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DR. DENNIS CARROLL

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INTERVIEW

Q: Good morning. This is John Pielemeier. I'm beginning the interview with Dr. Dennis Carroll. Dr. Carroll is an infectious disease specialist. He's worked for AID (United States Agency for International Development) for many years and with other organizations. He's had, I think, a very intriguing and marvelous career that's affected many of us, although we may not realize that.

Dennis, I'd like to start with talking a little bit about where you grew up and how you moved towards working in international affairs.

CARROLL: Great. Well John, first, it's great to be with you this morning, and thanks for the opportunity for this chat.

You know, I'm one of the rare people in that I am actually a Washington, DC native. I was born here and for the better part of my childhood, until college, I lived here. And it's really sort of a quirk of my own father's career. He was a general in the U.S. Air Force, but he had a career in the air force that largely kept him at the Pentagon. And so, as a result, I spent my childhood at Bolling Air Force Base.

Q: Really?

CARROLL: And my father worked in the Pentagon. He was the first head of the Defense Intelligence Agency, so he was an intelligence officer. And in that way, I grew up in an environment where thinking about international affairs was one that was very much steeped in our family. So, it really is no surprise to me when I think retrospectively why I chose a career that focused on international life because my childhood was largely

surrounded by discussions and issues dealing with international affairs. So, as a Washingtonian, embracing the idea that looking at the world through an international perspective was one that was very familiar to me. So, that's the genesis of it. It's pretty much in my childhood and it's in my, I guess you could say my family genes.

Q: Did you travel ___ as a youth? (Crosstalk/indiscernible)

CARROLL: My father only had one overseas posting, and that was to Germany in the late 1950s, early sixties. Other than that, we were very much in DC. For myself, I ultimately left and went to college and after two years of college in the late sixties, in the midst of all of the turmoil that was playing itself out at that time. And in fact, I was here in Washington, DC at George Washington University. I ended up leaving the United States and I traveled for about five years, mostly in Asia and this will come back later in our discussion, but in the course of that travel I ended up working on a leprosy colony. And that experience really laid the foundation for my ultimately ending up doing global health work.

Q: Going back just a bit, how did you pick GW as the place for college?

CARROLL: You know, that's an interesting question. I'm not quite sure how I picked it. I liked living in DC, so I guess I was interested in staying in DC. And this was 1967 and so, Washington, particularly in terms of the political discourse, was increasingly becoming the center of gravity for a lot of the social/political sort of dynamics and events. So, being at GW in 1967 and '68 was really being ground zero in dealing with the political challenges we were dealing with at that time. And also living in D.C., even before that, I had the opportunity to actually participate in the March in Washington in 1963. I mean, I was thirteen, fourteen years old and very much—very far from the stands at the Lincoln Memorial, but it was a galvanizing moment for me. It was really quite an extraordinary experience to see how people could really come together and embrace a shared vision. And in this case, a shared vision across racial and economic divides. And it really had an impact on me. And so, as we moved further into the sixties and the issues around the Vietnam War, civil rights, staying in Washington seemed like a good thing to do.

Q: What was your major?

CARROLL: My major, in fact, was anthropology. And in the course of that I ironically made every effort I could to avoid math and hard science courses. Later, of course, when I went back to school, I ended up getting a major in physics and biology with a minor in math, so go figure.

Q: So, you spent two years at George Washington University in Washington, DC, and you decided to go traveling then? You said for five years?

CARROLL: Five years, yeah.

Q: How did you structure that?

CARROLL: I structured it with my thumb. I hitchhiked. And so, basically, I flew into Paris and then initially had a motorcycle, but I blew the motorcycle up somewhere in the Alps, and after that I just started hitchhiking, which basically took me across Asia Minor, you know, Turkey, Iran, Afghanistan, and down into Pakistan and India. Ultimately, after living there for several years, I then migrated back, ended up on a kibbutz in Israel, and then took six months and worked on an archaeological dig at the old—at the Wall, the Wailing Wall, at the base of it. They were still doing excavations. So, part of my travels I peppered with working on different archaeological sites. I worked on an archaeological site in Herat, Afghanistan, for instance. So, that was sort of—I knew I was heading east. I had already made arrangements to work on the leprosy colony. A friend and colleague here in Washington was a friend of a man who had worked closely with Mohandas Gandhi, and I met this individual, and he told me that where I should go is—in India was to work with the group that Mohandas Gandhi had established and was still being carried on by his deputy, a man named Vinoba Bhave. And it was a—in the spirit of Gandhi, it was a non-governmental group that worked in education, land reform, agricultural reform, health. They really saw themselves as a parallel system to the national government. And so, he put me in touch with Vinoba Bhave, and he invited me—he gave me options, would I like to do this, that or the other, and I picked the leprosy colony. And so, over the course of my travels to India, even as I stopped off here and there, my endpoint was going to be India, and I was heading towards the leprosy colony.

Q: Where was that in India?

CARROLL: It was in—well, if you know India, there is Nagpur in central India, and about forty miles away from Nagpur is a small town called Wardha, and ten miles outside of Wardha is where the leprosy colony was, Dattapur Leprosy Colony.

Q: Hm. Amazing. Any other thing along the way that struck you as you remember being important to your later career?

CARROLL: Well, one—it was my first real chance to begin seeing how people saw us, Americans. And so, I think any American who travels outside the United States, if they listen and look in reasonable ways, they begin to understand that the world sees us in ways that we do not see ourselves. And so, it was, one, it was really a powerful awakening for me to understand, one, how disproportionately impactful we were on the world, even then in 1970, you know, before we were in the midst of the telecommunications revolution. And so, see how profoundly we were impacting people around the world, disproportionate to any other country in the world. And that really struck me. And I'll give you an example.

As I was crossing from Pakistan into India the border between Pakistan and India was closed and only opened up two days a week. There was a war footing going on. And when I crossed the border, I was taken aside by the India customs military people, and they essentially interrogated me for an hour, as they were trying to get any glint of

intelligence that I might be able to provide them of what's happening on the other side of the border. Of course, I had nothing to say, but the long and short of it was that by the time I got out, it was now nighttime, and as I got into the city, which was Amritsar, I could not find a room for the night anywhere. Everything—because it was a mad scrum getting across the border, so all of the available rooms were taken. So, I'm walking down the street late at night and an Indian man bicycling by stopped and asked me what I was doing, and I said I was trying to find a hotel room for the night. And he goes, well, he had a cousin who had a hotel, and he would take me over there. And I went, okay. So, we went over to the hotel and the cousin, very apologetically said, "I'm totally booked. I have people sleeping on the floor." So, the gentleman said, "Well, come and stay with me. You can stay at my house." A remarkable gesture of kindness. And so, I went to their house, and we went in, and it was a two-room house. There was the living area and then there was the bedroom. And as we went in, he said, "Stay here for a second." I was in the living room, and he went in to wake his wife—it was now after midnight—wife and child. And ultimately, they vacated the bedroom, insisted that I sleep in the bedroom while they slept in the living room. And just wonderful gestures on their part.

But going back to the point I was going to make is that while I was standing in the living room, they had a little mantlepiece. This is 1970, and they had a mantlepiece and on the mantelpiece were two pictures. There was a picture of Krishna and there was a picture of John Fitzgerald Kennedy.

Q: Who would have guessed. (Indiscernible)

CARROLL: And, this is before television. At best, you might hear his voice over BBC radio or something like that. But they were so inspired by him. And they saw him as the future, the hope of the world. And so, for as much as America was captivated by John Kennedy, here on the other side of the world in a remote part of the world, with very little direct contact with the United States, you could see how one president now seven years dead, was still revered as a point of inspiration. So, those kinds of events really sort of profoundly affected me in terms of how people see us and the fact that we weigh so heavily in people's sort of weighting of the world around it. We have a disproportionate—we occupy—we're the proverbial 800-pound gorilla in every situation.

Q: You didn't speak any of those languages you were traveling—whose lands you were traveling across.

CARROLL: Yeah. Well, you pick things up as you go along.

Q: Yeah. When you got to the leprosy colony, how did that function? Did you just introduce yourself to the head of the colony or how did that work?

CARROLL: Well, as I said, I already had a letter exchange with Vinoba Bhave. It turns out that his—he lived only six miles from the colony itself. So, anyway, he had given me a letter of introduction, so when I arrived—they knew I was coming at some point, so it had already been arranged by Vinoba.

Q: Why did you make that decision to work in a leprosy colony? Was there something technically you wanted to learn about—that might lead you in a certain direction with your career?

CARROLL: To be honest with you, I think it was probably an exercise in confronting a fear. My only exposure to leprosy was in the movie *Ben Hur*, and if you remember the movie of *Ben Hur*, there's a tragic scene that takes place with Ben Hur's mother and sister, who in his long years away had become infected with leprosy, and the story of leprosy is that once you become infected you essentially are expelled from your community. And they essentially lived in a cavernous colony. And that was my first exposure to it and so, there was something fearful about leprosy, you know, it's almost a primal thing. And so, it was an exercise in trying to confront probably one of my fears and to try and understand not only the disease, but the culture and the social politics around leprosy. So, in this colony every single individual in this colony had been expelled from their community. It was exactly as I'd seen in the movie. And anyone who became showing signs of leprosy, the telltale signs of the wounds, et cetera, they were thrown out of their villages. And this colony was a place of refuge. But what was extraordinary about it, and really the most profound lesson coming out of that, was the people who lived on this colony, and this now was their lifelong residence because at that point there was no cure for leprosy at all. There was a treatment that you could take, a sulfa drug called dapsone, but you basically had to take it every day for the rest of your life, and you spent the better part of the day vomiting because it was a very noxious drug. But these people, it was a self-sufficient colony. They were able through growing crops and craft work, they were able to self-sustain themselves, and it was an economically robust, thriving community. And there were families there. They created whole lives for themselves. And seeing how resilient and more than anything, optimistic and caring and loving this community was in the face of such really extraordinary adversity, both biological adversity, medical adversity, but also social and political. They were cut off from their families, their communities. They never saw them again.

Q: Wow.

CARROLL: And so, that kind of resilience was something that was just profoundly moving to me.

Q: You were in your mid to late twenties at this point?

CARROLL: Oh, I'm in my early twenties. Remember, I had only dropped out of college when I was probably, what, nineteen or twenty, so I was like twenty, twenty-one, twenty-two, twenty-three, twenty-four, twenty-five, that range.

Q: And you were there for how long?

CARROLL: I was in the colony for about three, three and a half years.

Q: That's quite a lot. My goodness. What led you to leave and where did you go?

CARROLL: Well, it was time to leave. And I ultimately, as I said, I migrated back, I ended up in Israel, and worked on a kibbutz on the northern border with Lebanon , one of the original socialist kibbutzim that were set up after World War II when the Israelis were trying to establish their independence from the British. And they built a number of kibbutzim that acted as a buttress from neighboring countries, sort of a first line of defense. So, this was directly on the border with Lebanon. And it was a point of conflict. While I was there, there were periodic missiles coming in so it was one of these places that was always in full alert and in a perpetual war setting. But again, it was an example for me because most of the people in this kibbutz, the older people in the kibbutz were all survivors of the Holocaust.

Q: Oh, wow.

CARROLL: And they had all come to Palestine at the end of World War II looking for a new life. And I was taken under the wing of a man named Yitzhak, who in fact, was a survivor of Auschwitz.

Q: Oh, my.

CARROLL: And his whole family had died in Auschwitz. But living in that environment, sort of in the long shadow of the Holocaust, was just again, one of these powerful experiences. But as a counterpoint to that, when I left the kibbutz and started working on the archaeological dig, I was a laborer, nothing more than that. I had no skills, so I was essentially a mule driver. I essentially would—the dirt that would be excavated would be thrown into bags and thrown over the backs of mules and then I'd lead them away and dump the dirt somewhere else then come back. But in this case, I was working all the time and befriending Palestinians, and so I now had the opportunity to see Israel through the lens of Palestinians and was quite close to a number of them and spent time in their villages and in their homes. So, it was an opportunity to see Israel both through the lens of Jewish Israelis and see Israel through the lens of Palestinians, sort of post '67 when the land I was working on had been part of Palestinian territory prior to '67. So, this was only like six, seven, eight years later. And it was shortly after the October war, the Yom Kippur War of '72. So, tensions and passions were always high. But again, it was one of these things; I could see the warmth and the love of the Jewish Israeli side living on the kibbutz and conversely, I could see the warmth and the love of the Palestinian side, working and living with the Palestinian community as well. So, again, it was one of those experiences that teaches you just how complex situations—the world is not black and white. And for—I do not condone nor welcome the long-term Israeli approach towards how it has established itself within the Middle East, but I can also appreciate where that need came from and understand that. But I also recognize how it has profoundly and negatively impacted on the Arab and Palestinian communities there as well. So, life—gave me the realization life is far more complicated than just being right or wrong.

Q: Hmm. My goodness. How long were you working on—

CARROLL: I was there for a year.

Q: A year?

CARROLL: Yeah. Half and half between the kibbutz and the dig.

Q: That sounds like an extraordinary experience.

Did you leave there to do more hitchhiking, or what was your thought after that?

CARROLL: At that point I decided it was time to go back to school. But I didn't quite make it back to school. I ended up in Canada at a Buddhist monastery, and I lived there for a year, sort of learning meditation and silence more than anything else. And then, after living in the monastery I decided to go back to school, and so then it was a question of where I was going to go. I ended up in Boston because I had some friends in Boston, and then very cautiously dipped my toe back into academia. Because now I had decided after traveling that what I wanted to do was to become a scientist, which was the anathema of where I was before I left. And so, I took a physics course, and I took a biology and a chemistry course to see where or not I could deal with them—part-time. During the day I worked in a psychiatric hospital, so for three years as I went to school ultimately, I worked in a lockup ward of a couple of different psychiatric hospitals. And initially, I thought I would end up becoming a therapist, which is one of the things I was thinking about. But ultimately, I gravitated, after much evolution, towards biology and ended up tracking in the direction of what ultimately brought me into Global Health was by getting my degree in biology.

Q: Was there a particular professor who led you in that direction?

CARROLL: There was, there was. Herb Lipke. You know, as I decided to go back to school, I self-financed it rather than my parents. And I had a great relationship with my parents. My parents were always remarkably supportive. And if I may, I'll pause and go back to that right now.

As I mentioned, I left college at the end of 1968. Obviously, and John, you'll appreciate this, one of the benefits of being in college was the student deferment.

Q: I was wondering about that.

CARROLL: Yeah.

Q: And your travels.

CARROLL. Well, I mean, most of my career in college it was less academic, and it was much more anti-war. And at the end of 1968, this was really a personal but very profound experience. I went back over to my parents' house at Bolling Air Force Base, and I told

my father I needed to have a discussion with him. So, we went—and it was nighttime, maybe it was late fall, and I told him that I was leaving college and I was turning in my draft card, and I was not going to get drafted into the military. And I said that I was going to petition for conscientious objector status. Well, obviously my father, who was in a very meaningful way one of the major architects of the Vietnam War, being the head of the Defense Intelligence Agency, and it's worth noting, my next-door neighbor, who I grew up with and had a friendly relationship with, General LeMay, if you remember General LeMay—

So, I explained that I was dropping out of school, turning in my draft card, and I was going to apply for conscientious objector status. This was the real extraordinary lesson. Obviously, my father profoundly disagreed with me. One, he believed in the Vietnam War, did not want me to drop out of college for obvious reasons, no parent would, but he made it very clear to me why he strongly disagreed with my position. He understood and believed in the sincerity of my position. And as a result, he said he would support me any way he could. At great cost to him, he paid a price within his own working environment as a general in the air force who had a son who was essentially a draft dodger. And he got grief for that, and I heard that from a variety of different quarters. Other generals also have kids, and we talked to each other, and they would learn what their father was saying about my father and what they were saying about me. So, my father paid a pretty steep price professionally. When I ultimately went to court my father showed up in his general's uniform and he testified on my behalf.

Q: Oh, my.

CARROLL: So, if there's a lesson, to me it was one of the most profound lessons I ever got from my father, that he put his faith in family and faith in honesty above all else.

Q: That's quite a story.

You mentioned going to court. That was to determine whether they would accept your CO (Conscientious Objector) status?

CARROLL: Yep. And they did. Ultimately, they did give me a CO status. And then, they told me I had to work at St. Elizabeth's, the psychiatric hospital. But I had already worked at St. Elizabeth's. When I was in high school, I worked up at St. Elizabeth's, and I wasn't going to do that, and I sent them a letter saying I wasn't going to go to St. Elizabeth's. I then said I was going to a leprosy colony in India, and if they had any issue with that, they could always send me a letter, and I never heard anything from them, that was the end of that.

Q: All right. That's quite a story.

Where were we? We were back in college; we were back finishing your degree.

CARROLL: So, Herb Lipke—so the point was, when I went back to college, I was going to self-finance that. I didn't want to ask my parents to help me. They would, of course, they would have helped me. So, I got a work study program where—at the University of Massachusetts, where I worked in a laboratory, and it was my first exposure working in a laboratory. And the head of that lab, Herb Lipke, you know, I initially went in, I was just cleaning dishware, that's just making sure petri dishes and all of the tubes, so I was just cleaning. But over a period of time, he started giving me little tasks, and those little tasks grew into bigger tasks, and over time I began to realize that I was a natural working in a lab. I could do experiments very well. And Herb really helped me appreciate that, in fact, I had a natural aptitude for being a scientist, both in terms of the ability to reproducibly do my work, but also the kind of questions I would ask, and then the kind of analyses I could do on the data that would come out. And so, that, getting that validation from him, I never saw myself as a scientist, and I came out of a family where no one, there was no one that—I never knew a scientist. So, getting that validation, that it was something that I was not just good at, I was actually very good at it, and that swayed me that this became something almost second nature. So, that put me on a career track as a biologist. And then, over the years, I refined that to more specific areas and ultimately virology and molecular level virology.

So, I went to UMass both as an undergraduate and as a graduate in biology. I spent a year at Tulane Tropical Medicine Program, getting my first real deep dive in tropical medicine. And ultimately graduated with a degree in molecular biology with a tropical disease focus. I took that and ended up doing a postdoc and then became a research scientist at Cold Spring Harbor Laboratories in New York, which is a genetics lab. The head of it is Jim Watson of Watson and Crick, so he was my boss.

Q: Oh, wow.

CARROLL: And so—

Q: Did someone give you a recommendation to go there or how did you link into that?

CARROLL: There was an advertisement for a position there. When you finish your degree, when you finish your doctorate, there are advertisements for post-docs, and you look around. So, I applied for two different post-docs. One was at Cold Spring Harbor, and another was at the Imperial College in London. And I got both of them and ultimately decided Cold Spring Harbor was the place I would go to. And one, in terms of genetics and virology, it's like—it's the pinnacle, it's the premiere research facility in the world. You know, probably a third of all of the Nobel Prizewinners in biology over the years have tracked their way through Cold Spring Harbor. So, it's a place that is incredibly innovative, cutting edge, very forward leaning, so it was a very exciting place to be as a researcher.

That said, when it came time for a sabbatical, I wanted to—I began—for as much as I loved research and the elegance of science, I was still being drawn towards how could I translate this into a meaningful impact to deal with the kinds of people I had worked with

on the leprosy colony. And so, the laboratory, while it was rewarding on one level, did not have the immediacy of really directly contributing to the wellbeing of people. So, I applied for an AAAS [American Association for the Advancement of Science] fellowship. They had science and diplomacy opportunities. And so, they had two; one for international and one legislative. And I applied for both, I got both. I went and interviewed to figure out which way I would go. I had one option, was to work in Ted Kennedy's office and the other option was to work at USAID as part of science and diplomacy. Fortunately, I took the option of working at USAID, and that was 1989, and I joined then the Office of Health, where Nancy was—

Q: Your wife and senior.

CARROLL: Yep. She was not yet the deputy. There was—Ann was the deputy, and then—

Q: Ann Van Dusen. Ann Van Dusen.

CARROLL: Right. And I'm dropping the name of the person who was the head of it, but he left and then there wasn't—I think you may remember, there was a tradition that they had where CDC (Centers for Disease Control) tended to be the head of the health office, and Ann became one of the first of the USAID professionals to assume that responsibility. So, I started that, working in the division that dealt essentially with tropical diseases. So, it was a natural migration point. And in fact, the first project they gave me to work on was to oversee a new activity AID was supporting that WHO was carrying out, which was developing—doing field tests on a new innovative therapy for leprosy.

Q: Really?

CARROLL: And that was in Venezuela, and it was a new approach towards, you know, leprosy is caused by a bacteria and along the way they began experimenting with using multiple antibiotics to see if they could cure leprosy, move away from this lifelong drug, dapsone, and this became known as multidrug therapy, using multiple antibiotics at the same time. They were actually able to completely cure people after a two-year treatment regimen. So, that was my first program I was given responsibility for overseeing. So, it sort of closed the circle in some way.

Q: Right.

CARROLL: Ultimately, it's worth noting that that new leprosy therapy has now been reduced to months of treatment. They've improved the drugs. But it also then became a strategy of using multiple drugs to deal with an infection became the long-term strategy for tuberculosis and ultimately HIV. So, using the multidrug therapy was totally innovative at that point, and it ultimately became the backbone for many future therapies for other infectious diseases. So, that was my first sort of opportunity then to take science, like this was the opportunity where I came in as a scientist, I understood the science that was being explored in this field trial, and then how could you translate that

science into a meaningful field-read intervention. And ultimately, I think that's what I end up carving out as my niche because I brought a rigorous scientific understanding to how you could develop new strategies and approaches to dealing with long-term problems, and really adapt them and ultimately roll them out. So, you'll see over the course of my career, whether it was working with onchocerciasis [Oncho], river blindness, dengue, malaria or other emerging diseases, it was always about trying to find innovative interventions, new ways of dealing with long-term problems that had little to no solutions to them, and what could you do to build an evidence base that allowed you to come up with a new toolbox for actually being able to intervene and deal with these diseases. And that ultimately, taking that AAAS fellowship and having the opportunity AID offered me, was an opportunity to translate a scientific perspective into developing new tools and approaches to deal with core development health challenges.

Q: I'm sure that's exactly what AAAS would hope for—

CARROLL: Yes.

Q: —when they set up that program, to give you all a chance to work within the implementing agency. But I believe I recall it was just a two-year program; is that correct?

CARROLL: It was a two-year program, so at the end of the second year I decided I did not want to go back to bench science. I had decided—I cast my die with development. And so, essentially, I negotiated a position with CDC that detailed me to AID, and so I became a CDC employee seconded to AID, and my portfolio at AID continued to be infectious diseases.

Q: Who were you working with there? Were there people who were your bosses that were either helpful or unhelpful?

CARROLL: Well, my bosses were always helpful, in particular my first boss, John Austin, who was the head of the division. It was the division for vector borne diseases, I guess, but it included water and sanitation and vector borne diseases, so the WASH program and the VBC program were there. John was enormously supportive, and he very quickly created opportunities for me to learn and to grow, and he really empowered me to be able to take the lead on a number of key areas. So, that enabling environment I flourished in. I think one of the things that was a hallmark for my career is my superiors always created a space for me to work, to be innovative. And partly is, you know, the world of infectious diseases within health was always on the margins of the core agenda of the health program. The health program, certainly when I came into it, was driven by the twin engines of child survival and that—and to a lesser extent maternal and family health issues. Reproductive health or family planning was the other big issue. But if you were working on things like river blindness or malaria or dengue, those were marginal. They had limited budgets, and usually heavily earmarked. You've got a budget for river blindness. Congress had a $2 million budget for river blindness, so I ran that. Ultimately, over time in my interactions with Congress, they began providing additional resources.

Ultimately, they created an infectious disease account that allowed me to be able to expand our infectious disease portfolio to a much larger extent. And so, it was the enabling support from AID leadership and then ultimately the incredible investments that Congress made and earmarking money specifically for the programs that I was running created an opportunity to really do what I think was really good work. There was always that kind of supportive environment and over time ever steady increasing budgets for the work that I was doing.

Q: Did you have much direct contact with people on the Hill?

CARROLL: I did. And initially, because I was working on the margins of the health program, they didn't really mind my talking to people on the Hill. And the first occasion came in 1996, and I got a phone call from a staffer on the Hill, Tim Rieser, who looms large, I think, as a person who has been a great enabler of Global Health.

Q: He was Senator Leahy's man.

CARROLL: Yes. And he called because he was reading an article in the *New York Times* that said for the lack of a dollar people in Africa were not getting access to critical, lifesaving interventions like bed nets. And he wanted to know what the story was. And I said, "Well, do you want me to come by and we can have a chat?" And he said, "Sure." So, I came by and that opened up a dialogue. I explained to him—I mean, our total budget for malaria was maybe $2 million at that time. And most of that—

Q: Let me just jump in here. Tim Rieser greeted you in blue jeans and an open shirt, as he always did.

CARROLL: Yes. You know, we had a budget for a malaria vaccine, so it was a research budget, but we didn't have a budget for malaria field operations. And what money I was able to scrape together I actually was able to get from the Africa bureau. They funded activities that I ran. Ultimately, in 1997, Tim established an earmark.

Let me backtrack a second. So, we talked about malaria and the lack of funding for malaria, but we—a number of us within the health office were also informally talking about what could we do about tuberculosis, and there was no support within the hierarchy for tuberculosis because you know, the fear at AID, if you start something new, it comes at the expense of something old, so the financial hydraulics is always something. So, when we drafted a TB proposal that was shot down you may remember, because there was a concern that it would siphon money away from other health issues. So, Tim and I expanded our discussion beyond malaria, we began talking about tuberculosis. Also talked about the importance of the rising concern of antimicrobial resistance and its future threat to virtually all infectious disease issues. Tim then crafted a budget for a new infectious disease earmark that was—the very first earmark was about $25 million. Ultimately that grew to multiple hundreds of millions of dollars. But it was an earmark that essentially opened up the opportunity for us now to begin making forward leaning investments. We could start figuring out how we could build an evidence base for really,

in this case, tackling malaria, as well as TB and these other issues. And so, for the next seven years it was really about building a toolbox that allowed us to think much more innovatively about how we could protect children, protect pregnant women, how we could better understand the populations at risk, and most importantly, how we could deliver these interventions in an integrated way through the platforms that were being developed by both child and maternal health platforms.

You may or may not remember, and you were in Brazil, so you should remember this, the malaria program in Brazil was reflective of basically the way malaria programs were everywhere. It was a separate, independent operation, and if you had malaria, you never went to a health clinic; you had to go to a malaria clinic. It was something that was isolated and distinct from all other parts of health service delivery.

Q: TB was the same structure.

CARROLL: So, the resources Tim made available allowed for establishing what was the Africa Integrated Malaria Initiative and the Amazonia Integrated Malaria Initiative. And used that money to build up programs in five countries in Africa and about three countries in the Americas to really understand how we could best deliver improved therapy at the—within clinics how we could build in child survival, and how we could work with antenatal clinics for women to get access to prophylaxis during their pregnancy, during term. And ultimately, that gave us a terrific foundation for thinking about a much larger program. How could we move this from a five-country or eight-country to something that could be a district level operation to a national level. And that's where I had then, without senior leadership necessarily being aware, but not necessarily disapproving at the same time. I had side discussions with people over at the National Security Council. This is now under the Bush Administration and after the success of PEPFAR (United States President's Emergency Plan for AIDS Relief) and one might say the failures of Iraq and Afghanistan, the Bush Administration was looking for a life raft, something else they could do to do something positive. And so, they were looking for another international health initiative. So, I drafted up an initial proposal that I called The President's Malaria Initiative and presented it to them. They loved the idea, they asked me to come back with more detail, so I drafted a strategy for PMI. They endorsed it and ultimately, they, as you know, made a massive infusion of funding, and it became a—it's become a powerful tool within the Global Health arena. And I did that in 2004.

My relationship with malaria, however, and the other infectious diseases, at that point I was running, you may remember Global Health had essentially organized itself around strategic objectives. And there was a maternal health strategic objective, there was a family planning strategic objective, there was an HIV strategic objective, and there was an infectious disease strategic objective. I ran the infectious disease strategic objective, which included malaria and tuberculosis and other stuff, including other emerging diseases. And while I finished up designing PMI, other emerging diseases became a much larger issue, and that was because of avian influenza in 2005.

Q: All right, move in that direction, at least stay with malaria for a little bit longer and maybe also TB, did you—these were—the work was contracted out or were you also given to organizations to implement these programs? How were they carried out?

CARROLL: Well, the Africa Malaria Initiative, we first negotiated with the country, with the missions about targeting that country for what each of these would be a districtwide operation. So, Senegal, Benin, Kenya, Malawi and Zambia were the countries in Africa, and Peru, Bolivia, Guatemala were the countries in the Americas. And when we did that, then negotiated with the government what province and what would be the parameters. And then, with that said, designed a request for proposal for submissions to be able to deliver the package that was articulated in this program. And so, ultimately groups like Africare, Save the Children, they ended up becoming the primary implementers in those operations.

Q: Did you travel to those sites?

CARROLL: I traveled all the time. So, I would say in the course of my career I typically was in the field well over 50 percent of my time.

Q: Oh, my goodness.

And normally you'd be doing stops of two or three days or a week or two in each site?

CARROLL: When I would go out, I typically would go out for at least four weeks.

Q: Uh-huh.

CARROLL: Yeah.

Q: Right. That is a lot of travel.

All right. Tell me a little more about malaria and _____. How long were you working with it and how successful do you believe it was?

CARROLL: Well, when I first got involved in malaria, and that would be 1991, WHO was trying to re energize a global malaria program. There had been no program for malaria in more than ten years, ever since the Global Eradication program essentially went belly up in the late seventies. There was a bad taste in the global health community's mouth about malaria, and they kept themselves as far away from malaria as possible. Jim Grant in the 1980s, rather than embrace malaria, focused on child survival that was principally focused on things like diarrheal diseases and vaccine preventable diseases. But it totally skirted the issue of malaria. So, even in Africa the vast majority of febrile illness and febrile related deaths were due to malaria. There was no organized intervention to deal with that issue. And a number of missions, one in then-Zaire, wrote a letter, a cable, everything was by cable, sent a cable back highlighting the disconnect between the health program and the health realty, that—and Gary Cook was, I think, one

of the health officers out there in Kinshasa at the time, and framed a challenge of how we could continue to target improved child survival without addressing the challenges of malaria. Easily said, but the problem was there wasn't an intervention that we had in our pocket. The primary therapy for malaria, chloroquine, was facing massive resistance as the plasmodium adapted and evolved to be able to be resistant again, and so we didn't have a widely available treatment. We really had no tool for protecting against infection in the first place. And we sort of understood that women during pregnancy were vulnerable, but we didn't understand what that meant.

So, the first thing we needed to do was develop a toolbox. What are the things that we can put in the field that could be deployed against malaria? So, the first part of running the malaria program and certainly a core part of the Africa Integrated Malaria Initiative was to develop the evidence base for what tools would look like. What was the value of bed nets? Or what was the value of impregnating bed nets with insecticide? How could we get them to the populations at greatest risk? How could we better treat and manage illness within children? How could we not only develop new therapies, but how could we better train health workers to recognize malaria and to better comply with treatment protocols? So, that period of time was really about developing the evidence base, a toolbox, because there really wasn't any intervention. And there was no history of a malaria program in Africa with the exception of Zanzibar and Ethiopia, both of which had been tangentially involved in the global eradication program. But other than that, there had been no significant investment and no significant infrastructure invested in malaria control. So, it was an area of very little precedent within Africa as opposed to the Americas or Asia, which had been the targets of the global eradication program. So, there was a very well-defined and strict sort of institutional lines drawn between the malaria program and the other programs within health. So, the opportunity to begin developing a new way of doing business and making it evidence-based so that we really understood how to do it.

And even as this was going on, there were two countries in the world where AID was still involved in the long, traditional malaria program, which was largely insecticide spraying operations. They were a legacy of the eradication program. Insecticide spraying was the big investment. Pakistan, which had an annual program of $10 million, and it was all focused on insecticide spray, and Bolivia, again insecticide spraying. Those programs by the mid-nineties had all died out, they were gone. So, we were left without not an awful lot to build on and how to do that. So, that's what the nineties was really about, building the evidence base, working with the ministries to get them to rethink how they could integrate malaria. And fortunately, fortuitously at this time, there was a new effort in WHO dealing with child survival that was trying to, as a way of improving the management of childhood illnesses develop a better diagnostic algorithm for clinicians, short of having a diagnostic tool, you were doing it by signs and symptoms and developing a well-defined algorithm, you know, is there rapid breathing, what is their temperature, you know, things like that, you begin differentiating between a disease like—that may be an influenza causing illness versus a malaria illness. So, we're able to actually build into this integrated management of childhood illness, IMCI [Integrated Management of Childhood Illness] an algorithm specifically looking for malaria. So, it

was the first time that malaria was elevated within the child survival architecture, it was the first time that we were actually able to get child survival funds to target malaria. And so, we used that platform along with the monies Tim was providing to be able to develop the evidence base. That ultimately became the foundation for what was proposed in the President's Malaria Initiative. PMI built on that ten years of investment to understand the what, the where, the how, and build that into the architecture of Global Health.

Q: I don't want to divert this too far, but just take us one more step here, if you would. Once the initiative, the Malaria Initiative was established, I think there was a political appointee appointed to run it, Admiral Somebody.

CARROLL: Tim Ziemer.

Q: Tim Ziemer. Were you still involved with it as that was rolled out and how successful has it been?

CARROLL: Okay. When the decision—first off, the decision was made to actually establish the President's Malaria Initiative, then the whole issue, first, as you can appreciate, the first issue, well, who's in charge? And as you know the way Washington works, it was teed up for a food fight between USAID and CDC. And at this point, I'm still working with—I'm still a detailee from CDC. The decision was made, first and foremost, that the person who would run PMI would be a political appointee. Now, personally I was very disappointed because I saw myself as the natural lead, having once spent the previous decade developing the evidence base and then presenting the strategy and the approach. And at one point in conversations with leadership at AID, they asked if we knew any Republicans who would be good candidates to run PMI. And of course, the response back was, other than you guys, I don't know any Republicans.

Q: (Laughs)

CARROLL: So, the long and short of it is, Tim Ziemer was picked. And to be honest with you, he was much better at running PMI than I ever would have been at running PMI. So, he came in and he benefited by in some ways being illiterate with respect to malaria. He didn't come in with preconceived prejudices or biases. You know, I had built a decade of deciding what was the right way versus the wrong way. But he was in a position where he could bring in more flexibility and latitude, and he surrounded himself with very good, technically sound people. So, Tim did a brilliant job in really moving PMI forward, so I give him full credit for all of the good things that came out of PMI.

At the same time, and again, the discussions around PMI began happening with AID, not with the NSC, but with AID began happening in the spring/summer of 2005. That coincided with the elevated awareness of this new influenza virus in Asia, the avian influenza. In January of 2005, I sent a note to Tim, saying that there were some disturbing events happening in Southeast Asia signaling a potentially new threat that we should be thinking of. And I asked if he wanted me to come over and brief him on it. So, I came over and gave him—did a briefing about what was unfolding, about the emergence of this

new virus. And he was alarmed, and he put together a proposed budget with the support of a junior senator from Illinois, Barack Obama. And they essentially, on the back of the emergency tsunami funding—if you remember in December of 2004, the massive tsunami event opened up an opportunity to create additional money for avian influenza. They put into that bill a $25 million budget for AID to develop a way forward to deal with avian influenza. And so, that initiated a series of steps that led to a much larger program, but the end result of that was that the then head of AID, Andrew Natsios, in the spring of—late spring of 2005, as we briefed him on the events of what was unfolding, he asked me to step away from infectious diseases and to take on the avian influenza as an all-agency event, that I would essentially oversee a team that was made up of the Global Health but also the agriculture environment programs within USAID. So, at the same time there was this beginning to formalize the future of PMI, there was this second step of developing an agency response to avian influenza. At that same time, Andrew made it clear he didn't want someone from CDC to be running an agency operation like this, so he created a position for me, and I just—I essentially laterally moved from CDC to AID. So, by June of 2005, I was now a direct USAID hire, and I was fully working on this new cross-agency operation.

Q: So, this was a GS position, General Service position?

CARROLL: Yes.

Q: Okay.

How many years had you been at CDC?

CARROLL: From 1991 to 2005.

Q: Fourteen years.

CARROLL: Yep.

Q: All right, all right. But you were essentially doing the same work?

CARROLL: Yes. But the end result— the reality is that no one really knew who my boss was.

Q: Right. (Laughs)

CARROLL: So, you know CDC didn't give me real orders and no one at AID gave me real orders. So, it was a very sweet spot to be in. I was in this ambiguous spot within AID architecture.

Q: And when Administrator Natsios created that position, did you go out and have a drink? Were you happy about that or you thought, Well, this is not good, I should stay with CDC?

CARROLL: No. I mean, there were caveats attached to it. Because I said the—I told them that the advantage of my being with CDC is that I was program-funded, which meant that I basically had unlimited travel funds, unlike an AID direct hire, it's pretty much sharp elbow areas where people are battling to get travel money. And what was discovered was that there was a loophole in appropriations that Congress had provided for USAID to create a program-funded direct hire position. So—which meant that I could continue, as long as Congress provided funding for avian influenza, I had money to travel. And my money—

Q: Was this the TAACS [Technical Advisors in AIDS and Child Survival] program?

CARROLL: I don't remember the name of it. [The TAACS program was a mechanism to hire non-OE direct hires; the Congressional loophole that I was brought in under allowed for hiring career direct hires].

Q: I believe it was.

CARROLL: So, Andrew supported that, that I become part of the agency as a program-funded career AID employee. So, I was the only one that had that designation, and that was the only thing I was concerned about. What I didn't want to do was to become an AID employee who was essentially restricted to Washington. And the real value was—and this goes back to my experience with John Austin and with Herb Lipke. My real responsibility was never to micromanage, but to create an enabling space for people in the field to be able to do the work, and for me to have as frequent an interaction an encounter, one to build a team sort of experience, but for also for me to be constantly aware of what the in-country challenges are, and what I needed to do to make sure that the people we had in the field were empowered to be able to do the job well. So, being able to travel was critical, and to be able to build the personal relationships with counterparts in the field, within the ministries, within the private sector and the communities that we worked in, putting a premium on, you know, not just being an ATM, a bank, doling out cash, but being able to keep my finger on the strategic and operational pulse so that my own understanding of what the strategy needed to look like, this is a dynamic, evolving space, so being able—we always referred to it as building our ship as we're sailing it, so making sure that had real time understanding and insight as to what the evolving challenge looked like, so what we were investing in and what we were prioritizing was adapting and evolving in ways that were appropriate. And that required a lot of travel.

Q: That's great. That's absolutely essential that you were able to structure that is wonderful. Yeah.

I'm wondering if you might want to take a break?

CARROLL: I'm fine. I mean, if you want to take a break, that's fine.

Q: Well, let's keep going then, let's keep going.

We need to eventually get to more emerging diseases, but I want to just come back and make sure we covered a couple of the ones you mentioned earlier and your involvement. You mentioned onchocerciasis early on. Tell us a little more about what your role was there.

CARROLL: Well, first off, my experience with onchocerciasis was my first real experience in a successful international program. You know, river blindness, that river blindness program in an ironic way was an atonement by Robert McNamara, my father's boss, for his misdeeds in Vietnam. And when he became the head of the World Bank, he used his position in the World Bank to make a number of investments that were really targeting the poor and disenfranchised. And one of the things that he became aware of was that particularly in West Africa large segments of the West African population were living with the burden of river blindness, and in particular those parts of West Africa where the abundance of water, fresh water, was highest. And so, you can imagine population settlements were largely around these riverine areas, but it was also the breeding site for the flies that transmitted river blindness. So, he invested—he had the World Bank invest in a program for West Africa called the Onchocerciasis Control Program [OCP].

That was run out of Ouagadougou in Burkina. And AID had—when I came to AID had an earmark that supported this program. And in my position as the lead on infectious diseases, I took the lead on that. And in fact, my first sort of personal earmark from Congress came as part of dealing with Oncho. The Oncho program largely was about trying to spray larvicide in the rivers where black flies were reproducing and trying to control the black fly population. But by the late 1980s, Merck, the pharmaceutical company, realized that a drug that was a livestock drug for treatment of worms in livestock was, in fact, a remarkably effective treatment for ivermectin, also a worm—I'm sorry, for treatment for onchocerciasis, and the drug was ivermectin, a drug we've heard a bit about by virtue of our past president as a miracle cure for COVID-19.

Q: Right, right.

CARROLL: So, there wasn't—so by the early 1990s Merck had committed itself to underwriting the availability of a human formulation of this drug and making it available to OCP. But OCP didn't have the organizational structure for being able to deliver ivermectin in an effective way. They were really, again, an insecticide spray operation and a group that went around and did what were called nodulectomies, where the worms would be noticeably clustered in boils on the nodules of a body. You would cut those out. They didn't have any therapy delivery capability. So, I wrote a proposal to the appropriations committee about getting a fund for exploring community-based distribution of ivermectin. How could we do that? Could we run a program that would deliver—you needed to deliver ivermectin twice a year to the at-risk population to protect them. So, I got about $2 million earmark essentially to design an ivermectin delivery program, IDP. I did that in 1992 or '91, one or the other, don't know. And it was a

program, again, that was competitive. It was like Helen Keller and Sightsavers and groups like that, but we targeted Niger, Burkina, Nigeria and Zaire for exploring whether or not you could use community-based delivery schemes to get this drug into people on a semi-annual basis. And that actually provided the evidence for the OCP then embraced the community strategy, and that became the long-term backbone of the OCP. And so, ultimately it led—the combination of insecticides and ivermectin distribution led to essentially the elimination of Oncho transmission in West Africa. And in 1998 or so, maybe a little later, maybe 1999, there was a celebratory closeout of the West Africa program and essentially ended the operation there. But then, using community-based delivery schemes, expanded into the other countries in Africa that were struggling with Oncho that were really very community friendly in terms of distribution of ivermectin. So, that led to the African Programme for Onchocerciasis Control (APOC) that dealt with Ethiopia, Rwanda, Zaire/DR Congo and Cameroon and others. And that's still an ongoing program.

Q: Oncho is probably—the degree of disease from onchocerciasis is reduced by what, 90 percent or you have any figures on—

CARROLL: It was essentially eliminated as an issue of transmission. So, you know, you would go into these villages, whether it was in, say, Burkina or out in Adamawa State in Nigeria, and you would go into a village in an area that was, Sahelian, and you'd have these rivers running through. And you'd go into these villages and the village would be abandoned except there'd be old people and young children, and the young children's responsibility was to guide the old people who were blind. All of the other people left. And by eliminating the transmission of Oncho these villages were reopened again triggering new agricultural and economic opportunities. So, by eliminating it you really led to a dramatic revitalization of the communities in those areas again, that were inherently agriculturally rich. Because of the disease the agricultural grounds were fallow. The elimination led to a dramatic surge in resettlement and reinvestment in agricultural operations.

Q: Amazing. Wonderful. Wonderful success story.

If you'll allow me one more—I want to go back to one more traditional disease in your role with tuberculosis. Were you involved with the TB—the beginning of the TB program in AID?

CARROLL: Yes. The initial $25 million for Infectious Diseases Tim shepherded through , we divided that up between tuberculosis, malaria, antimicrobial resistance and disease surveillance. So, those were the four critical arms that we invested in. And that allowed us then on the TB side to lay down an agency strategy, what is it that the agency could do and how could it be supportive moving TB further along. By 2000—I don't remember, '03 or so, the budget for TB—we began developing standalone budgets coming in from Congress, so we ended up earmarking so much for TB, so much for malaria. And that, then, really elevated the degree of engagement. So, we put together a whole TB team that had singular responsibility for moving that agenda forward. The last time I was involved

with TB myself was going to Afghanistan shortly after the fall of the Taliban and over a period of a year developing a TB program for the new Afghani government. And it became a highly successful program, particularly in terms of getting compliance and follow up in high-risk populations, and so the people who ultimately ran the program did a phenomenal job, as you can well imagine, under extraordinary conditions. But that was basically the last time I had anything to do with TB.

Q: Okay. I'm interested in (indiscernible)—as a contractor after I left AID I was asked to lead a team evaluating the TBCTA (Tuberculosis Coalition for Technical Assistance) program, which was run out of The Hague, I believe, an international organization, (indiscernible) organization, sort of leading a group of organizations that were working together and then involved in designing the next phase of that program. So, again, I think a quite successful program, and it was being run as TB expanded, especially because of its relationship to HIV-AIDS.

CARROLL: Right. And that was the transformative moment by the early 2000s and after PEPFAR had been established that the connection between HIV infection and tuberculosis allowed for a larger spigot of resources.

And I might take a step back. The other big event was the Global Fund. You remember the Japanese hosted the G8 at the time in Tokyo, and this is in 1999, I think, or '98 or '99, and a spinoff of the Tokyo G8 was the G8 decided to hold the first G8 health, global health forum. And that was in Okinawa, and it was originally designed to build the support for establishing a Global Fund for HIV and tuberculosis. And I was one of the people that participated in that, and I think you can appreciate that one of my goals was to take the A and the T and add an M to it, which is to move it from AIDS and tuberculosis to AIDS, tuberculosis and malaria. And we were able to make a presentation at the Okinawa meeting that underscored the opportunity to include within the Global Fund funding for malaria. And with that said, afterwards, when there was an agreement to establish, there was a series of meetings up in Ottawa and elsewhere but then, with the establishment of the Global Fund, then Tim Rieser stepped forward, and in discussions with him Tim was able to get language written in the pending appropriations bill that the United States was committed to providing one-third of the funding for the Global Fund if other countries stepped in and provided the other two-thirds. And there was a target number that was set at that point in time. I don't remember what the number was. But it essentially really put the U.S. government at the center of galvanizing a global effort to create this independent funding platform—

Q: I think I just lost you.

CARROLL: Huh?

Q: I just lost you for a few seconds there, but—

CARROLL: Okay. Can you hear me now?

Q: Yes, now I can hear you.

CARROLL: Okay. So, the other piece we ultimately were able to get Tim to put into that language was offsetting up to 10 percent of the funds that were to be committed to the Global Fund, that that fund would be made available to AID to provide technical assistance and support to the countries to be able to implement the Global Fund funded. So, it then allowed for additional resources to ensure that the right technical expertise was available at the country level for effective implementation of HIV, tuberculosis and malaria programs.

Q: Hmm. And as we know, some of us called it the ATM Fund.

CARROLL: The ATM, exactly, ka-ching.

Q: (Laughs) All right.

But let's move on if you've got the energy to move forward, let's do it. As we move more from the early 2000s, you're now an AID employee, and many of your initiatives have been funded and are underway. What was your next interest, what were you trying to do next?

CARROLL: Well, avian influenza for me was an eye-opening experience. I mean, my previous history had always been dealing with endemic health issues. Dealing with an emergent health issue really brought very fundamentally different challenges, a completely different ecology of disease profile, if you will. When you're dealing with an endemic human disease, you're really talking about how do you protect against the infection against a known infective agent. When you're talking about an emergent disease, we learn by way of avian influence the important multi sectoral aspects of the disease ecology of emergence, that an emergent disease did not begin with the human infection, it began much earlier in wildlife with the movement of a virus that has already learned to co-exist in wildlife populations, so it largely moves unfettered through wildlife. But at some point, given the opportunity of interaction with humans or livestock, it can spillover into human populations. And what we learnt from avian influenza and subsequently with other diseases is that if we wait 'til the virus in this case is circulating among people we're really at a great disadvantage because that virus can move much more easily than our ability to control it. The real key was reaching further back and trying to control the events within the animal and the environmental sectors to really minimize the opportunity for a spillover, but if it did spillover you had a surveillance capability that was able to pick it up much earlier before it became a capable, efficient human-to-human transmission. So, avian influenza laid the foundation for the Emerging Threats Program, which looked more broadly at emerging infectious diseases beyond influenzas, inclusive of things like Ebola or COVID, looking at the large family of viral populations out there that have a certain genetic pedigree that makes them good candidates given the opportunity for spillover into human populations for wreaking havoc among humans. So, the whole portfolio that I put together at AID was first and foremost about validating that with the current tools and technologies that we have we can, in fact,

begin defining with much greater precision and clarity what constitutes risk, where—what populations are at risk of exposure to potential threats, and what are the behaviors and practices that elevate that risk. And so, in thirty countries in Africa, Asia and the Americas we laid down a portfolio which really began giving the globe the first real insight into what the underlying drivers of disease emergence are and how we can use that information to better define hotspots, certain places on the planet where the risk of emergence is greater. Not all places are equal with respect to the potential for disease emergence. So, by better understanding hotspots it allowed us to think much more strategically about where we need to look for potential spillover events, and what practices and behaviors in those communities we needed to target to lower the risk of spillover.

But let me take a step back:

One of the things that we began to realize as we began tackling emerging diseases is that first and foremost the world we're living in today is very different than any other time in human history, and that the elevated risk of emerging diseases is far higher today than it's ever been. And that's for one simple reason: human population. The sheer magnitude of our footprint on this planet has transformed the interactive dynamics we have between ourselves, our livestock and wildlife. And our footprints, both from our settlements to our agricultural practices have totally transformed the landscapes around us and totally disrupted the kind of ecological balance which had been largely in play throughout the 250,000-year history of our species. You know, it wasn't until the 1800s that the human population hit the one billion mark. That's after 250,000 years. A hundred years ago there were 1.8 billion people on this planet. Now, think about that. It took us 250,000 years to get to 1.8 billion, but in ten decades, 100 years later, we have eight billion people. We added over six billion people in ten decades. And that explosive increase has been basically throwing kerosene onto smoldering embers, and what we have is a total disruption of the ecosystem around us. So, the twenty-first century, among many other things, is a century of dramatically elevated risk of emerging diseases. And understanding the underlying drivers and understanding the where, the how and the why really allows us to be much more forward leaning. The strategy we embraced is about going to the virus before it comes to us, not waiting passively for that first human index case. It is about knowing where the risk of spillover is greatest, not just geographically, but what populations of people are most vulnerable, and what are the practices that they're engaging in that elevate their risk. That allows you to, one, think about working with governments and the private sector to change some of those behaviors and practices. It's the way a live animal market is structured, the way animals are handled in those live animal markets. You can create much safer ways of managing those markets by adapting certain protocols. It also allows us to target surveillance. If we want an early window into an emerging threat, then having active longitudinal surveillance in these hotspot areas allows us to understand where we need to look for the next threat and what we can do, one, to prevent it, but two, pick it up should it emerge. So, that—we essentially, until I left AID in 2019, the portfolio was really about building the evidence base for what we need to look for, where we need to look, and what we need to do, one, to prevent a spillover, and two, to pick it up at its earliest point.

Q: I'll just mentioned, one of the people I've worked with in the past is Dr. Gladys Kalema from Uganda—

CARROLL: Yeah.

Q: —who I'm sure you know well, better than I do, but who was is a veterinarian who has worked with animal disease transmission in western Uganda, and who went back and forth between animals—diseases between animals and humans in the forests of Uganda and the DRC (Democratic Republic of the Congo). And I think you have a network of people like that, I hope who will work with you on this issue.

CARROLL: Yeah, absolutely.

So, ultimately, you know, this moved the whole discussion that emerging diseases was inherently a multisectoral workspace, that if we are going to really get a better handle on it then we need to look beyond the traditional boundaries of the ministries of health, and we need to forge and build cross-sectoral partnerships between ministries of health, ministries of environment, ministries of agriculture, ministries of livestock. And one of the core take home lessons for me, particularly having straddled between CDC and AID, is that AID is unique among organizations around the world for being able to occupy this multi sectoral space as a natural point of habitation. As a development agency we have normative partnerships with all of those ministries. CDC has a partnership with the ministry of health. AID is a development agency as uniquely positioned to strengthen those partnerships and ultimately build the cross-linking between those different ministries. Unfortunately, and this has become the challenge within AID, culturally we are a stovepipe agency. You know, Global Health does a very poor job interacting with the bureau that deals with agriculture or with the environment and ditto the ag people do a really terrible job. We have all of the instruments within AID to really build a truly multisectoral approach towards addressing these inherent problems, but our culture is very sector specific, and our funding streams are so stovepipe that it really is an impediment to creating the kind of horizontal sort of dynamics that bring strategic targeting across those different sectors, including education. So, while I think AID has all of the ingredients, AID, as you can appreciate as a bureaucracy, is inherently conservative and bureaucracies are inherently risk averse. So, changing the way we do business has been the most daunting challenge. The viruses themselves, I think, are the least challenging part. It's our own organizational and political architecture that has proven to be the biggest spanners in the works. So, there's a significant amount of social re engineering that has to happen. But I'm optimistic that no place is better positioned to do this than AID, but no place is probably more resistant to doing it than AID.

Q: Very good points. We could argue that people in missions are more likely to come together to do the interaction than people in Washington.

CARROLL: Agree totally. And there is a position within AID which is a natural lead point for all of this work, and that's the general development officer, the GDO, you know.

Q: Mm-hm, yep.

CARROLL: Which was always a position that was intended to toggle across the different sectors, but it was always an underfunded or non-funded position. But strategically it spoke to the very issues of being able to bring together at the mission level the different players to be able to speak to that. So, there is that piece of architecture that AID has had that would enable it, but it's never been utilized or invested in in a way to make it happen, but it is at the country level. And that's why the way we designed the Emerging Threats Program was essentially to establish a unit in each of the missions that we worked in, and we would directly fund those people, but they would sit within the mission and be accountable to the mission, but they would also report back to us. But they had to essentially integrate their work within the context of the mission itself.

Q: We have another big chunk of your career to talk about, as I know you moved eventually to the NSC, and you've been very much involved with COVID. Do you want to continue to that point now, or shall we wait 'til the second interview?

CARROLL: I'm going to have to go probably in another fifteen minutes, so it's up to you. We can do it in the second interview. It's actually—there's a lot of worms in the can in that one.

Q: We all get a little tired. So, let's—why don't you cut us off and then, Dennis, let's talk for a few—

(End of Session)

Q: All right. This is John Pielemeier. This is our second interview with Dennis Carroll on Monday, June 27, 2022. And Dennis took us through much of his career in the last interview.

And Dennis, we'd like to talk a little bit about your work with the National Security Council during the Obama Administration in, I believe, a position that was a new position created that you filled at a very, very important time. So, I'll turn it over to you at this point.

CARROLL: Great. Well John, thank you.

My work with the National Security Council really began with my involvement in avian influenza. The NSC set up a small working group to try and coordinate across the U.S. government how the U.S. was responding internationally to the NSC. It also was coordinating with OMB (Office of Management and Budget) because as you may remember, there was a surge of funding that was being made available, as I mentioned initially, on the back of the tsunami emergency appropriation. And throughout 2005 there were a series of funding streams that became available, but they became increasingly larger and the NSC and OMB asked me to coordinate the—how Congress appropriated

something on the order of about $370 million in the fall of 2005 for avian influenza. And it cut across multiple U.S. agencies. But they weren't sure how that would work, so they asked me to convene a process under the aegis of the OMB to coordinate a strategy that would cut across USAID, CDC and USDA (United States Department of Agriculture) as well as DOD (Department of Defense). Even though DOD would not get any of this funding, they had their own money that they would make available, so it was a matter of coordinating. So, we led a series of meetings where we convened discussions agreeing on, one, what the scope of the activities would look like, and we developed a fairly detailed Excel file breaking out across a range of activities and deliverables and budgets that spoke to individual agency responsibilities, but also highlighted the points of convergence to maximize the synergies across those different agencies. So, by December of 2005 we had worked out a detailed appropriation for what this would look like. This essentially meant about $150 million for USAID. We basically had about half of the budget. And as I mentioned, even with the USAID budget it broke apart against engaging multiple parts of the agency, so it was not simply a Global Health exercise. It was one that spanned agriculture, environment, et cetera. So, that was my first encounter with the NSC.

Over the next couple of years and particularly by the time avian influenza began challenging us to think beyond that particular virus and to understand to what extent that virus gave us a window into the larger dynamics around emerging viral diseases, that's when I began developing the emerging threats portfolio, which spanned multiple agreements, if you will. But that laid the foundation for the NSC to establish their own unit within the NSC that they called the Emerging Threats—I'm not sure what—Emerging Threats something. It sort of plagiarized our name, which we gave happily. So, under that situation, we had routine meetings over at the Old Executive Office Building that really began pivoting the larger discussion around emerging diseases that really accelerated in 2009 when the H1N1 influenza virus emerged, and in June of that year WHO declared a pandemic. At that point, the NSC really amped up the coordinated activities across the U.S. government. And what was an important take home message for that was that once we were faced with a global event that posed real risk to domestic agenda the NSC was very clear that CDC's role was really going to be negligible on the international side. Largely, CDC was directed to bring home most of their overseas staff to deal with the domestic issues.

Q: Oh, really?

CARROLL: And USAID essentially was put center to coordinating and running the international part of the portfolio.

Q: One quick intervention. Was there someone within the NSC or in the White House who was a champion of this program?

CARROLL: Yeah, Richard Hatchett, who was an HHS (U.S. Department of Health and Human Services) detailee to the NSC. As you know, the NSC is populated by detailees from different parts of the U.S. government, and Richard Hatchett, who had been with

BARDA (U.S. Biomedical Advanced Research and Development Authority). He was the deputy over at BARDA over at HSS.

Q: BARDA is the?

CARROLL: BARDA is the group that essentially is responsible for developing new technologies and investing in vaccines, et cetera, for the U.S.

Q: Okay.

CARROLL: Richard, who is now the executive director, he retired from HHS, he's now the executive director of CEPI [Coalition for Epidemic Preparedness Innovations]. It's a major international group that is really pioneering the way of developing next generation vaccines for high-risk viral threats.

So, anyway, Richard was the lead, and Richard was basically arced out and oversaw the entirety of what we all did. And one of the challenges we had early on was the sheer magnitude of the task of responding internationally to a global event that would involve virtually every single country in the world. And we—for as much money as we had, it was always finite and so, trying to figure how to be most impactful with that. So, I developed a strategy that I presented to Richard which was endorsed by the NSC, which basically targeted the U.S. government's effort against a specific set of countries based on the following criteria. I went through essentially documents that—we were first concerned with making sure that the people that got vaccinated were the high-risk groups, and obviously, the highest-risk groups at that time were health workers, you wanted continuity of health services, and pregnant women. There was a real concern about the impact that infection during pregnancy not only would have on the mother, but also on the fetus. And so, I went through and went across essentially the range of countries that the U.S. is engaged in for foreign assistance and calculated the total number of health workers in each country, and the total number of pregnant women per annum. And it worked out that with the funding we had, we had the flexibility if we targeted those groups, we could work in thirty countries and fully impact the effect of the health workers and pregnant women. And that essentially became the touchstone for what the U.S. government did. We also, with the NSC's support, then detailed a logistics team to WHO that ultimately oversaw the coordination of the deployment of vaccines and other critical materials to countries around the world, so they oversaw the logistics issues.

You may remember Barack Obama, then president, pledged that 10 percent of what the U.S. procured for vaccines they would make available for international donation, to WHO. And other countries followed suit. So, there was a fairly large pool of vaccines that became available as the vaccines themselves became available, and we provided the logistics for the deployment of all of those vaccines and the ancillary, you know, needles, syringes, et cetera, that you needed to be able to do that. And we also coordinated with HHS. They would procure the vaccines at different pharmaceutical manufacturing sites in the U.S., and they would then set aside that 10 percent and we would essentially send logistics teams, FedEx, DHL, to those groups, to those pharmaceutical company

warehouses and we would pick up the vaccines and then get them on airplanes and ship them around the world. So, that NSC did a really important job at this point in really deconflicting, which as you can well imagine within the U.S. dynamics, a scrum among the different agencies, and it worked well in terms of roles and responsibilities. So, that was in 2009, and following the pandemic in 2010-2011, that emerging threats group continued to work as we coordinated—we kept visibility on what different threats were emerging in different parts of the world. So, if there was an outbreak somewhere or, as we saw in 2013, the emergence of H7N9, another influenza virus that raised real concerns about its potential, in China again. And China has been and is largely the cauldron for most of these new diseases and it's perfectly understandable, given the population dynamics within China.

So, we had, with the NSC, sort of an extensive partnership that largely, you know, we would spend at least most of our week at the White House. At the height of the H1N1 pandemic.

Q: You can add it later.

CARROLL: Hmm?

Q: We can add the name later.

CARROLL: John Brennan was the point person for the Obama White House (later CIA Director) for coordinating the U.S. government, so we had a series of weekly meetings over at the situation room in the White House, in the West Wing, where again, coordinating across USAID, HHS, DOD our response. So, it got elevated essentially to the Oval Office level at that point. So, it was a—that was the first sort of major sort of engagement of the NSC.

Q: Were you the only person from AID in that group or was (crosstalk/indiscernible)?

CARROLL: At the beginning of the pandemic in 2009, Gloria Steele, you may remember—

Q: Yes, of course.

CARROLL: —was the acting head of Global Health Bureau, and she, essentially working with the administrator at that time, gave me a new position, which was senior representative to the White House for pandemics, or something like that. So, I was the designated point person for the agency for this work, so that when it came to then having briefings on the Hill, either Senate hearings or House hearings, and there were multiple ones, I would represent AID and join, say, Tony Fauci and others in the hearings themselves. So, they wanted to—because I was certainly relative to, say, a Tony Fauci of the world, I was a fairly junior person. They wanted, by giving me this title, to elevate my stature within that room, dealing with people like Tom Frieden is always an interesting challenge, Tony less so. Tony is a wonderful man.

And I'll give you, and this all sort of ties into this storyline. When I did design the emerging threats portfolio and Congress had allocated, I forget how much it was, probably about $150 million in 2009, and I designed this program, which had five different parts, and we don't have to go into that. But Tom Frieden made a pitch that this really belonged at CDC, this was the type of work CDC should be doing, it's not the type of work AID should be doing. And he went to the State Department, and I ended up having to go over— and meet with Jack Lew. He was the head of management at the State Department. He ended up becoming secretary of the treasury.

CARROLL: Anyway, he had a series of meetings where I sat with him and Tom Frieden and this awful person at the State Department, who was—just really had a bee in her bonnet about AID and was really agitating that all of the money should be transferred to CDC. No one in senior management at AID wanted to get caught in this scrum. It ultimately got resolved. I went back, surreptitiously back to the Hill and explained that there was a money grab going on from CDC, so they then, the appropriators then sent a letter to the State Department saying that under no circumstances would this money be moved out of AID, and it was for AID's use only, not for any other, and that ended the discussion. So, whatever rationale or good arguments I could make, it made no difference whatsoever. It was ultimately Congress weighing in and saying basically an earmark is an earmark, stick with it. So, it was—this was when earmarking was your friend in this particular case. But all of this, again, was overseen by the NSC. You know, they had a significant role to play in this.

What I didn't mention is that in the case of the avian influenza, the State Department was put in overall charge to coordinate. They were not given any money, but the State Department established an avian influenza working group that was principally headed up by former Ambassador John Lange, and his role was just to, again, deconflict and make sure that there was kumbaya among the different parts of the U.S. government. That group was largely ineffectual, and partly because they didn't have a good sense of what coordination meant. But fortunately, people like Richard Hatchett and all had prevailed, and it worked out quite well.

So, that established sort of routine relationships between ourselves and the NSC, which carried on throughout the rest of the decade. And the mode of a group, there was a Global Health directorate established formally under the Obama Administration at the NSC, and that Global Health directorate—

They established a Global Health directorate, and in that Global Health directorate we then, looking beyond avian influenza, drafted a fairly detailed strategy for how the U.S. government would coordinate any future response to any future emerging threat. And in that context the NSC asked us at AID to essentially host a series of simulations, cabinet-level simulations that were physically hosted over at the State Department, but the simulations and the coordination of the simulations was our responsibility. So, we ran a series of those that really helped each of the secretaries, the cabinet, to understand roles and responsibility, —who was in the lead. This was all about international roles and

responsibilities, to be very clear. And so, it was about the international role for each of the different departments and agencies, and you could see early on, when you would have a simulation, that began with rumors of an emerging problem in X part of the world, how do we respond to those initial signals, and then it evolved over time. It became more clear that it was a real problem, it was spreading, who had responsibility for what. And early in that exercise you would see when it was asked, Who saw themselves as responsible for carrying out this particular action?, you would get three secretaries raising their hand, saying, We're in charge, and it was clear that you couldn't have three secretaries in charge. So, each of these simulations allowed for shining a light on what the roles and responsibilities were and who was the lead, who was support, and began arcing out sort of a playbook, if you will, that we envisioned that should we be faced with a situation like this, you would basically have a playbook that you could open up and it would then be activated. And it wasn't a playbook against a specific type of virus. We gamed any number of scenarios that would lend itself to an influenza as much as an Ebola as much as a coronavirus. So, all of that was laid out and essentially became the cornerstone for thinking about the future, how we would execute, how we would play that out.

Sadly, it never really saw the light of day when we were faced with these situations, so that in 2014, when we had the West Africa Ebola epidemic, there was, again, very early on, real conflict in terms of who was in charge. CDC was adamant it was in charge of coordinating and responding. DOD made it clear they wanted nothing to do with being in the lead, but they were perfectly happy to provide support. Ultimately, again at the NSC level, and in this case Ron Klain, who's now President Biden's chief-of-staff, he was Biden's chief-of-staff as vice president, he oversaw the coordination at the NSC level and directed that AID, and in particular OFDA (Office of U.S. Foreign Disaster Assistance) would be the lead entity for coordinating and leading the U.S. government's response. And CDC's response was to be supportive. So, OFDA in this case, and our role at Global Health then was to populate OFDA with the technical expertise they needed to be able to do the work that they did. And then, the administrator, Raj, essentially appointed me lead strategist and coordinator for his office, and we then worked with OFDA and then all of the other principals to run this out. But this again was the issue of the NSC being able—and Ron Klain essentially being able to deconflict and bring sort of a harmonized approach forward.

After the epidemic was brought under control, that working group that oversaw the Ebola response continued to work together as we were faced with a series of other new emergent threats. There were some nipah outbreaks in India and a bubonic plague outbreak in Madagascar, so that set the table for how we would be able to coordinate and respond to those events as they played themselves out over time.

Q: Dennis, moving back just for a moment, did you travel to West Africa during the—?

CARROLL: Yes.

Q: What was your role there?

CARROLL: Well, my role there was to make sure that the strategies that we were promoting were consistent with what the field needs were and getting better visibility on the effectiveness of what we were doing. So, for instance, early on when I went there one of the clear issues that was evident is that throughout West Africa you had largely a collapse of the health system, which meant that normative health services were not being addressed, and in particular pregnant women were having a real problem getting to antenatal clinics and for getting access to trained birth attendants. Everyone was terrified of exposing themselves to the Ebola virus, and particularly the vulnerabilities women had during pregnancy, during delivery made it really difficult. And we also saw that children were not getting vaccinated, so there was a real concern that we would have, for instance, a surge of measles epidemics in West Africa because we weren't maintaining due diligence. So, the challenge was how to juggle more than one ball at the same time, not only maintain support for bringing Ebola under control, but how to elevate our support for ongoing health services, particularly critical health services. So, that allowed for a pivot and expansion of resources that we would direct towards health services, and really putting a premium on ensuring that there was good infection prevention and control measures in the health facilities, not only to protect the health workers, but also to provide assurances to community members that if they went to these health facilities, they weren't at high risk of being exposed to the Ebola virus.

So, my role was to play those kinds of strategic adjustments based on what the dynamics were. Some of my work went well, others I had a knockdown, drag down with Tom Frieden at CDC. The overall U.S. strategy in the fall of 2014 was essentially to build Ebola treatment units, ETUs, and essentially isolate all of the people that were infected with Ebola in these Ebola treatment units. Basically, that's the model that was used in Central Africa, DR Congo, Congo, et cetera. And in DR Congo, for instance, there was a good strategy because you basically had populations at risk that were in the hundreds, so building an ETU and housing those people was fairly manageable, both in terms of logistics, but also in terms of time, how quickly you could set it up. In West Africa the populations at risk were in the hundreds of thousands. So, the size and the number of the ETU units really became extraordinary, and it was clear that it was going to take four or more months to get these ETU facilities in place. I argued that that was the wrong strategy. The ETUs were good, but they weren't the strategy we needed in September, October, November, because you wouldn't get the first ETUs in place until the end of November. And I put a premium on investing in community-based strategies to educate communities and households what they could do to minimize their risk, that if they were caring for someone with Ebola and they didn't have a facility to take them to, then what could they do at the home to minimize the risk, you know, having access to personal protective equipment, et cetera, et cetera. Ultimately, Tom Frieden ruled the day on that, but the long and short of it is that communities ultimately stepped forward, still in the absence of ETUs, and began essentially taking on those responsibilities. And when you would go out into the villages in October, November, you began seeing home providers now jerry rigging their own personal protective equipment because they couldn't get access, we were not providing access as I had hoped we would to more standard equipment. And they were using black plastic garbage bags, they would cut them and wear them in a way that lowered their own risk. We also had intensive communications

campaigns that tried to educate people of what to do, how to minimize their risk, and they essentially adopted those practices so that by the time the ETU units came on, the back of the Ebola epidemic was broken at the community level where they had taken essentially their own responsibilities in hand and did what I had hoped we could have done in a more organized way.

So, anyway, those are the type of dynamics and the type of things that were going on at that point in time.

Q: Is there anybody in the missions who you worked with who was sort of leading the field effort there?

CARROLL: I'm sorry, could you say that again?

Q: Were there any people in the AID programs in those countries like Guinea, Sierra Leone, Guinea Bissau, anybody there in those missions that you worked with that were leading the field operations there in AID?

CARROLL: Yeah, well, again, OFDA was positioning people in each of the countries as coordinators, so the head of the health unit within OFDA, Peter Morris, was sent to Guinea for six months to oversee the OFDA response in Guinea and coordinating all of the CDC, OFDA, DOD. And DOD played an enormous role in this. Even though they did not want to be in the lead, they had the heavy lift capabilities and logistics, so they were flying in on C-140s massive amounts of equipment and materials into all three countries. And it's also worth noting that it was also not just the U.S. We were also coordinating with Europeans and in particular with China. China had built a number of ETUs [Emergency Treatment Units] and staffed them with Chinese physicians. The current head of the China Centers for Disease Control, George Gao, was the lead person for the China response in West Africa at that time as well, so there was a lot of coordination among the different international donors. David Nabarro, who may or may not know, was the point person for the UN for coordinating all of the UN's work throughout all of that and so, we worked closely with David, just to maximize the U.S. investment, but also to coordinate that investment with the others that were involved as well.

Q: I know it's not your job to wonder why, but why were the Chinese interested in dealing with Ebola in West Africa?

CARROLL: Well, you know, China had—SARS (Severe Acute Respiratory Ailment) in 2003. This event was a real wakeup call for China, their vulnerability to emerging infectious diseases. And they performed miserably against the SARS epidemic. And as you may remember, then head of WHO, Gro Brundtland, and the head of—the assistant administrator, David Heymann, who oversaw WHO's response to SARS, they publicly chastised China for the lack of transparency, and for their ineffective response. That really humiliated China. And coming out of the SARS epidemic they put a premium on elevating their capabilities and expertise in emerging diseases and in infectious diseases in particular. And with the help of the U.S. Centers for Disease Control, CDC, played an

absolutely critical role in supporting the training and ultimately helping to establish what is the China Centers for Disease Control and Prevention.

Q: Oh, really?

CARROLL: They modeled themselves after Atlanta.

Q: Yeah.

CARROLL: With the exception that they ended up establishing provincial level CDCs as well so that they sort of federated—we have a national CDC that has a very weak presence at the state level. They established CDC operations in each of the provinces that were coordinated at Beijing level and George Gao oversaw that. So, when there were a series of outbreaks, over the course of the next ten years they developed really an exceptionally good capability to be able to respond to those. That's part of the answer. The second part of the answer is that as they expanded their international footprint, economically and politically, they understood that they were increasing their vulnerability of importation of dangerous microbes from outside of China into China. So, they were particularly concerned about how, for instance, their workforce—they have people, mining other economic and infrastructure operations across Africa. With outbreaks of Ebola, yellow fever and other infectious diseases there was a real concern that Chinese workers in Africa could become infected and then return to China carrying an Ebola virus or something. It was something that they were very much concerned about. So, China took an international position on health, which was far more engaging. They were critical towards the establishment of the Africa CDC, and there was a joint memorandum between the U.S. CDC and China to support, they would jointly support the establishment in Addis Ababa, the Africa CDC. Our CDC provided technical expertise and China essentially underwrote materials and logistics and operational support and built facilities for them. So, their getting involved in Ebola in West Africa was an extension of that; one, they now had expertise within China and two, it became increasingly more part of their own bilateral assistance program, being able to work with countries at—in supporting health. So, it became one of these shared safe havens between the U.S. and China that no matter how fractious our relationships may have been over geopolitics and economics, places like Global Health was one we were able to navigate quite well. So, for instance, we had a very strong operational partnership with China within China on emerging diseases. I spent a lot of time in China, working with both provincial and national partners on emerging diseases. We put a premium on training people in field epidemiology in China, so there was a really strong, very fruitful partnership between the U.S. and China within China domestically, and then internationally. All of that, obviously, the wheels came off after 2016 and there was a change in administration where all points of relationship became poisonous.

Q: That's really intriguing and helpful to know.

You were saying post-Ebola there were a couple of other outbreaks?

CARROLL: Well, post-Ebola West Africa there were a number of other events. One, there continued to be outbreaks of novel influenzas in China that were constantly being attended to. You never had an idea which was going to be the next one, so every time we saw sort of a breakthrough virus that had certain signature features to it, then being able to mobilize a coordinated response, and in this case a coordinated response with the Chinese, was always desirable. We also were dealing with other outbreaks in other parts of the world. Zika, for instance, in the Americas, again a coordinated effort led by the NSC ensured that how we responded to Zika maximized U.S. investment. As I mentioned, there was a plague outbreak in Madagascar, again, coordinating those—there are serial outbreaks of Ebola in Central Africa. Those continued to be well coordinated. So, you know, those are the kinds of things that were constantly being attended to.

But along with that, it wasn't simply reacting. We also put a premium on working with countries around the world and in the case of the portfolio that I ran, we were working with thirty countries around the world to essentially prepare them for how they would respond to a future event. So, as I mentioned, we ran simulations in the State Department that involved the secretaries, department secretaries for a coordinated U.S. response. We did similar exercises, bringing all the different partners of the UN together, WHO, World Food Program, et cetera, what were their roles, what were their responsibilities. So, we coordinated those. And then, we also invested at the country level. So, in the Vietnams, Indonesias, Ugandas, et cetera, how to work with national authorities for them to develop a national strategy that they could look to for being able to respond to a future event. And it's worth noting, and there's an interesting—and the *New York Times* does—you know, they do editorials, but they also do these video editorials.

Q: Right.

CARROLL: Right? And they did one that featured the outcome of U.S. working internationally preparing countries for a future outbreak, and they zeroed in on success stories that when you looked at how, particularly in the first year of COVID, how well Southeast Asia responded. As we were completely overwhelmed with the virus, the countries that were the first victims of the virus. In January of 2020, I was in Bangkok, Thailand, when the first exported case of COVID showed up at a hospital in Bangkok, and a team we had trained in the portfolio that I ran, on being able to identify novel infections, quickly identified the source of the infection as a novel coronavirus and they isolated it and sequenced it. It was January 10, and it was only the next day that China released a sequence of the virus that was circulating in China, and in fact, what the Thais identified with the same virus that was circulating in China. So, based on the investment the U.S. had made in Thailand, they had identified the first exported case and quickly isolated and eliminated the risk from that case. And you know, by the end of 2020, there were only a few hundred deaths of COVID across Southeast Asia. And you'll see in this video, and I'll send it to you if you want, I'm featured in it, but that's not the point of it, the point is South Korea and other countries specifically signal that their ability to respond as quickly and as effectively as they did was because of the training and the work we had done with them. They knew what to do based on that investment from the U.S. government, and they did it. And you'll see in that video I said that the problem we had

was that it's not that we didn't know what to do, it was the one thing in all of the simulations and all of the gaming that we did, we never factored in a failure of political leadership. We always assumed that when faced with facts, we would act accordingly. But obviously, that was not what happened in the United States. So, we had just never factored in, even though we had a detailed playbook, if we had leadership that never opened up that playbook, and openly declared that playbook fake news, then we were in a position of failure. And that's what happened in the U.S., but in the countries that we worked in overseas they believed in that playbook, and they executed that playbook, and they got the results that they got.

Q: You mentioned the portfolio that you were managing. For future readers, AID transfers funds to contractors or grantees or to other international organizations, rather than physically carrying out the work in the field directly through U.S. personnel. The portfolio, what was the portfolio called? Did you have a name for it?

CARROLL: It was called the Emerging Threats Program, and it was made up of five components. The first component was trying to understand viral discovery. Could we go out and identify future threats before they emerged? In other words, could we with current technologies and current capabilities actually do the kind of fieldwork that would give us insight as to where future risks would be greatest, hotspots, for instance, and we could begin identifying which animals and which viruses we should be tracking and monitoring. So, that was predicted and that was that piece. And it worked very well. Again, that was thirty countries over ten years.

We also had a communications program that was intended to target communities and political leaders on what they needed to do, what the proper messaging was before an event, and also have a library of messaging that could be activated in the event of a new one that we were able to repurpose messaging rapidly, rather than having to create it whole cloth. We could have had field validated messaging that could be on the ready, so that in the face of future threats we would be able to activate that.

We also had a recognition that most of the new emerging diseases were critically linked to livestock, and the trade in livestock, the marketing in livestock. So, we had a very large portfolio with the Food and Agricultural Organization [FAO], again targeting improved biosecurity, biosafety practices on farms, in transport and in markets to lower the risk of infectious diseases spreading.

And then, we had another piece which was about—and this was identify and it was about strengthening laboratory capacities, both human health laboratories and animal health laboratories at the country level to be able to do the kind of sample collection, transport and laboratory analysis that would allow them to get early insights as to any new risks, so strengthening laboratory capabilities.

And then, the last piece was about anticipating what the long-term workforce needs would be. Everything that we were doing then was essentially teaching old dogs new tricks. How can we teach the current level of professionals in the ministry of health,

ministry of agriculture, ministry of environment in the private sector, how they needed to understand and respond to threats. But they had never been trained in their early education about this, so we set up a program called One Health Workforce that is now operating in 175 schools of public health, veterinary medicine, public health, nursing, forestry, environment, across Africa and SE Asia and it is essentially investing in ensuring that graduates from those portfolios, those sectors, have passed through an element that teaches them the core competencies they need around this space; how did they think about new disease risk and how do they, in their actual education, how do they have exposure, that if you're training to be a physician, how do you ultimately get field exposure to work with a veterinarian to be able to respond. So, for instance, one of the programs run out of Uganda at Makerere University, whenever there is a Marburg or an Ebola or some kind of outbreak they'll bring together people from their twelve countries involved across Africa from East Africa, Central Africa, and West Africa, and they'll bring together a team representing the multidisciplinary aspects and those students will get a firsthand experience on the ground, going out and working with the local professionals, understanding what they need to do and how they need to understand it. The idea being that when they become professionals in the ministries or in the private sector, they have already been trained professionally to understand this problem from a multisectoral perspective and have already had the experience and confidence to be able to work across sectors to make them more effective.

So, those are the things that we have invested in. And then lastly, a partnership with the private sector, how to recognize the private sector, you know, there's not a single ministry of health or ministry of agriculture that raises chickens or pigs. If you really want to make an impact, you need to invest in the private sector and they see it in their own interests that the economic returns of imposing these biosecurity measures save the lives of their animals, make their animals healthier, and ultimately the bottom line is economically favorable. So, a very strong partnership with the private sector to be able to leverage the investments they're making to be consistent with the very same national standards and guidelines that we're working at the country level to promote. So, that's the emerging threats portfolio.

Q: Mm-hm. That's quite a complex set of activities.

All right, where should we move from here?

CARROLL: Well, you know, we can move on to what happened in the Trump Administration then.

Q: All right.

CARROLL: Because a lot of the good work that had been done previously went fallow under the Trump Administration, so that ultimately all of the working groups that I mentioned that were a lynchpin to the ability to coordinate across the U.S. government, those were disbanded. Our very robust partnership with China, both domestically and internationally, was terminated, and it became a political liability. So, the inability to

really work with China has obviously been at our collective detriment. And ultimately, our undermining the networks and partnerships that had been built up over decades to ensure a global problem would be met with a global response, what we found with COVID was, I think in the absence of U.S. leadership every country essentially fended for themselves. Even remarkably, when you think about Europe, which has the European Union and a long history now of coordinated activities, they essentially imploded, as you can remember, and in the early days of the spring of 2020, you found every country in Europe trying to outbid each other to get the scarce personal protective equipment, you found every country in Europe beginning to regulate traffic flow across its borders without any consultation with neighboring countries. So, all of those things about coordination and synergies were lost, and I think to a large extent it underscores just how dependent the world is on U.S. leadership, stepping forward and reminding the world that any global threat requires a global response. And we were the first essentially to—essentially turn this into a U.S. agenda and refused to really engage and interact with other countries around the world. So, I think what we've seen is a wholesale abandonment of those long standing partnerships and strategies under the Trump Administration. So, we're now in a very myopic space where we're not making a coordinated investment against whatever the next emergent threat will be. And you know, the problem with that is that, as we've said before, these emerging threats are a guarantee. While we can't say when, we can speak with greater specificity as to where. We understand hotspots better, so we understand the geographic places on the planet where the interactive dynamics between people and animals is enabling spillover, the jumping of a virus into people as most likely to occur, but we're not at all getting the kind of investment that allows for a revitalization of that whole effort. COVID has largely sucked the oxygen out of the room and there's nothing else that people are focusing on.

So, by way of that, one of the things by 2016, prior to the election, we were coming to—I was starting to think about the next iteration of the emerging threats program. You know, we run on five-year cycles, so I was beginning to look backwards to understand what would the next iteration look like, and the one thing that we tried to do with each iteration is not repeat ourselves, but rather stand on the elevated platform that the previous five years have given us and make the next level of investment. One particular area, I mentioned viral discovery, to what extent could we elevate our ability to better forecast where and under what circumstances new threats might emerge, to what extent could we essentially become the equivalent of meteorologists, who can with fairly good precision look at an event happening off the coast of West Africa, a meteorological event off the coast of West Africa and be able to speak to whether it was a high-risk tropical storm or whether or not it was a high-risk tropical storm that could evolve into a hurricane. And so, our ability to forecast those kinds of meteorological events is completely predicated on having fifty years of investment in data, multiple generations of modeling that data, understanding how you can use it for insight, and exploiting new technologies to further refine our data acquisition, our remote sensing and everything.

So, it seemed to me the next step for our viral discovery portfolio was to move from a USAID project to a global partnership. The issue was scale. Even as we worked in thirty countries, it was still way too small and it was owned by the U.S. government, how to

move on the back of the Predict portfolio to build a global partnership that would essentially build a federation of viral discovery operations across the globe and knit them together into a shared, coherent database that could be the basis for essentially early insight. And at the country level would elevate their understanding of where geographically their greatest risk was so that they could target the behaviors and practices that elevated that risk, improve the markets, improve the farms. So, in 2016, I drafted a proposal, and the Rockefeller Foundation gave us access to Bellagio to host an international meeting to talk about a way forward for a global partnership. And so, we invited a cross-section of global players, including senior players from China, from Brazil, one of your old haunts, from around the world, and we had a weeklong meeting to identify what would be an appropriate vision for what we could do. And what came out of that was a vision about what was called the Global Virome Project, a global partnership essentially to target an effort that the U.S. government would contribute to, but so would China. And out of that we wrote a paper that was in *Science* that proposed the Global Virome Project. At that point, China National Academy of Sciences hosted a series of meetings where they brought together across the Chinese scientific community expertise to speak about their interests in this venture, both domestically and internationally. And there was strong support from China for both the Global Virome Project and a national virome project. And in fact, the U.S. ambassador to China sent back several cables to the White House asking the White House support for endorsing U.S. support for such a venture. The Trump Administration refused to support that. And that said, China went ahead, as did a couple of other countries, Thailand, for instance, and took steps to establish their national level virome project, as I said, a federation, so the vision was to do this. And they were scheduled to launch that at the end of 2019, but it got derailed by COVID. The launch coincided with the emergence of COVID, so essentially, all of the effort to develop this global partnership to elevate the scale of our ability to essentially go to the virus before it came to us was undercut. So I still have communications with the Chinese colleagues, this is something they're still interested in, but obviously global politics has made this type of venture far more complicated. And I was in Thailand a few weeks ago; they established a ministry unit that would be the lead point for this, but again, there's the lack of a—sort of a global endorsement of it at this point, largely because people continue to look at COVID-19.

Anyway, it's an example of work that AID did which was really recognized as cutting edge and really unique. This was a space that no one else was operating in, and so the lessons we were culling out of that experience were ones that were incredibly valuable to people, scientists and political leaders around the world, but it was ultimately undercut, and my own ability to promote GVP, when I was within USAID, ultimately they cut—as I mentioned, one of the reasons I joined AID was I was program-funded. Well, essentially under the Trump leadership they cut that ability, so in 2018 I was essentially grounded and unable to continue to promote and travel, which was unfortunate. I was at the Pasteur Institute in Paris as a first leg of a trip, where the Pasteur Institute signed on. They were interested in being a key partner to this. And in Qatar, the Qatar Foundation was hosting a small meeting to talk about future directions. Larry Summers, who you may remember, the former Treasury Secretary and president of Harvard (crosstalk/indiscernible), invited me to come to this. He was very supportive of GVP, and invited me to come to make,

essentially, the plenary presentation to the Qatari Fund for this program. But just before I left Paris to fly to Qatar I got a phone call from Washington, saying they had canceled my tickets, and that I was going to come back. So, when I came back, I asked why they canceled the tickets. Well, this was late November 2016. The leadership in AID decided this was not something that the incoming Trump Administration would want, so they wanted to avoid getting in the crosshairs of the Trump Administration. So, they essentially dissed it.

Q: Oh, my. Oh, my. It's called—a boss of mine called this preemptive capitulation.

CARROLL: Yes. Well, you know, I was quoted in the *New York Times* as laying at the feet of risk averse bureaucrats. And essentially, as you understand the way things work, by November of—after the election all of the political appointees have largely left, so the people in charge are the rank and file career USAID people, and for better or for worse, what largely works towards elevating someone within that system is your ability to please who's above you, and the people who were now in charge of AID were now anticipating what would displease the incoming administration. The irony, of course, and I ultimately sent a—I shared a picture with them, is one of our key implementers in the Predict Project, based in New York, EcoHealth Alliance, they annually had a fundraising operation and people who annually made major contributions to them were Jarod and Ivanka—the Kushners. So, I sent a picture of them at the most recent gala event, underscore that obviously this space is one that they'd been supportive of, but that was, you know, that was the end of the story.

Q: Yeah.

CARROLL: So, ultimately, that's why I left AID, the inability to work in that kind of environment where it became more risk averse and more reactive than proactive. It was contrary to the thirty years I'd been there.

Q: So, that was in 2016 or '17?

CARROLL: Ultimately, I tried to work the system afterwards. It wasn't working, so in 2019 I just said, "I'm gone."

Q: Two thousand nineteen. Wow.

Where did you go? What did you decide to do?

CARROLL: Well, I left, and one of the things that—you know, I was still interested in promoting GVP, but I had to make sure of conflict of interest issues, to I worked with the inspector general's office to make sure that the promotion—the activities that I was promoting for GVP while at AID was not conflictive in a post-AID, that there were not either financial or other issues that could be seen as compromising the integrity of GVP. So, when I left, we did not establish GVP as a 501(c)(3) NGO (Non-Governmental Organization) until three months after I left because the inspector general said that if we

established it before and I was involved in it, it would signal conflicts of interest in future funding support. So, we launched it as the pandemic was underway, but as I've said, it's been hard to get traction subsequent to that. So, I've been promoting that, and I'm also doing work with URC (University Research Corporation) and then, I've been working with Rockefeller and the Milken Institute in the interim as well.

Q: So, URC is University Research Corporation?

CARROLL: Yep.

Q: One of the AID health—

CARROLL: Earl Gast, who you may remember.

Q: Yeah, (indiscernible).

CARROLL: Is the CEO for that.

Q: Okay. Great.

At one point, as I recall, the PREDICTS Project was getting some press related to Wuhan, to the laboratory there. Would you like to discuss that?

CARROLL: Sure. As I said, we had a strong partnership with Chinese researchers, and among the Chinese researchers were at the Wuhan Virology Institute. So, we would go out and do sample collection together, and then they would work with the samples. There was never any financial relationship between our work and their work. It was technical interfacing. But you know, the popular press has a hard time, and the politicized press has a hard time differentiating between working in scientific partnership and funding and providing resources to an organization like that. And obviously, when the U.S. government started making accusations that the source of the coronavirus was a lab leak from the Wuhan lab, it became enormously politicized that any interfacing with them was seen as a—something nefarious. So, it really, really muddied the waters completely. And it's worth noting when these accusations began. You know, if you roll the clock back, in January and February the only thing the administration had to say, and in particular Donald Trump had to say, about COVID was his admiration for China and its execution of massive lockdown in Wuhan to limit the spread, so he praised President Xi for his ability to execute that kind of citywide quarantine. And really did not speak negatively at all. It was only when the stock market became impacted at the end of February, beginning of March, which was what—you know, Donald Trump, that was the metric for his success as a president, how robust was the stock market doing. And you'll remember, it went into a tailspin at the end of February, early March. At that point, Donald Trump got Jesus, if you will, with respect to COVID. And rather than accept responsibility that he essentially did nothing for two months, found a scapegoat, and the scapegoat was China, and in particular the scapegoat was clearly a laboratory release. You know, we can't say definitively how the COVID virus emerged, naturally or by laboratory release, because

we don't have the type of data to speak definitively, and that's unfortunate. China has done everyone a disservice by not allowing the kind of forensic investigation that needs to happen to definitively determine the virus' origins. But it's also worth noting that that was largely prohibited by how politicized the whole COVID story became, so no matter how open and transparent they were, I think it's safe to say the people who wanted to believe that China was a culprit, regardless of whatever future evidence that could say it was a natural event or not, they would not believe it. And China would still be the subject of huge political blowback from the United States. So, China made the decision not to allow that forensic investigation, which is really unfortunate. But we've been able to piece together enough information that I think it's telling that the vast majority of scientists who operate in this field agree that it's overwhelmingly likely—again, we can speak with absolute authority because of the lack of critical data , that its emergence is most likely a natural event that had nothing to do with the laboratory. It was just coincidental. We had already identified hotspots where spillover events are at a heightened risk. We had already identified the Wuhan market as one of the most risky places on the earth because of the type of animals that were sold there, the conditions under which they were sold, the way they were transported, so when we have our hotspot maps, Wuhan is very much a pre-identified high-risk place. So, that it came out of Wuhan is not a surprise whatsoever. It was totally predictable, and we predicted something like that coming out of Wuhan. So, you don't need a virology lab. But that said, I had hoped that when all of this discussion about laboratory release was getting a lot of press, that I hoped it would actually—there'd be a silver lining. Because we are in a very real situation where accidental release of dangerous pathogens from a lab is a real risk and it's getting riskier every year. The proliferation of labs around the world that handle very dangerous viruses is only increasing, but what we don't have are international standards to ensure high compliance of good biosecurity measures and openness and transparency that ensures accountability, equivalent to what we already have in the International Atomic Energy Commission, that nuclear power plants with the exception right now of Iran, are subject to routine oversight. And I hoped that we would be able to translate this concern about laboratory release to one that would hold all labs that handle these viruses to the same standards with the same openness and transparency, whether it's the BSL4 (Biosafety Level Four) lab up in downtown Boston, the New England Infectious Disease Lab [NEIDL], or the lab down at CDC. Labs have had mistakes and they've accidentally done things that you don't ever want to see happen. But none of them are subject to this kind of international oversight. And so, I firmly believe that COVID was a natural event, but I also firmly believe sooner than later we're going to be besotted with a laboratory event, and that this political firestorm essentially has prevented the kind of forward leaning effort to bring all of these labs under a better managed umbrella is an enormous lost opportunity. Wuhan was not the source of this, but tomorrow the Wuhan Lab could be, as could be the New England Lab or the CDC Lab.

Q: To make this more difficult, some of these laboratories are military, like the (crosstalk/indiscernible) here in Baltimore.

CARROLL: That's right. We have the naval labs in Peru and Cairo, for instance, or in Bangkok. The one we used to have in Jakarta is sort of floating around in the Pacific now.

Those labs aren't subject to that type of oversight. China also has their military labs as well. At the very least, taking out of the equation the civilian public labs would be an enormously important step, and we know that setting high standards in one environment can affect "all ships will rise" phenomena, the standards and performance, even in the military labs could benefit from such an effort.

So, politics has essentially acted as a misdirector. It's had people focus on things which are not what we need to focus on. It's prevented us from having the type of discourse we urgently need to have. And as I said before, health, which has long been a safe haven, as had been the environment, those are no longer safe havens. And they've become politicized and ultimately, it's to all of our disadvantage. And so, we've dug ourselves into a very, very, very deep hole. And the Biden Administration, unfortunately, has done nothing to help us get out of it. I think they've added gasoline to the fire. They've come out and accused Wuhan Lab the same way. They've not backtracked from Trump's. And they have no more information. As we've seen, the intelligence community by and large has sided on the side of natural release. My father's own Defense Intelligence Agency has said it's a natural event. So, the Biden Administration could have opened up doors to reclaim health and environment as safe havens, critical for climate change, right, but they've not done that. John Kerry under the radar has been trying, but we still have so politicized our overarching relationship with China, and President Xi is, —he's a challenge in and of himself. So, unfortunately, we've not seen the Biden Administration tack away from the hardline China rhetoric, and at least try to nuance safe havens for collaboration. They've not done that, and I think it's just a tragedy. We're going to pay a long price for that, because John, you know, I've said this before, others have said this, COVID-19 is not the first, it's not the last pandemic threat. And the frequency of these events is going on with greater intensity. We're seeing these more frequently, and we've said before, it's all about population and population pressure. And you can't add six billion people in one century and not have an enormous disruptive effect on the ecosystem around us, and that's what we're living in. Climate change and emerging diseases are different sides of the same coin. They're all driven by population, they're both driven by land use change, and our negative impact on the environment. And one way or another, we have to depoliticize that whole space if we're going to be able to deal with rising temperatures and extreme weather events or to deal with the steady emergence of new diseases. And I think it's a failure of the current administration not to be able to break out of this box.

Q: Yeah. The part of it that you've touched on that I've seen more—working more in Africa is the bushmeat problem where almost every market you go to in a rural area is selling bushmeat that's come out of the forest or been killed along the road, and who knows what you're eating.

CARROLL: Well, interestingly, in partnership with FAO, we launched the Africa Futures Project in 2016. Basically, looking retrospectively in Asia from 1960 up to the turn of this century, it was clear that the—both the population boom and the economic boom across Asia created wealth that began demanding access to animal protein. You know, when impoverished populations have limited access to animal protein. And what we saw across

Asia in the second half of the twentieth century was this incredibly explosive increase in livestock production, unregulated, uncontrolled. For instance, in China at the height of the Cultural Revolution in 1969, there were 100 million poultry under production. With the economic liberalization after the Cultural Revolution and increased wealth, by the turn of the century people's purchasing power had transformed the poultry industry from a 100 million number to 18 billion—

Q: Oh.

CARROLL: —poultry. And it was that unregulated growth that allowed for the absolute proliferation of avian influenzas to grow out of control, and there's an equivalent growth in the swine population. So, they were completely unregulated, and these are the intermediary animals that act as a switch point and further evolution for dangerous viruses. Looking at that and then looking at Africa, if you look at Africa, by the end of this century, or by 2050, the population of Africa would have gone from just under a billion to three billion people within fifty years, but half of the population in Africa will now be middle-class and it will be urban. And that increased demand for animal protein is very predictable. There's very little organized animal production in Sub-Saharan Africa today. You don't have large poultry or large pig farms. But all of that is changing, and the demand is going to essentially lead to—left to itself, will lead to a repeat of what we saw in Asia. So, I asked FAO to begin developing a forecasting program that we could then work with different economic unions in Africa as well as ministries of agriculture to begin forecasting what the growth in livestock would look like, moving beyond bush meat, and how that will completely transform the risk of spillover in Africa of naturally circulating viruses in an environment where mammalian diversity and mammalian diversity is a proxy for viral diversity. Mammalian diversity is extraordinary in Sub-Saharan Africa.

Q: What is mammalian diversity? I don't know what the term means.

CARROLL: It's different types of mammalian species, how many mammalian species do you have? And Africa is rich and diverse, and as we see the predictable increase in livestock production, with the predictable marketing, all unregulated, uncontrolled, then you have—Asia will no longer be the epicenter of new emerging diseases; in the twenty-first century it will be Africa. Above and beyond Bushmeat we're going to see an explosive increase in the risk of all of the different viral populations that are circulating in the remote regions of DR Congo, for instance. But we're not only looking at an increased population in the middle-class, you're looking at increased mobility. Infrastructure is—increasing, is dramatically changing in Africa, roads, railways, air travel. So, you know, what you saw in West Africa with Ebola is a preview into what we'll see in Africa throughout this century. You take a virus that was circulating in Central Africa and a population that was typically with very low mobility because the infrastructure was so poor, so you would have an Ebola outbreak, but it largely would be limited to a geographic area because the population mobility was limited. Introduce that same virus into West Africa, which has a much more mobile population with the infrastructure much more mobile, and what you saw was a virus that typically threatened hundreds of people

now infecting—putting the entire region at risk because of the mobility dynamics. The mobility dynamics and the purchasing power dynamics of Africa are transforming future risk, and that's this project with FAO was to begin trying to put at the national level regulatory laws in place and policies in place that would begin managing the new investments in livestock production, the kind of requirements that would be in place for what the farms would look like, what the transport systems would look like, and what the markets would look like, the ability to put those in place. Now you see in Asia they're trying to put the genie back in the bottle and they're doing it with some measure of success but at huge cost. The idea with our partnership with FAO was to have biosafe systems in place as animal production grew and basically make sure that we never let the genie out of the bottle in Africa.

Q: Right.

CARROLL: But anyway, so you know, you mentioned today we think about Asia, tomorrow it's all about Africa.

Q: When I was a Peace Corps volunteer many years ago there was one small little restaurant in the very small town I was—where I was teaching, and I was offered a culinary delight once when I went there, which was field rat.

CARROLL: Yeah.

Q: And I was told that the field rat was a delight because those rats had been eating grain.

CARROLL: Yeah.

Q: And they were very tasty.

CARROLL: (Laughs)

Q: Something you should eat, and I did.

CARROLL: Yeah.

So, anyway, the portfolio I ran, I think, we did a nice job in one, broadening the sectoral space, bringing health and environment and livestock together, and agriculture, also private sector, really looking at the role of the private sector, and leveraging their future investments so that you know, their economic incentives are the bottom line, and ultimately proving to them that they would have more financial return by reducing the opportunities for these viruses. It's not just viruses that are dangerous to us. Most of the viruses the agricultural, livestock community deal with, are uniquely dangerous to animals. African swine fever is hugely, hugely infectious and deadly. But if you can control the spread of African swine fever, a virus only a threat to livestock, not people, into a farm, you control every virus that we're concerned about for humans going into the

farm. By way of an example we worked a lot in Vietnam, helping them better manage their biosecurity and farms to protect against avian influenza. In 2018 there was a massive African swine fever epidemic in China which spilled over into Vietnam, but Vietnam was able to mobilize a rapid response, again building on the experience they had gotten in how to better manage the risk from avian influenza, as did Thailand completely eliminated the risk of Africa swine fever by adapting their protocols on avian influenza, and we saw similarly in Laos and Cambodia hugely under resourced places, but they were able to show that they could take experiences and capabilities that were designed to deal with the human health issue and rapidly apply it to a livestock issue, which ultimately was hugely important in terms of food security. People's lack of available access to animal protein we know is a huge issue. And even though I am a vegetarian, I appreciate our ability to maintain healthy livestock, not only protects humans from future infectious disease, but also ensures people ready access to critically needed animal protein and micronutrients.

Q: Hmm. Very important.

Well, I recall trypanosomiasis and rinderpest and other animal diseases that—

CARROLL: Right. exactly.

Q: —people have been trying to protect, especially for export, export meat, there had to be protections for that that the European Union primarily pushed many of those African countries—

CARROLL: And you saw that in Thailand when avian influenza in 2004-2005, was having avian influenza outbreaks, like the whole Southeast Asia region, everyone in that region essentially reverted to vaccines as a way of trying to control the virus. But the vaccines, as we see with COVID-19, if you get a COVID-19 vaccine, it doesn't stop you from getting infected and it doesn't stop you from spreading the virus, but it does stop you from serious illness and death. And avian influenza is the same thing, that if you vaccinate a chicken for avian influenza, it doesn't stop it from getting infected and it doesn't stop it from spreading the virus, but it does stop it from dying. Well, basically the Chinese, the Vietnamese, the Indonesians, they all went the vaccine way and they've been controlling the virus through vaccination, but the virus is still circulating, and any day could pose a risk. Thailand, 3 percent of its GDP (Gross Domestic Product) comes—came from export of poultry to the European Union.

Q: Really? Huh.

CARROLL: And when the European Union, they understood that if they got vaccinated chickens for H5N1 coming into Europe, they were at risk of that virus spreading in Europe. And so, they made it clear to the Thais, if you're going to continue to export you have to do it without any vaccination at all. So fifteen years ago the Thai government established a public-private partnership with the Thai poultry industry and to this day have maintained a very high level of rigorous control of viruses moving among their

flocks. And they've been essentially free of avian influenza, and they continue to have high export returns. Vietnam, Laos, Cambodia, Indonesia, all of their production was domestic use, so they never had the same incentive that the Thais did.

Q: Ah-ha. Hmm.

Coming to the present day, AID's director of health is Atul Gawande, who's recently been appointed, has a reputation as a writer as well as a researcher and international health expert, have you had any contact with him?

CARROLL: I've had none, not at all. So, I couldn't offer any valued insight one way or the other.

Q: All right. You don't know if he's interested in the work you were doing in the past?

CARROLL: I continue to interact with the team that I left behind, but again, I'm also very cautious—I mean, I had a fifteen-year run to run this program and to put my stamp on it, and it's up to them to run it and put—I interact with them, and I talk with them, but I try and also—I keep a very hands-off approach. I've either left my mark or I haven't. And I'm also in consultation with them, but I keep it as low-profile as I can.

Q: All right, well, that is what you can do in retirement. But you're not really retired. You said you were doing several other things.

CARROLL: Yes. No, I'm quite busy, but happily so.

Q: What does VIROM stand for, v-i-r-o-m?

CARROLL: VIROM, v-i-r-o-m, it's basically—it's a word that speaks about viral ecology.

Q: Viral ecology.

CARROLL: It's a global viral universe project.

Q: Hmm.

CARROLL: So, we took a page out of the Human Genome Project. When I first—I told you last time that I had a scientific career, and I was at Cold Spring Harbor.

Q: Right.

CARROLL: And when I was at Cold Spring Harbor my boss, Jim Watson of Watson and Crick, the Human Genome Project was just beginning, and he was the initial head of the Human Genome Project. And Cold Spring Harbor was an epicenter of that work. So, I wasn't directly involved in it, but I definitely absorbed a lot of what was going on with

the Human Genome Project, so when X number of years later looked at developing the Global Virome Project, I essentially looked back at the Human Genome Project to understand what works and what doesn't. And one of the key contributors to the design of the Global Virome Project, Eddie Rubin, was the head of the Joint Genome Institute at Lawrence Livermore Berkeley, which was one of the four laboratories worldwide that was responsible for the Human Genome Project. So, he saw that, and so he brought a very rich and powerful insight into the Human Genome Project and how it—what aspects of it would resonate and be appropriate for the Global Virome Project. So, it's basically trying to do to viruses what we did to the human genome.

Q: Oh, boy. Interesting.

Well. I wanted to—you have such an illustrious career and it's been so forward looking and so successful in many ways, I'm wondering now if a young scientist came to you and said, I'd like to apply some of what I've learned to the real world and in the global community, where would you point them? Would you point them to AID, would you point them to WHO, CDC, or to the private sector?

CARROLL: Yeah. Let me first off say at what stage in their scientific career are they?

Q: You tell me where you would find—

CARROLL: Okay. So, if they were recent graduates from undergraduate school, I do tell them, I say, "The first thing you want to do is to get out of the lab and do something like join the Peace Corps. Get some real-world experience and begin to understand the world you live in. Then go back—" and you know, I used the same—when I worked on the leprosy colony, right, it profoundly impacted on how I saw my way forward, and I'm sure similarly for you, in your experience. So, I say, "First, if you're interested in science, first off, understand—and particularly if you're interested in biologic science or even climate science, get a direct feel for what the world is made up of. So, take a two-year period, get out there and do that. Then go back and get your degree and get your expertise. And then secondly, once you've done that, if your interest based on that field experience that you had is trying to figure how best to apply the best of the new science to the needs of the world, then look at engaging, in this case, in international work," and I would definitely point them towards AID. I'd point them to CDC, but I'd point them preferentially to AID, and that goes back to something I said before. AID doesn't really exploit all of the potential it could. As I've aid, it is the most multisectoral, multidimensional organization on the planet, that it is so robustly invested across all of the different dimensions that ultimately constitute and determine whether we have a good and healthy life, economic well being, education, environmental, governance, health, et cetera, all of that, education. And the opportunity to bring your scientific insight into that kind of environment has a chance to be profound. You go into CDC, and you'll end up living and working in a world that is singularly partnering with the ministry of health. That's important, so that's good. But if you really want a rich and constantly challenging environment, consider my own experience where I went from a traditional public health role, working in malaria, tuberculosis, stuff like that, into one that suddenly had me hanging out with bats and

chickens and pigs. I mean, that was transformative. I mean, that was like, goodness gracious. I mean, this is such an interesting space in that nexus where we're bringing all of this together. You know, we're the only species on this planet that tends to think of ourselves as separate and distinct from the ecosystem around us. I know when I grew up, we were constantly being taught that one of the great advances in human civilization was in our ability to control the world around us. We now had the power to manage and control. We could build dams, we can control things we never controlled before. But what we ultimately saw was ourselves as separate from the environment around us. The opportunity for new scientists to come in and see us not as separate and distinct, that our role isn't to dominate, but to live in harmony with, and how to use science to really maximize not just the benefits to our species, but to benefit to all the species on this planet, then we're in a far better place. And I think AID is in a position to lead that way and having scientists from multiple professions and interests be able to bring that kind of vision. If we did that, the end of the twenty-first century would be profoundly different from the beginning of the twenty-first century. So, when you talk about someone young and beginning well, they're career is going to take them up past the midway point of this century. They're going to own what the world looks like in 2060. What can they begin doing—what is the world they want in 2060 and what can they begin doing today to bend the arc and move us in that direction? I think scientists bring the kind of critical thinking, evidence-based analyses that allow them to really think in a forward acting, forward leaning manner.

So, I would argue for AID, and I would just argue that in the future, I wish we would get leadership that really, really understands just how unique and special, and to build a life cycle health portfolio that largely looks at what were the needs to ensure a healthy pregnancy, both the environment, the woman and the fetus are exposed to. When they deliver their baby, they get good healthcare. When that child is five years old, they get a good education. When that child is older, they have access to good jobs, that they live in an environment where they have good governance, they live in a good environment. You know, AID tends to stovepipe. We vaccinate kids to the age of five, then we leave them alone until they become pregnant women, then we get interested in them again. But we have the tools to take cohorts of people and essentially from conception to death they have the—we have the ability to give them an environment, the whole ecosystem of governance, economy, environment, everything that would make them not just healthy, but living in a healthy environment. And there's no organization I can think of that has such a multidimensional understanding or commitment to the world we live in. And the world we live in is multisectoral; it's not unisectoral, but we operate in a unisectoral way.

Q: Right. And these young people, whatever background they come from, they have to be—have more ability to move between sectors and between areas (crosstalk/indiscernible)—

CARROLL: Yeah.

Q: —disciplinary—multidisciplinary.

CARROLL: Exactly right. Exactly right. So, anyway, I would direct them in that way. Get world experience and then join AID. And make AID the organization it could be.

Q: Are you teaching at any local universities?

CARROLL: Well, I'm teaching at—I have a professorship at Chulalongkorn in Bangkok.

Q: Oh, really? How?

CARROLL: I teach there, and then I give guest lectures here and there, here domestically. But I was far more interested—to me, the next generation of leaders are coming out of Africa and Asia, so I was really interested in having access to teaching that next generation. So, I'm in a newly started global health program at the medical school at Chulalongkorn and so—

Q: Is it in Bangkok? Is that in Bangkok?

CARROLL: In Bangkok, yeah, it's in Bangkok. It's the premiere university there. And it has students from Asia, Africa, the Americas, so it's a good platform. And I'm trying to negotiate something for Makerere. I'd like to have a position at Makerere where I could do this work as well.

Q: Hmm. Very interesting. Yeah.

Well, thank you very much. Is there anything else you'd like to say?

CARROLL: No. I just hope you and Nancy are doing well.

Q: Thank you.

We will stop here.

End of interview