Reselling of data without opt-in is a serious privacy problem. Only aggregates that use differential-privacy should be shared/sold outside the company. GDPR and CCPA are interesting prototypes, but the USA should design a system that is easier to comply with. but has no loopholes.
- Fund contact-tracing for all 50 states, 3007 counties, and 6 territories. It requires hiring (employing(!)) a lot of people to do important work to reduce the spread of the virus.
- Support digital exposure notification app distribution. It reduces cost and increases effectiveness of contact-tracing.
- Addressing COVID-19 requires leadership, from our executive branch, legislative branch, state government and county government. Without the leadership, we will not get a handle on this virus. I believe my governor, Gov. Laura Kelly of Kansas, is making the hard decisions necessary to reduce the spread.

BROOKINGS

QUALITY. INDEPENDENCE. IMPACT.

Combating the Spread of COVID-19 Includes Strategies that Aim to Dismantle Structural Racism

Andre M. Perry
Fellow, Metropolitan Policy Program, The Brookings Institution

Testimony Submitted to U.S. House of Representatives Committee on Financial Services Task Force on Artificial Intelligence

"Exposure Notification and Contact Tracing: How AI Helps Localities Reopen Safely and Researchers Find a Cure"

July 8, 2020

Chairman Foster and Ranking Member Loudermilk,

Thank you for inviting me to testify today on this extremely important issue affecting millions of people across the country.

The COVID-19 pandemic will continue to take significantly more lives than the approximately 130,000 it has already claimed if the United States government does not invest in tools that are proven to combat the spread of the virus, including strategies that aim to dismantle structural racism. According to an analysis published on July 5 by *The New York Times*, Latino or Hispanic and Black residents in the U.S. are three times as likely to become infected as their white neighbors. Higher COVID-19 mortality rates among Black and Brown communities reflect the historic devaluation and disenfranchisement of their lives, property and communities. Racism is the preexisting condition that must be accounted for in our battle with the coronavirus.

It's hard to calculate the damage that the lack of a coordinated, comprehensive federal response has cost families in terms of lives, jobs, and businesses. Those losses will be even more severe if there's not sizable investments in infection testing, social distancing, mask-wearing mandates, medial supply chain coordination, extended paid leave, supplemental unemployment insurance, hazard pay, and contact tracing. However, the universal application of these preventative tools won't eradicate the substandard housing, poverty, limited job opportunities, and other conditions of structural racism that underlie racial health inequities.

The effectiveness of contact tracing and other tools in Black neighborhoods will be significantly determined by the extent to which these interventions help eradicate policies and practices that generate racial disparities. COVID-19 interventions should lead to investments in disenfranchised Black and Brown communities; expanded contact tracing should heighten outcomes in Black- and Latino- or Hispanic-owned firms, raise employment, and increase community involvement.

Racism already takes years off Black and Brown people's lives, and its impacts facilitate the rapid spread of the virus. Black and Brown communities cannot afford for COVID-19 interventions to come at the expense of our long-standing battle against racism. Consequently, we must apply a racial equity lens to our forays into digital contact tracing and exposure notifications.

This written testimony presents three general concerns regarding artificial intelligence in contact tracing as it pertains to structural racism and racial bias. First, contact tracing and exposure notification are not necessarily remedies for structural inequality. In their article "Structural Racism and Health Inequities," UCLA public health professors Gilbert Gee and Chandra Ford write, "Structural racism is defined as the macro level systems, social forces, institutions, ideologies, and processes that interact with one another to generate and reinforce inequities among racial and ethnic groups." Structural racism refers to how society's policies and practices serve to aid White families in building wealth and limit Black families from accessing similar opportunities. Contact tracing and other public health tools are not neutral; they can exacerbate or mitigate the impacts of structural racism.

A second concern taken up by this testimony revolves around representation. Contact tracing systems should include the people from the communities that have historically been excluded from other systems that generate better health and economic outcomes. From the tech tools that are developed to the contact tracers hired, Black and Brown people must be included in any effort to expand contact tracing.

Third, AI tools in health pose the same risk that they do in other fields. AI is only as good as the information and values of the programmers who design it, and their biases can ultimately lead to flaws in the technology and amplified biases in the real world. Our expedition into digital tools must demand greater recruitment and investment in Black and Brown tech firms, rigorous reviews and testing for racial bias, and more engagement and involvement from local communities.

What's at stake

The think tank APM Research Lab compiled one of the most comprehensive databases on COVID-19 mortality outcomes by race. As of June 24, 2020, APM found that—at 65.8 deaths per 100,000 (or one in 1,500)—Black Americans' mortality rate is approximately 2.3 times as high as the rate for Whites and Asian Americans, about twice as high as the Latino or Hispanic and Pacific Islander rate, and 1.5 times as high as the Native American rate. APM wrote that if people of color had died of COVID-19 at the same rate as White Americans, "at least 15,000 Black Americans, 1,500 Latino Americans and 250 Indigenous Americans would still be alive."

Underlying the disproportionate death rates are what researchers call "social determinants of health"—neighborhood conditions shaped by public policy that predict for life expectancy. To mitigate the spread of COVID-19, the Centers for Disease Control and Prevention (CDC) recommends social distancing measures: avoiding mass gatherings and maintaining at least six

feet of distance from other people. For decades, however, Black people and Native Americans have been subject to a different kind of social distancing in America: segregation, discrimination, and devaluation. COVID-19 doesn't discriminate, but past and present policies in housing, financial services, transportation, education, criminal justice, and other sectors do.

Inherently anti-Black policies not only influence where we live, but shape the quality of our lives. Policies built on a racial hierarchy isolated Black and Native American people closer to polluters and in areas more susceptible to natural disasters. History has shown that social distancing through racist housing policies such as redlining extracted wealth from communities of color, eliminating a crucial buffer against the financial shock of a crisis such as today's.

According to my research with David Harshbarger and Gallup's Jonathan Rothwell, homes of similar quality in neighborhoods with similar amenities are worth 23% less in Black-majority neighborhoods than in neighborhoods with very few or no Black residents. After accounting for factors such as housing quality, neighborhood quality, education, and crime, owner-occupied homes in Black neighborhoods are undervalued by $48,000 on average, amounting to a whopping $156 billion that these homeowners would have received if their homes were priced at market rate.

Social isolation through policy discrimination has extracted significant wealth from Black families. According to the Federal Reserve's most recent numbers, White families had a median family wealth of $171,000 in 2016. Black and Latino or Hispanic families had $17,600 and $20,700, respectively—making these household far more susceptible to pandemics of this scale.

"For life expectancy, money matters," according to the Harvard Gazette. Wealthier people live longer, but the COVID-19 pandemic has revealed that our fates are more intertwined than we think. Due in part to a lack of access to managerial positions, Black workers are overrepresented in occupations that require face-to-face contact, such as health care support, personal care, and protective services, as well as in gig-economy jobs. While business in these sectors has been rising during the pandemic, the nature of these jobs places workers at greater risk for contracting the virus, with many employers refusing to offer paid sick leave. White-collar workers can telecommute, receive paid time off, and socially distance while remaining financially secure, but the most vulnerable members of society are forced to choose between their work and their health.

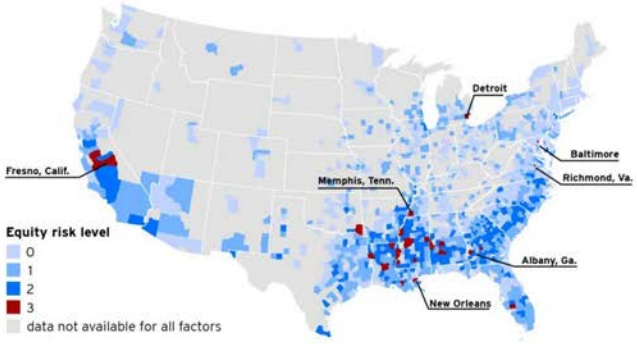
Far from a cure, historical social distancing created a social disease that has made many of us sick—literally. According to a 2019 study, residential segregation makes Black communities more susceptible to hospital closings. Another study, published by Medical Care Research and Review in 2014, found that an increase in the concentration of Black people in a neighborhood is associated with a corresponding decrease in the availability of surgical equipment. Social distancing for Black people should not continue to be another form of discrimination

Discrimination based on race and place are clearly associated with COVID-19's spread. According to Brookings analysis of CDC data, "Black people are dying from COVID at roughly

the same rate as white people more than a decade older," which highlights how the places that have been most hard hit by COVID are Black communities. According to APM Research Lab, Black South Carolinians—who represent about 27% of the state's population—made up 48% of COVID-19 fatalities. In Washington, D.C., Black people are 46% of the population but nearly 75% of COVID-19 fatalities. And in Michigan, where Black people make up only 13% of the population, 41% of the dead have been Black. But indigenous lives have also been ignored, in Mississippi, the Native American death rate is nearly 450 per 100,000, for context, the state's White death rate is 24 per 100,000.

MAP 1

Places with equity risk factors similar to New Orleans are located primarily in the Deep South
U.S. counties, 2018



NOTE: EQUITY RISK LEVEL REFLECTS THE NUMBER OF TIMES THE COUNTY APPEARS IN THE TOP QUINTILE OF ALL COUNTIES FOR POVERTY RATE, MULTIGENERATIONAL HOUSEHOLDS, AND GAP IN WHITE/BLACK LIFE EXPECTANCY.

Source: Brookings analysis of 2018 5-year American Community Survey estimates and 2018 National Center for Health Statistics Mortality Files via countyhealthrankings.org.

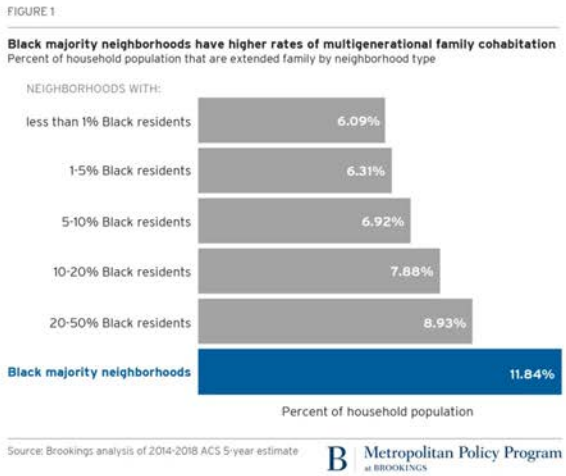
B Metropolitan Policy Program at BROOKINGS

The above map sheds light on areas which have a high "equity risk level," determined by high rates of poverty, inequitable health outcomes, and multigenerational family cohabitation. We measure poverty by the share of families below the poverty line (from Census Bureau estimates), inequitable health outcomes by the gap in life expectancy between Black and White residents, and multigenerational family cohabitation by the share of the population of family members living in households in which they are neither spouses nor children of the head of household. Counties are ranked by the number of metrics in which they fall in the top quintile, with those in the top 20% for each risk factor shown in red.

As an example, New Orleans shows how the virus thrived in a Black-majority city where basic structural inequities and intrinsic qualities have come to bear. In Orleans Parish, the poverty rate for families is 17.8%—well above the national figure of 10.1%. Life expectancy for White

residents is 80 years, compared to 75 years for Black residents. Of people living in households, 9.4% are extended family members, compared to 7.4% nationwide. These shocking numbers place Orleans Parish in the top 20% of all counties on each metric.

Due to decades of discriminatory policymaking, correlations between poverty, life expectancy, and predominantly Black communities are well documented. Similarly, poverty is correlated with levels of multigenerational family living, which has a positive correlation with the share of the Black population. Poverty and housing is strongly influenced by past economic and housing policy.



The other counties in this cohort are primarily scattered across the Southeast, particularly in areas throughout Louisiana, Mississippi, and Alabama with high Black population concentrations. Most counties in this classification are rural, but the cohort notably includes counties outside of the Deep South with large Black cities, including Detroit, Baltimore, and Richmond, Va., as well as Fresno, Calif., a city with a Black population of around 8%.

We're all susceptible to the White supremacist myth that claims the conditions in Black communities are mainly the result of Black people's collective choices and moral failings. But it is historic and systemic housing devaluation, economic injustice, and discrimination in health care that have created the conditions that increase rates of morbidity and mortality, especially during this unprecedented pandemic. Our interventions must not exacerbate structural racism's impacts. Unfortunately, federal officials have ignored the realities of structural racism in recent recovery efforts. In order to facilitate COVID-19 response efforts, the Department of Labor suspended "all affirmative action obligations of supply and service and construction

contracts." Meanwhile, the staggered, insufficient rollouts of multiple legislative relief packages—including the Payroll Protection Program—left out too many firms owned by people of color. Our health efforts should not follow suit.

America's digital divide, artificial intelligence, and racial health disparities

According to the CDC, contact tracing is the process of "identifying people who have an infectious disease (cases) and people who they came in contact with (contacts) and working with them to interrupt disease spread." Digital exposure notification is essentially the same, but as the memorandum for this hearing states, it "requires explicit user consent for how data is used and collected, does not collect location data, and does not identify consumers to other consumers." In concert with other tools, contact tracing and digital exposure notification can disrupt the chain of transmission by identifying levels of exposure to people and places.

However, these technological tools bring up another issue related to racial equity: America's digital divide and unequal access to the internet. While there are certainly racial gaps related to cell phone and broadband access, the digital divide is becoming less about access and more about the quality of usage. According to the Pew Research Center, White, Black, and Latino or Hispanic Americans have roughly the same rate of smartphone usage, which is important for digital tracing. However, digital tracing efforts will require users to opt in, which requires a basic level of trust in public health authorities and software developers. Brookings research has shown that Black Americans are less likely to take part in voluntary digital contact tracing. Due to a history of unequal treatment, including unethical experimentation and a track record of unequal outcomes, Black Americans have good reason to mistrust the equity of the nation's health care apparatus. This is why Black and Brown communities need contract tracers and app developers who are from the neighborhoods they serve.

Data shows that Black patients experience better outcomes when their doctors are also Black. One explanation for this effect is that a shared background promotes a greater level of trust and better communication. Surveys also show racial bias in the assessment of pain and treatment recommendations for Black patients, in which 25% of medical residents stated that Black patients have thicker skin than White patients. Unequal outcomes today, especially in maternal mortality rates, show that when it comes to health care, race matters.

Analogously, manual contact tracers rely on skills of interpersonal communication and empathy in order to build trust and receive and interpret information. If we hire an army of White tracers to track the spread of the virus, we should expect unequal or even negative results in Black communities. In addition, if we do not hire local Black and Brown people to serve those neighborhoods, we exacerbate the community wealth gap, which also serves as a barrier of protection against infection. Hiring Black and Brown manual tracers offer an opportunity to add jobs to neighborhoods that are experiencing higher levels of unemployment.

Artificial intelligence has transformed almost every aspect of our lives, and soon, contact tracing will be no different. The automation of this long-standing public health tool is imminent, and the speed and efficiency of such digital tracing services can save lives. But as with all technological applications that use AI, we should prepare for racial bias that will negatively impact Black and Brown communities. We've already seen the risks of using biased algorithms in the healthcare: UnitedHealth's use of a medical algorithm steered Black patients away from getting higher-quality care. In criminal justice, software used to forecast the risk of reoffending incorrectly marks Black defendants as future criminals at twice the rate of White defendants.

With all contact tracing mechanisms, we should avoid attaching fines and fees to individual violations that become apparent in the data. Criminalization and financial penalties would further burden people already encumbered by structural racism.

We need more due diligence and intellectual exploration before we deploy AI technology to communities. Systemic racism and discrimination are already embedded in our health, housing, and educational systems. Developers must intentionally build AI systems through a lens of racial equity if the technology is not going to generate outcomes that reflect the biases of the developers.

The limits of contact tracing in Black communities

Black-owned businesses and workers are highly engaged on frontlines of the COVID-19 pandemic. Black Americans are more likely to be part of the essential workforce. Black-owned firms with paid employees generated nearly $128 billion in receipts in 2017, with the largest share ($24.5 billion, or 19%) earned in the healthcare and social services sector. Some of the top industries for Black-owned businesses, by number of firms, include occupations that are directly combating the virus or are most impacted by the country's social distancing measures:

- Thirty-two percent of all Black-owned businesses with paid employees are in the health care and social assistance professions, which includes independent practices of physicians, as well as continuing care/assisted living and youth services.
- Eight percent of Black-owned businesses are in administrative, support, waste management, and remediation services, which includes call centers, temp agencies, collection bureaus, and recycling and waste management facilities.
- Seven percent of Black-owned businesses are in retail trade, which includes everything from grocery stores to home furnishings to gasoline. (Restaurants are not included in this.)

If contact tracing efforts alert an essential worker that they've been exposed, what are they to do? Generally, Black people know they are working and living in high-risk areas, but they have few alternatives. People of color simply cannot afford preventative measures that do not address the underlying racism that situates them between a rock and a hard place.

Conclusion

As more Black and Brown people are exposed to these racial inequities, more will die from COVID-19. The proliferation of the coronavirus forces us to see our inherent connections in a way that our public policy has not always recognized. Individual recovery is contingent upon how much we collectively live by the principle of being "all in this together." If undocumented residents are sick, the country's citizens will be as well. If Black and Latino or Hispanic people suffer from COVID-19's effects, so will Asian Americans and White people. Being aware of our vulnerability is not the main problem—the trap of racism is.

Statement of Ramash Raskar, PhD, Asso. Prof. Massachusetts Institute of Technology and Founder and Chief Scientist, PathCheck Foundation

Hearing on "Exposure Notification and Contact Tracing: How AI Helps Localities Reopen Safely and Researchers Find a Cure" July 8, 2020

Let me begin by expressing my thanks to Chairman Foster and Ranking Member Loudermilk, to the members of the subcommittee and the full committee for the opportunity to testify today. It is an honor and privilege to be here today.

We face an unprecedented economic and health crisis brought on by the COVID-19 pandemic. It is a crisis that calls on the best of us as Americans to seek innovative solutions to the immense challenges we have coping with the pandemic and its impact on our economy and country.

Today we have two fundamental questions before us. The first is how we can use technology and the tremendous capacity for technical innovation in this country to help turn the tide on COVID-19. Second is how do we deploy digital public health technologies without sacrificing our deeply held national values of personal privacy, liberty and freedom. I'm optimistic that there are positive and impactful solutions to these challenges available today and are ready for large scale adoption.

I come to these questions having spent much of the last decade working in advanced technologies at the Massachusetts Institute of Technology researching artificial intelligence, digital health, and algorithms for the preservation of personal privacy. We have been working on how to create privacy preserving global AI: a distributed machine learning method called Split Learning that can build AI without accessing any raw data that may be unavailable because of the factors such as privacy, HIPAA regulations or trade secrets.

In March, my research team at MIT created one of the first privacy preserving smartphone app called MIT SafePaths that illustrated how smartphone data analyzed locally can provide confidential notifications to an individual and also support manual contact tracing efforts. That research led to the creation of PathCheck Foundation, a charitable nonprofit organization dedicated to building free open software and industry standards that assist US states, nations and private sector organizations with their pandemic response. PathCheck plans to augment and simplify manual contract tracing (exposure notification, case interviews and contact followup) using privacy preserving solutions for the users. We are already building exposure notification apps, backend servers and dashboards for various US states and nations.

Since our first demonstration, the digital solutions to assist public health authorities at the local, state, and national level have evolved and developed rapidly. Today, health officials now have at their disposal a powerful toolset that complements the growing capacity for testing, manual contact tracing, and the management of cases for self-quarantine to reduce spread.

As the committee has justly identified, there are several challenges with contact tracing, both the manual efforts and through the use of smartphone apps. Let me first address the four top concerns and present some recommendations.

- There are cases that fraudsters are taking advantage of manual contact tracing efforts by soliciting personal and financial information from unsuspecting consumers. A smartphone

app with the proper privacy controls in place can make a difference here. Every bank and consumer financial institution in this country has an app that their customers use to access their private information. The same sorts of technologies that banks use can be used for contact tracing, to ensure that consumers secure their own data and share it with only authorized institutions.

- Smartphone apps that facilitate contact tracing have been developed and deployed in several states and countries around the world. Some have been demonstrated to collect consumer data without their consent, and in some cases, even sharing that data, inadvertently or otherwise, with third party data brokers. It is imperative that any contact tracing technology be developed by credible organizations, preferably non-profit organizations that are not looking to make money from the use of their technology. Furthermore, the technology should be built as open source so that anybody can see exactly what is being built and how it works so that malicious intent and security issues can be identified and dealt with openly. The open-source approach yields collaboration of the smartest minds. Public health is about the *public* - there should be no secrecy in how we address a public health emergency.
- The accuracy of digital contact tracing solutions is evolving rapidly. There is much research and development to be done. At the same time, organizations like MIT PACT and PathCheck and others have made tremendous strides in making the sensors more accurate. At PathCheck, we have shown that with the combination of sensors like GPS, WiFi and bluetooth, we are better at triangulating where somebody is and who they have come in proximity with. At the same time, let's not forget that there are more low-tech ways of determining where people go and who they come in contact with - as simple as scanning QR codes or manually "checking in" to a location. We must use multiple methods to reach the masses, especially in cases where people do not own a smartphone or those who cannot afford the latest smartphone technology.
- Lastly, great progress has been made from the collaborative efforts of Google and Apple to create sensor technology that allows for both types of phones (Android and iPhones) to be able to talk to each other. However, we have not seen widespread adoption of this technology by state authorities. I believe that this is due to a lack of a comprehensive and consistent national strategy for sharing data across state lines. As we all know, the virus does not respect borders. Just like there are national and regional utility alliances to move electricity around the country, there must be a national "grid" of contact tracing alliances that allow for contact tracing across borders.

These four concerns - fraud, privacy, accuracy and adoption - all lend to what I believe is the necessary public policy to kickstart contact tracing (both manual and digital) as a viable and scalable solution to reduce the spread of the virus:

1. Congress should advocate for the broad adoption of **digital apps to augment any manual contact tracing** endeavours, especially when they can make a difference with improving the public's trust in such efforts and to protect against malicious actors.
2. Congress should set out a series of requirements that ensure that contact tracing **technologies are built transparently, as open source ideally by non-profits** and like other public utilities, open for scrutiny by the public.
3. Congress should actively **require inclusive solutions** to not exclude those who don't have the latest technology. We can't make contact tracing only effective for the well off.
4. Congress should require the creation of a central body - **National Pandemic Response Service**, that is mandated with coordinating data sharing across state and county lines to make sure that we can trace the spread of the virus no matter where it causes infections.

Let me discuss a few of these points in detail.

How Manual and Digital Tracing will work together:

Digital exposure notification apps in Germany & Switzerland, two highly privacy-aware countries, already have 15% adoption in less than two weeks. They are using US technology which we are not yet using in our country on a large scale. However, we can at least assume that the adoption will pick up if the app is privacy preserving.

In our beautifully diverse country, with varying opinions about personal freedom, uneven use of smartphones and a distrust of government mandated programs, it is also important to reach the last few percent of the population. So it is critical to also use manual contact tracing to improve inclusivity. Beyond contact identification, manual tracers also conduct case management: monitoring and supporting the exposed person.

Manual contact tracing has a rich history. But for Covid-19, to manage the scale with 50,000 cases per day, we need technology for public health as well as apps in the hands of the citizens. Several public health officials have said that with so much community spread, trying to trace the contacts of every positive case is unrealistic.

It is true that solutions that rely on smartphones cannot serve everyone. However, smartphone penetration in US is 70% and amongst 18-64 age group it is 90% . Thus, the digital exposure notification can reduce the burden on manual tracing operations. In addition, digital apps can be deployed overnight. So we believe a hybrid solution can let apps address smartphone users and manual tracing can address the rest of the cases. At PathCheck, we also plan to provide follow on guidance to an exposed person so it partially supports the triage and monitoring.

How this relates to testing infrastructure, vaccine development and AI

According to MIT Institute for Data, Systems and Society, just 50% adoption of contact tracing can bring the spread factor RO to 0.5 and eliminate the pandemic. This model assumes no social distancing or widespread testing. This is particularly important when considering low income communities who don't have access to testing.

The US is expanding testing infrastructure and making great progress on vaccines. At the same time, testing 300+M Americans every 14 days or about 20M per day is impractical. For small businesses, testing their employees regularly is cost prohibitive. For low and middle income communities, setting up such infrastructure is challenging. It is going to take a long time to create, validate, and scale the vaccine & administer to the wider population. With notification and tracing apps, we have a privacy first American solution in action that will get us out of this disaster now. It's about saving lives and revitalizing our economy, till we get widespread testing and vaccines.

National Pandemic Response Service and Smartphone Apps

We need a National Pandemic Response Service that can not only monitor current cases, but provide insights on policy decisions and predict the spread. Just like the National Weather Service predicting the path of the next hurricane, accurate data is the most important element. It is the same with a pandemic - we need to have access to real time data to monitor, predict and reduce the spread. However, responding to the dynamics of a hurricane is different from the response to the dynamics of the movement of the inflected people. Instead of creating a surveillance state

and a top-down response system, we need to encourage the people to participate in this data-dependent operation. Smartphone apps are the best tools. We need a new AI that relies on the information stored in people's smartphones. We have learned through Split Learning, our work on privacy preserving AI at MIT, that we can indeed create such a decentralized AI and orchestrate the socio-economic interaction between the government, businesses, individuals and their communities without creating a surveillance state. The National Service will allow this micro and macro aggregation for analysis, prediction and actionable intelligence.

Thank you.

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