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ALEX MAIERSPERGER: 100% of us were affected by public agency decisions made during the pandemic. Today we have a unique opportunity to talk to one of the most senior health officials and public faces of the pandemic response to get an insider view into the past, present, and future of how we respond to disease globally. I'm your host, Alex Maiersperger, and in season three of our podcast and YouTube series we celebrate those changing health care and life sciences for the better.

Our guest today is Dr. Robert Redfield, virologist and former director of the CDC from the all important years of 2018 to 2021, and current senior advisor to Governor Hogan and the state of Maryland for public health. Welcome, Dr. Redfield.

ROBERT REDFIELD: Thank you, Alex. Glad to be here.

ALEX MAIERSPERGER: Dr. Redfield, please catch us up on what you've been up to in the past 12 months after your time at the CDC.

ROBERT REDFIELD: Well, it was a great honor to be given the opportunity to lead CDC. I didn't really know at the time I went down there that it was going to be so eventful. Although I did have a premonition that our nation was very vulnerable to a pandemic. I thought it was going to be a bird flu pandemic. And so obviously it was just readjusting back into life after really a 14 to 20 hour a day, seven day a week job, working with really over 20,000 outstanding young men and women that really work each day to try to protect the public health of this nation. What I've done since is I'm obviously a senior advisor for Governor Hogan in public health in Maryland to keep me engaged in public health policy.

I've also started a company whose goal it is to try to facilitate the distribution of vaccines-- initially COVID vaccines-- to resource poor and moderate income countries. It's very disappointing to me that despite the enormous scientific advancement that we made with Operation Warp Speed-- and it was a great honor to be part of that and be on that board-- is that really more than 80% of the world still lacks access to the COVID vaccines in an effective way.

Some of them got a single vaccination, but they're really very limited effective vaccines. So I'm working to try to help countries build an effective, sustainable, scalable vaccine strategy. So I'm spending quite a bit of time on that. And then doing some strategic advisory positions for different biotech and public health companies. So staying busy, but it's obviously different than the 40-plus years I spent in public service.

ALEX MAIERSPERGER: Yeah, it sounds like those 18 hour days might be down to 17 and 1/2.

ROBERT REDFIELD: The only advantage is I can control the nine holes of golf that I want to fit in during the week whenever I want to do it.

ALEX MAIERSPERGER: There you go. You spoke about some of the challenges encountered and I'm sure you encountered many sort of armchair quarterbacks who weighed in on what health leaders could have done different or better during COVID response. In a recent speech you talked about how not everything is broken and so not everything is a challenge. There's incredible ongoing work in outbreak

investigations, chronic diseases, environmental health, birth defects. Can you tell us more about what's going right in the world of public health?

ROBERT REDFIELD: Well, I would start by just saying, you know, despite the enormous amount of criticism-- most of which I don't think is justified-- the CDC is really an excellent organization of dedicated public health care professionals. As I said, there's over 20,000 that work every day to try to protect the public health.

I will say-- and I've testified before Congress on this on multiple occasions-- the CDC has been hampered by the fact that the United States is not appropriately proportionately invested in public health in the United States. Really the amount of investment in public health, I look at it as highly inadequate and when you realize that CDC forms the basis of funding the public health, not just at the federal level, but we fund the public health in each of the states, the territories, the tribal, and the local health departments, it's really highly inadequate.

And I argued that it was time for the United States Congress to appropriate the resources, not only that our nation needs for an effective public health system, but actually that the citizens of our nation deserve. And I will say, still at this state, public health is extremely underfunded.

I gave one example, which is just one area that I pushed hard was it's hard to have a public health response if you don't have data in real-time. I tell the story about my first briefing when I was CDC director in April of 2018, I got a briefing on what at the time was the number one epidemic that I was asked to lead a response to at CDC and that was opioid deaths, fentanyl deaths, drug use disorder deaths.

As an ID virologist I thought when I went there I'd be working on infectious disease and the first one I had was this drug-related deaths. And it's very personal to me. I've mentioned that I've almost lost one of my three sons from fentanyl that was contaminating cocaine. I think it's a miracle and thank God every day that he's now seven years in recovery. It was eye-opening journey.

But when they briefed me on the deaths and we were losing 80,000 people that year-- when you now know it's up over 100,000-- it's a lot of people. To put it in perspective, I remind people we lost somewhere between 53,000 and 57,000 people in Vietnam from the 1950s through the 1970s, and yet now we're losing 80,000 people in a year-- mostly young-- say under the age of 45.

And they briefed me and gave me a great briefing-- very accurate scientifically, very useful-- and I asked them what the data was through for how this epidemic was going through our nation that we were now putting lots of resources into and they said the data was through March 2015. And I said, but it's April 2018. Yep.

And they said, you know, Director, I don't think you understand the complexity that we have at the federal level getting the states to report the data. And I did say-- and I think some of them were not happy with my response and they probably don't even want me to repeat it, but I continued to repeat it because I think it's a critical issue. I said, when I came to CDC I thought I was going to lead this agency to make meaningful public health impact and what you're telling me is really what I'm becoming is a medical historian.

And so reality is that. And I went to Congress and asked for data modernization for our public health system in America, which I was successful in getting some funding that began and continues, but it still wasn't proportional. I wanted more like \$25 billion to redo the public health reporting system in America and I think the initial appropriation was for like \$300 million.

I tried to express to Congress that my own hospital system here in one little city of Baltimore spent over \$1 billion upgrading their computer systems for health care so for the United States to cover the entire nation and to invest in a modernization act that wasn't proportional-- you know like \$300 million-- it wasn't proportional. So I will say one of the challenges-- and you're seeing it right now-- in general in public health, it's hard to respond if you don't have real-life data in real-life time.

So I do think that's one of the real holes in the system that needs to be addressed. The other one was you need to have public health laboratory resilience. When we developed the original testing for COVID we developed it based on a platform that the health departments had-- it was a platform that was developed for flu.

It was a low-input platform that could maybe do 30 to 50 tests in a laboratory a day and what we really needed to have in those laboratories is what we call high-throughput laboratories with resilience in both equipment, as well as technicians that were trained to run that equipment. None of that's really in place. The other thing that's still very, very underfunded is the public health workforce. I mean I had some states when the COVID pandemic started, and we were diagnosing people with symptomatic disease, and trying to do contact tracing and quarantine, I had some states that had less than 50 people in their public health workforce.

ALEX MAIERSPERGER: Wow.

ROBERT REDFIELD: And so the whole public health infrastructure in this country is very inadequately supported by Congress. And I'm concerned that Congress has a short memory. You know, Senator Alexander and I talked about this a lot, Senator Blunt and I talked about this a lot, that we wanted to get this funding up while people were still seeing the impact of the pandemic because once the pandemic-- and they get back to life as usual-- the interest in funding may not be there.

I do agree with some of my congressional colleagues and friends now that would try to acknowledge to the American public-- and I do believe this to be true. It's not hyperbole-- the United States is at much greater threat in its way of life and security from a public health threat than we are from Korea, Iran, China, and Russia. And we ought to invest proportionately to that threat. And unfortunately our nation still hasn't done that.

ALEX MAIERSPERGER: I appreciate all that you covered there and just want to say seven years in recovery is certainly something to celebrate so glad to hear that for your son and for your family.

ROBERT REDFIELD: Yeah, it should be the rule for everybody. You know, I'm very disappointed. The complexity of it was not easy. I'm very thankful to my son for his courage and I'm very thankful to God. I always remind my son that it was God that really healed him, not his father and mother.

But I am disappointed that so many people in our nation that are struggling with drug use disorder-- and you could extrapolate that to mental illness because much of drug use disorder is really driven by people self-medicating for underlying mental use disorder, whether they have mood swing disorder, bipolar disorder, depression.

And I really think that our nation needs to do much, much more to make sure there's universal access to high quality care for drug treatment disorder and for mental illness. And it would be to our nation's great, great, great benefit if we could make drug treatment and recovery the rule rather than the exception.

ALEX MAIERSPERGER: Amen to that. You talked about just all of the areas of opportunity for investment. One area that it seems that, at least from a newsworthy cycle, that you didn't really hear about before that I think now the public is facing a lot is diagnostic testing.

It really hasn't been in the news or investment cycle and now you hear about some innovation and investment coming out in finding new diseases or being able to easily see them much faster or more accurately. In the diagnostic market, what innovation and investment is underway that can change the outcome of the way we look at and treat diseases?

ROBERT REDFIELD: Well, I'll give you an example. I mean, part of the challenge when COVID started-- one of the first real critical errors-- was that the scientific community and public health community chose to call COVID SARS-like and that really drove the initial public health response in January/February. It took until March that Ambassador Birx and I really tried to shift the focus.

Because SARS was a virus that, when it infected humans, caused symptomatic illness. And so what it meant was you could focus on looking for humans with symptoms and then you could basically do your contact tracing, isolation around that. But COVID is not SARS-like because a majority of COVID is not symptomatic, it's asymptomatic.

So when we set up the original screening that we did we screened people for symptoms as they were coming back into the country. I had originally about 14 cases of COVID that we diagnosed in the last two weeks in January and the first couple two or three weeks of February, and from those 14 cases CDC and the public health system within our nation evaluated over 800 contacts and of those 800 contacts we only demonstrated that two had COVID.

ALEX MAIERSPERGER: Interesting.

ROBERT REDFIELD: So a lot of people, including myself, with that data-- because the Chinese had affirmed that they had no evidence of human-to-human transmission-- that this virus was not being transmitted in the hospital-- that it just reinforced that this virus was SARS-like and really didn't know how to go human-to-human-- we could focus on symptomatic disease.

And both of those two cases were actually spouses of index cases. But had we tested people rather than interviewed them for symptoms, I think we would have found a significant number of those contacts were infected. And it wasn't until March that Ambassador Birx and I realized that this was not SARS-like.

This was its own virus-- COVID-19. It was highly transmissible, asymptomatic, and the key to a public health response was not interviews and contact tracing. The key to the public health response was accelerated diagnostics.

Now there was a problem with that and I was in the White House in March when the president brought all the diagnostic companies to the Roosevelt Room and we had a meeting-- Roche, Abbott, Labcorp, Quest-- they all were there-- Thermo Fisher-- because we needed them to get fully engaged. And one of the questions was, why weren't they engaged already? And that goes back to the fact that this was called SARS-like and MERS-like.

Because when SARS happened in 2003, the private sector jumped in to develop diagnostic test and guess what happened? It went away. There was less than 1,000 cases. There was no market for SARS testing. So then when MERS came back in 2012, 2013, the private sector jumped in again and guess what happened? No MERS.

ALEX MAIERSPERGER: No market again.

ROBERT REDFIELD: So there was one exception, and I think it's a great example to answer your question-- it's a long way to answer your question-- but the one exception was Korea because Korea, back in the late 2000-- I can't remember the date exactly. I'm going to guess it was 2016, 2017, 2018

timeframe-- Korea imported a case of MERS in someone that shared a smoking room from someone from the Middle East, and that individual came back to Seoul, Korea.

And when that was done there was several hundred cases of MERS. It was several billion-- I think almost \$10 billion worth of economic loss shutting down Seoul, all because they were trying to figure out how to contain MERS. Now luckily for all of us, MERS, like SARS, doesn't know how to go human-to-human. Luckily, MERS, like SARS, the way to diagnose it symptomatically is really very good. But what Korea did was form a private-public partnership with the diagnostic company at that time so that when COVID came they were able to activate that private-public partnership, and they were really able to bring testing on board very, very rapidly.

Unfortunately that wasn't accomplished in the United States, in Europe, and other parts of the world. So very slow. I used to argue with my friend and colleague Brett Giroir, who was in charge of testing for the country, and he would tell the world every day how many tests we did. And I would say Brett, that's not the right question. The question is not how many tests we did, the question is how many tests do we need.

And I was a big advocate that we needed about a billion tests a month if we wanted to launch an optimal public health response, that needed to be grounded in diagnostics, all right? And so clearly that's why I said about the public health infrastructure-- besides the data system-- the other system that needs to be augmented is the capacity of our public health system to do diagnostics.

When the pandemic happened and I at once realized that our platform was low volume-- 30 tests-- and we needed to go to high input, I contacted-- as the CDC Director-- companies like Roche to try to get their high-throughput machines into the public health labs across the country. And guess what? They didn't have any available. You know it was a six month to a year waiting list to get these machines on board in our public health lab.

So we have to build that public health resilience both in equipment, but also you can't do it if you don't have the technical team that you require. So I actually think a lot of redundancy needs to come into the system. You can divert that redundancy to doing diagnostics for chronic disease when we don't have pandemics, but you need to be able to reprogram that redundancy for a pandemic disease.

So again, the United States is not prepared-- that we're not prepared. And people know that I believe the great pandemic is coming. It's not COVID. I call that the lesser pandemic. The great pandemic-- it's coming. It's going to be a bird flu pandemic. It's going to be rough. We're going to see some significant mortality around the world, including the United States.

It's not going to distinguish between different people who's going to have a bad outcome-- like COVID had a bad outcome for those of us that are over 60, 70, 80. The bird flu, when it comes, it's going to have a bad outcome from children, from adolescents, for people in their 20s and their 30s, 40s, 50s. It's going to be problematic.

The good news is we have the mRNA technology so we'll be able to make a vaccine pretty quickly. The bad news is we'll never be able to make enough vaccine for 350 million people quick enough because we haven't built the redundancy in being able to convert that science to products for the American public. And the bad news is we still haven't built the redundancy for diagnostics.

[INTERPOSING VOICES]

ROBERT REDFIELD: To answer your question, the scientific ability to make unique novel diagnostics and get them done is really here, you know, but the reality is how to operationalize that in real-time. Those systems aren't there. I call on the United States just like we've done for the Defense Department.

We have long-term, private-public partnerships with Boeing, and Northrop, IBM, and others that again, going back to my point of view that the risk for pandemics is far greater than the risk of North Korea, or the risk of Iran, or the risk of Russia, and the risk of China to change our way of life.

We got a little taste of it with COVID but we haven't gotten anything compared to what-- and we should be overinvesting in our ability to rapidly respond to minimize the ability of that threat on our way of life to having an impact. And sadly to this day we're not overinvesting in it.

ALEX MAIERSPERGER: I appreciate the discussion, and investment, and need for investment, and call out for need for investment in both-- I think all the people, the process, the technology, the treatment, and the diagnostic side. Talking specifically about the people and on the leadership side, you've mentioned a couple of times throughout this conversation of meetings in the White House and meetings with very high profile, high sort of stress situations.

There's been a lot of talk lately about clinician burnout and burnout of leaders, mainly in the health care delivery system. It sounds like from what you're talking about there's definitely that same or maybe more intensity on the public health side. How are public health leaders holding up under the constant pressure faced today?

ROBERT REDFIELD: Well, I think it's very, very hard. As I said, the men and women at CDC-- which I got to know. Many of which had worked there for over 20 years when I got there. Some over 30 years. And dedicated public health servants-- I really think they got numbed to the frustration that they never had the resources they needed to do their job.

It'd be like we had a Defense Department, and we put them out in the desert, and we gave them enough water for 1% of them, and we gave them enough ammunition for 1% of them. So I think a lot of them got lulled into the fact that they just were underfunded for the mission. And so when you're underfunded for the mission, then it can start to make you believe that maybe the mission isn't as important to some people as it really is.

So the CDC, I think rapidly, spent more time becoming historic and using the data for historic purposes then they did using the data for immediate response. And I'm a big advocate to help the agency get realigned to be a public health response agency, not a public health historical agency. And I think that is something that really needs to happen if we're going to prepare ourselves over the next decade.

And you know, I think the hardest thing-- and of course, COVID being a great example-- was the constant negative criticism. You've heard it on the news probably over, and over, and over, and over again about the defective CDC test for COVID. Well, that's not really true. And everybody knew it wasn't true, but it didn't stop them from saying CDC botched the test.

I mean, the real truth-- if people want to the truth-- was that the sequence of the virus was published on January 10 and before January 17 my scientists at CDC had developed a test.

ALEX MAIERSPERGER: In a single week.

ROBERT REDFIELD: In 7 to 10 days, OK? And that test worked. And that's how we diagnosed the original cases. Now some of the problems with the test was in order for the Public Health Department to get the test they had to send the blood to CDC, right? So that's a reality.

And that test worked perfectly on the 17th, 18th of January, and it works perfectly today, and there never was a time in America when that test wasn't available to any health department to diagnose any patient at any time. But you wouldn't get that from the news when they say botched test, failed test, all this.

What CDC did do-- which again, I think was not optimal-- is they got a lot of complaints from the health departments around the country that they lost three or four weeks, or two weeks, by having to send the blood to CDC. Would CDC prepare the reagents for the tests they developed-- which we didn't patent-- which we published-- showed everyone how to do it.

We actually thought all the hospitals around the country would just mimic the test because we told them exactly what primer pairs to use, exactly how to do it. We didn't realize that the FDA was coming down hard on what they call laboratory developed test and was threatening to cite anyone that used these tests that hadn't been FDA-authorized. Although I will tell you, having ran many laboratory tests over the years-- I developed many laboratory developed tests and I used them for the benefit of my patients.

I think that was another big flaw in that early response was the FDA's perspective on laboratory developed tests so that not only the private sector wasn't involved, the whole medical system didn't use their molecular biology labs. But what CDC did was they then decided to make the primer pairs for the test and then give them to the states so they could actually do the test themselves based on our protocol. And that would have been fine, even though I would have rather them do what they-- in my view-- should have done, and what they did afterwards, is contract with a contractor who's a professional contractor in developing these reagents, and have them develop the reagents. And then give them to the states rather than have CDC, which is not a contracting production group.

But the third thing CDC did, which I disagreed with, they felt since this test now was leaving CDC-- the mothership-- rather than have two primer pairs to define a positive they were going to add a third primer pair. So they added a third primer pair and then they sent those three primer pairs to the states to see if they could validate the assay.

And of course, within 24 to 48 hours my phone was ringing constantly from my state colleagues telling me the test wasn't performing. They were getting false positives. And why did they get false positives? Well, it turns out the third primer pair didn't work. Now FDA will argue that it was contaminated. I argued that they had to consider that it could have a design flaw so that the primer pair annealed on itself and that would give you a false positive.

After a lot of investigation it turns out that I can't rule out that there wasn't some contamination in the third primer pair, but I can say we definitely definitively showed that the primer pair's design was flawed and caused self-annihilation. So despite the CDC, I would argue CDC should have gotten like a medal for creating a test in seven days. I mean, it took us three years to get a test for HIV. I was involved in that. We did it in 7 to 10 days.

And yet what we got was just night after night, after night of negative criticism. So when you ask about holding up when you're working seven days a week, 12, 14, 16 hours a day, these people are not overpaid. And then you come home at night and just get constant criticism from Monday night quarterbacks, people not in the arena. It is demoralizing. You got to really go deep and understand why you do what you do.

I can tell you, my family had no interest in me continuing at CDC. They constantly said I should resign. I'm just getting beat up every night on the news. And of course, I felt that I was highly skilled to do the job, and I was doing a good job, and trying to maximize our response to this pandemic.

And you know, so what if people want to criticize? I mean, many things. We heard the vaccine, we heard about the testing we just talked about-- the other criticism. You had Fauci, and you had Atlas and others telling the president that we were going to have herd immunity. And I'm a virologist and I was trying to say, no we're not going to have herd immunity. Herd immunity is not operational for this virus because when you get this virus you get immunity but it's short lived and then you can get reinfected.

If we have a vaccine the vaccine's going to mimic natural infection. It's going to be short lived. So stop this idea of herd immunity and get prepared for recurrent surges of this pandemic. And try to keep the capability of the United States-- particularly in vaccine development-- keep it moving forward. I mean, when we Did Operation Warp Speed, very proud that before I left we had three approved vaccines. But what should have happened was there should have never been a stop about creating additional vaccines with new antigens because this virus was going to continue to evolve and it was going to continue to get less and less impacted by vaccination. And instead, the common argument that was made by the other experts was no, no, no, no, no, we're going to have herd immunity.

You know, once 30% of the population is vaccinated or infected we're fine. Once 50% vac-- fine. Once 70%, we're fine. Finally, in the last four months, as the leading spokespeople for the administration have finally stated that there is not herd immunity for this virus, well, many of us in the public health arena said that 2 and 1/2 years ago. So I do think that's what causes frustration. That's what causes burnout.

But on the other hand, there's so many great moments in public health that I've seen. When we had the individuals that were developing severe lung disease from vaping, how CDC went in and figured that out within weeks. Or how we saw children that were getting some illness that looked like polio and caused them paralysis, and we figured that out in about a year.

How some people were bleeding to death in the Midwest and no one understood why they were bleeding to death-- young, healthy people come in bleeding to death-- and we found out it's because synthetic marijuana was contaminated with a product that blocked their blood from clotting.

ALEX MAIERSPERGER: Terrifying.

ROBERT REDFIELD: And the people that do this work and figure this out, it's exciting. But I do think it's been a hard time. It was a hard time when I was there. It's been even worse since I've left, the amount of public criticism that the public health community continues to get.

And you're going to see more criticism now with the monkeypox. We had a chance to probably contain monkey pox but that's gone now. You know, monkey pox is unfortunately going to be a significant sexually transmitted disease. It's not going to affect everyone. It's going to be probably contained to sexual transmission in people that have multiple sexual contacts-- gay community first.

We're starting to see spillover into the population, but it won't be huge. It will be similar to what we've seen with some other STDs. But we did have a chance when it first came to diagnose it, vaccinate around it, and shut it down. Now that we're seeing secondary cases already in the community, you know, I think we've lost that. This is going to become another STD that we're going to have to confront.

My biggest concern is then, as it gets established as an STD, this virus will actually infect rodents and then redefine a natural reservoir for pox virus in the United States and Europe. What had been contained in Africa for so many 70 years is now going to be-- it's ironic. It's the opposite of what people were arguing about SARS and MERS, where it went from a bat to an animal to humans. This is one that's going to be amplified in humans and then go back.

ALEX MAIERSPERGER: Human to animal and back?

ROBERT REDFIELD: Yeah, human to animal and back.

ALEX MAIERSPERGER: Interesting. I have new fears now so thank you for that. I also really appreciate how you articulated around funding and mission, and how even if you don't have the funding the mission doesn't change. But it can feel like it changed or can feel like it's not perceived as valuable. I think that is such a great reflection on the burnout and-- I think some have called it-- moral injury in both the health care delivery system and certainly the public health system.

Really appreciate the discussion around the challenges. And certainly there's challenges that have been, there are challenges that are, and it sounds like there are certainly potentially more difficult challenges in the future. All of that and you still sound upbeat, you still put in the long days and the hours. And we probably have to apologize from your family that the public health work keeps you at it. It sounds like they've tried to pull you away. All of that, what are you optimistic about or what keeps you optimistic?

ROBERT REDFIELD: Well, I think the real basis for my optimism is I have total confidence in the power of science. I think people have said this before. My father was a scientist. He went from Hopkins to the University of Chicago, to NIH back in the late '40s. From his group-- he died unfortunately in 1956-- but his group produced three independent individuals that won the Nobel Prize in medicine. So these guys played the game as good as it could be played.

My mother was a scientist-- after he died-- at NIH and she did a lot of work learning how our body makes proteins. I have enormous confidence in science. And when you see the advancements in science that we're seeing-- a good example is the mRNA vaccine. Something that I worried about as CDC Director, if we had a bird flu pandemic, I knew it was going to take me at least a year to get a vaccine, and we would just be doing body counts.

Right now with the mRNA technology, I can probably get a vaccine made within 2 to 4 weeks. Right? Now I don't have the manufacturing capability in the United States to make sure all the American public and the broader world gets access to it. And this is where I think we should have some redundancy, you know?

I keep going back to the military analogy. We invest a lot of money in the Defense Department, but I will argue that the greater threat is pandemics and we should have a proportional investment in our capacity to-- we have a lot of money invested in our contractors being able to make ammunitions if they need to and expand. Well, we should have that same full capability for vaccines and biologics.

So I have so much confidence in science-- what I've seen science accomplish-- that I'm just very optimistic about the power of science. I've always said the one thing I-- we come back to the vaccination. I always try to remind people that vaccination in my view is the most powerful gift of science to modern medicine and it frustrates me when it's on the shelf and not being used.

And that's why when I had to decide what I was going to do when I left, I decided I was going to create a company that was going to try to figure out how to make sure poor and median income countries get access to vaccines. And that's what I'm trying to do. And do it in a sustainable, scalable way. The current approach that we have for vaccines for the developing world is we give them away as donations. That's not scalable.

ALEX MAIERSPERGER: Right.

ROBERT REDFIELD: It's not sustainable. We've never tried to vaccinate the entire population. We've always done kids in a charity giveaway. And I've tried to explain that that is not a strategy that's going to

get us to be able to exploit vaccines for the broader population that needs it. And what happens when we rely on that strategy is we have huge portions of the world that don't have equitable access to vaccines.

ALEX MAIERSPERGER: Well, Dr. Redfield, there's infinite demands on your time and we're so appreciative that you took a little bit of that to spend with us today so thank you so much.

ROBERT REDFIELD: Thanks a lot, Alex, I enjoyed it. God bless.

ALEX MAIERSPERGER: And as a listener and a viewer, there's also infinite demands on your time so thank you so much for listening and participating. We can't wait to continue creating a healthier future with you. There's so many real challenges in the world. We hope wherever you there are ways to find and be the good around you. We welcome you to the conversation at our email address thehealthpostpodcast@sas.com and down here in the comments on YouTube. Thank you.

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