

CDC Ebola Response Oral History Project

The Reminiscences of

Daniel B. Jernigan

David J. Sencer CDC Museum

Centers for Disease Control and Prevention

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Daniel B. Jernigan

Interviewed by Sam Robson

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Interview 1 of 1

CDC Ebola Response Oral History Project

Q: This is Sam Robson, here today with Dr. Dan Jernigan. Today's date is May 27th, 2016, and we're here in the audio recording studio at CDC's [Centers for Disease Control and Prevention] Roybal Campus in Atlanta, Georgia. I'm interviewing Dr. Jernigan as part of our CDC Ebola [Response] Oral History Project. Dr. Jernigan, thank you so much for being here with me today. For the record, could you please state your full name and your current position with CDC?

Jernigan: Full name is Daniel B. Jernigan. I'm the director of the Influenza Division in the National Center for Immunization and Respiratory Diseases.

Q: Great, thank you. Can you tell me when and where you were born?

Jernigan: I was born in Fort Benning, Georgia, in 1963.

Q: Did you grow up there?

Jernigan: No. My dad was in the military, so we moved around.

Q: Were there any specific places where you spent a lot of your time growing up?

Jernigan: He retired to Oklahoma, and so that's where I spent probably the longest time, which was I think five or six years.

Q: When was that?

Jernigan: Nineteen seventy-nine, I think was when we moved there. I graduated high school in '82 and then graduated from college in 1986.

Q: What kinds of things were you interested in, coming up through high school?

Jernigan: [laughs] Not a lot, I don't think. Just the usual kid stuff, I guess.

Q: Were there any subjects at school that you were particularly drawn to?

Jernigan: I liked chemistry.

Q: Chemistry?

Jernigan: I ended up doing a zoology major in college.

Q: Where'd you go to school, college?

Jernigan: Graduated from Duke [University] in North Carolina.

Q: And then what happened after that?

Jernigan: After that, I would have liked to have stayed there for medical school, but they didn't really want me to stay there for med school [laughs]. So I moved on to Baylor College of Medicine in Houston.

Q: What do you mean they didn't want you to stay there for med school?

Jernigan: I interviewed there and they didn't accept me. [laughs] But that's just the way it goes. Nonetheless, I went to Baylor, and then at Baylor, ended up doing a five-year MD/MPH [doctor of medicine/master of public health] program. Which turned out well. It was an MD from Baylor, and a master's of public health from the University of Texas School of Public Health in Houston.

Q: Do you remember the decision-making process of, am I going to go to med school? What that was like for you?

Jernigan: For medical school? It was just something I wanted to do, go into medicine. I actually thought about doing a master's of public health at UNC [University of North Carolina] prior to going to med school, but a lot of the—all premeds [pre-medical

students] are quite high-strung. [laughs] Feel that you have to go right on to medical school, and not interrupt that process. It was good, so I went to Baylor and was able to do the MD/MPH, but while I was there, I actually had a lecture from—Steve [Stephen B.] Thacker. I don't know if you—

Q: Yeah, our famous library, right? At CDC.

Jernigan: [laughs] Yeah. Or our famous epidemiologist.

Q: Sure! [laughs]

Jernigan: Yeah, he came and gave a talk about EIS [Epidemic Intelligence Service], and CDC, and that was my first year of med school. My chief resident when I was doing my internal medicine rotation was Brad [Bradley A.] Perkins, who also was here. And then there were other folks there too, Wayne [X.] Shandera. I don't know if you know him, but he's in the book *And the Band Played On* with Harold [W.] Jaffe and others. Those guys were all around, including Herbert [L.] DuPont, who's former EIS, and all of them spoke glowingly of CDC. I did an elective as a student here in the respiratory diseases group, and then went on to internal medicine residency, and then after that, came to CDC, and then was EIS in the respiratory diseases group.

Q: I'm just taking a few notes. Do you remember what drew you to respiratory disease?

Jernigan: I was assigned to that group, the EIS medical student elective group. I knew that the infectious disease part was the most interesting part of CDC from my perspective. That group is one that has a lot of outbreaks, and so it was a good group to be a part of. Having worked there, and then subsequently doing some studies on *Legionella* in residency, it was a sort of no-brainer to come back and work with that group. Which was fun. That was mostly Legionnaires' disease, Group A strep [*Streptococcus*], multidrug-resistant *Streptococcus pneumoniae*, and other atypical pathogens, things like that.

Q: I've talked to a lot of people who went through medical school and took several years before finding the public health route was up their alley, but you were interested in maybe getting an MPH even before you went to med school.

Jernigan: Yeah.

Q: Where did that interest generate?

Jernigan: Not completely sure. The fun thing about infectious disease/public health is it touches on every aspect of everything, right? There's anthropology, there's human/animal aspects to it, there's politics, there's money. There's all these things that have to come together. There's multiple factors that come together that sometimes cause disease, and to mitigate the disease, it does require, again, a whole bunch of different factors to be addressed. It's very interesting stuff. At the time, there wasn't a global

health thing. There was no global health major or anything like that. In retrospect, if that was available, I probably might have done that. But who knows.

Q: You were interested in the international aspect, too?

Jernigan: Yeah, that, and just in the public health aspect of things.

Q: While you were getting your MPH, were you already focusing on—were you writing a thesis about respiratory diseases?

Jernigan: At the time, I actually had almost done my MPH thesis with [William Paul] Glezen and some other folks that do influenza at Baylor. There's a couple guys there that have been doing it forever. I actually met with them to talk about doing a thesis with them, but the timing didn't work out for that. I ended up working with a guy named Randall Reeves [former EIS Officer and University of Texas researcher] on daycare centers as a risk factor for antimicrobial-resistant *E. coli*. It was fun. It was the worst case control study that's ever been done. [laughs] But it served to allow me to fulfill my master's thesis.

Q: You got your MPH in what year, do you remember?

Jernigan: It was a combined MD/MPH—

Q: MD/MPH.

Jernigan: —in 1991.

Q: In '91, okay. And then you're class of, like, '94 EIS, right? So that's—

Jernigan: Yes, that's when I came—so I finished internal medicine residency and then came—

Q: And then came here, right. Any particular memories from internal medicine residency that stand out to you when you think back?

Jernigan: [laughs] Yeah, I really liked the diagnosis. I really did not like the management of medical illnesses. That's what's great about working here, is it's all the figuring it out part. The mitigation of it is often through prevention or other measures, which is different than a day-to-day physician's work of tweaking medicines and monitoring diabetes and things like that. I enjoyed the diagnostic side of things much better.

Q: What were some of the outbreaks or the assignments that, when you look back at EIS, really stand out to you?

Jernigan: There are a number of them. I arrived in July of 1994, if I'm remembering this correctly. The way that this works is EIS officers come, and they all sit in a class together

for a month. You learn different things. If you get pulled out of the class to do an outbreak, that's the cool thing. [laughs] Or, it's perceived—you know, it's fun. Because everyone else is just sitting in the classroom. You came to CDC to do outbreaks or whatever, and you're learning about regression, [a statistical analysis method]. Anyway, during that course, there was an outbreak of Legionnaires' disease. And they actually spoke with my officemate, Pekka Nuorti [former EIS Officer now at University of Tampere, Finland], to see if he would do that outbreak, and I think he was not able to for whatever reason, and so then they asked me to go out and that was fun.

Basically, we heard about it on a Friday morning, and then that evening, I was on the plane with Jo Hoffman [former EIS Officer] who was the second-year EIS officer, flew up. We were met by the quarantine staff in New York City, stayed the night, and overnight had actually faxed out—or not faxed out, we maritime satellite-faxed, or whatever you call that thing [laughs]—a questionnaire to a cruise ship, on which we presumed it was transmission of Legionnaires' disease.

The cruise ship arrived in the morning. We met the cruise ship, and it just was starting to get to be such a deal that Rob [Robert F.] Breiman, who was the supervisor of the group I was joining, ended up flying up as well. We essentially met the boat, talked to the staff that runs the boat, and began an investigation. But while we're there, we made everyone coming off the boat have a piece of paper that said, you may have been exposed to Legionnaires' disease [laughs] if you get sick. That was enough to start freaking everyone out. After that, the people that were intending to get on this ship for its next cruise were

all waiting on the dock. I don't know if you know who goes on cruises, but Rob [Robert V.] Tauxe in [the Division of] Foodborne, [Waterborne, and Environmental Diseases] has said that cruises are populated with the newlywed, the overfed, and the nearly dead.

[laughter] So those, which is an unfortunate characterization of that group, but there were a number of older individuals that were out in the sun, that were starting to have heat problems and chest pain and whatever. It was becoming quite a mess, and ABC News and all the others were there. We ended up actually having everyone that came on sign things saying that, I understand that if I get on this boat, I may get Legionnaires' disease, etcetera.

They got on, and then Rob, our supervisor, said, "You guys should just stay on the boat and go to Bermuda." So we stayed on the boat, and while we were on the boat, continued to do our investigation, collected water and all this stuff, and ended up collecting sand from a sand filter that filtered the whirlpool spas on the boat, and that sand was the only place where we were able to grow the *Legionella* bacteria from. The only reason we got that sand was because Rob continued to tell us, "You've got to get that sand." We had to open up this room-sized filter in order to get it.

Anyway, that turned out to be the sort of smoking gun for the outbreak. We were able then to connect some deaths that had happened, for which we had bacteria, with that one, and a number of ICU [intensive care unit] admissions, and sixty or eighty cases. We were able to find out that the circulation of water for whirlpool spas is separate from the rest of the water supply, and if you take on contaminated water, you're never going to reach a

level of disinfectant that will ever kill it. This sand filter became an accelerator of *Legionella* growth and transmission. We actually showed it—the proximity around the whirlpool spa, the more time you spent within a certain diameter of that whirlpool spa, the more likely you were to get disease. Anyway, that was my first outbreak.

Q: That is one of the coolest EIS stories I've ever heard. [laughter] It's really cool. Did it lead to changes that—

Jernigan: Yeah. Previously, there was all the diarrheal disease monitoring and mitigation associated with cruise ships. But for respiratory disease, there was nothing. Following that, it instituted respiratory disease monitoring, and then if you have a cluster of whatever, you have to notify—there was some associated connections between flu and cruise ships, especially in Hawaii and in Alaska. Those two things, plus the Legionnaires' thing, prompted the Vessel Sanitation Program at CDC to rethink things. And then CLIA, I think it's called, Cruise Lines International Association, that group we worked with very closely, a number of different people. So yeah, it led to some changes in policies and surveillance and awareness, and testing, too. Urine antigen really became a more commonly used diagnostic as well.

Q: Okay. That's really neat. [laughs] So, '96, you—I don't know what you say, you “graduate” EIS, or you—

Jernigan: Yeah, you—I guess, you finish? [laughs]

Q: You finish EIS, finish your term. What happens then?

Jernigan: After that then, my wife, who at the time was a pediatrician, the agreement was we would sort of swap training. [laughs] I finished EIS and she then applied for her pediatric nephrology—a kidney disease—fellowship. We then moved to Seattle, and CDC through Bob [Robert W.] Pinner were very kind in keeping me on staff. I worked in emerging infections and novel technologies, and other basic kind of surveillance issues, based out of the Washington State Department of Health for two years—three years, rather, while she finished her pediatric nephrology fellowship. Then, in 1999, we returned to Atlanta.

Q: What did you come back to?

Jernigan: I came back working in the Office of Surveillance, which was Bob Pinner's office. Working on emerging infectious disease surveillance, and surveillance improvements, new technologies for surveillance, for several years. Then in 2001, I took over the epidemiology section in the—what used to be called the Hospital Infections Program, which turned its name to the Division of Healthcare Quality Promotion. I was there from 2000—I think it was 2001 till 2006 or '07, and then at that point, moved over to influenza as a deputy director for the Influenza Division.

Q: What was it like climbing the ranks of the administration?

Jernigan: I don't know. There's so many opportunities at CDC that people do move around. In academic places, I think you tend to be more single-issue focused, and you sort of move up through that space. You change locations as you move on. CDC is a wonderful place in that you can move between topic areas but stay geographically in the same space. I think it's good to have a variety of experiences, too.

Q: No doubt. So through 2007, you said it was the—I guess what it's called now, DGH, Division of Healthcare—

Jernigan: DHQP [Division of Healthcare Quality Promotion].

Q: DHQP, excuse me. Acronyms.

Jernigan: Yeah.

Q: Do you remember any specific work that you did there that kind of stands out in your memory?

Jernigan: There was a lot. There were two main things that came up. One was the emergence of—at the time it was called community-associated methicillin-resistant *Staphylococcus aureus*, or CA-MRSA. It was an unusual appearance of a toxin-producing *Staphylococcus* that just became very prevalent, causing boils and skin

infections. We had football teams, wrestlers, schools, athletic facilities. Any place where skin-to-skin contact can happen, people were transmitting. Families, all kinds of stuff. It was quite a mess. It really emerged very quickly to the point where emergency departments were noting this enormous increase in awful boils. They initially were calling it “spider bite boils” because people were saying, “I got bit by a spider,” because you got a little bit of necrosis in it. So we described that. We ended up doing a *New England Journal [of Medicine]* piece on transmission of these MRSA skin infections among the St. Louis Rams and the San Francisco 49ers. Am I doing that right? Yeah. [laughs] Those two teams. There’s a wonderful drawing of the field in the paper where we actually marked with Xs and Os the people that had the different skin infections, and which one gave it to each other through tackling and contact and stuff.

Q: That’s amazing, actually like in-game contact leading to transmission. Wow!

Jernigan: Yeah, so that was fun. Because there was also this concern that the turf was the source. We went to the [National Football League Scouting] Combine in Indianapolis and met with the turf manufacturers. But we actually went down with sterile wipes and strategically wiped down the field after one of the games. You could find where most tackles occur. There’s actually just a few places where most of the tackles occur. We actually swabbed the turf, did not find anything. I think the turf wasn’t the source of infection, but it was the source of the abrasion which then allowed for people to get the MRSA.

Q: It makes sense once you think about it, okay. [laughs] So after '07, what did you say?

Jernigan: Joined the Influenza Division.

Q: Yeah, joined the Influenza Division, right. So, you must have had an interesting 2009.

Jernigan: Yeah, yeah. [laughter] I came in in 2007, and it was just as the Secretary of Health [and Human Services] was really pushing for a pandemic plan. He had just read *The Great Influenza* by—I cannot remember the author's name right now [note: John M. Barry]. But it was a book, and the president had also read it. That led to a real focus on pan [pandemic] flu, and then in 2004, the emergence of highly-pathogenic avian influenza H5 in China and other Asian countries, really demonstrated the need to have a plan and to have a prepared response system. Our division went from sixty-five FTEs [full-time equivalent employees] to about 170 FTEs now, a total of around 320 people, both contractors and FTEs. So it grew in size and scope. A fairly large international program now, and so forth. Then that was in place. When 2009 hit, people kind of knew what to do. [laughs] Which was really good. Everybody already knew what their roles were. We had exercised, and the laboratory system was already functioning, the diagnostics were already in place. Things were much better than they would have been had we not had a couple of years to prepare.

Q: No doubt. Okay, and just so, the next five years or so leading up to Ebola. You continued in the Influenza Division. Any particular memories that come to the surface there for you?

Jernigan: I worked very closely with the director, who's—Nancy [J.] Cox, who was thirty-five years working here, was essentially an international influenza diplomat. Lots of knowledge and experience. Federal employee of the year. It's a wonderful relationship to learn and grow. We were able to work on building a division, which you don't get to do that very often, so it was fun.

Q: Looking back, are there a few other people you'd point to as mentors, or having a specific influence on you that was important?

Jernigan: Yeah, I mentioned Bob Pinner before who was instrumental in me and Oliver [W. Morgan]. Actually, I don't know if Oliver mentioned him or not. And others. He played a really good role of identifying a number of folks that he wants to see move into positions later and investing in them. I think he did that. Nancy, I mentioned. Anne Schuchat, I spent a number of years many steps below her. But she's an incredible person to work with as well.

Q: I'm going to take a short break on this thing, and we'll come back.

[break]

Q: We're back after a short break. Sam Robson with Dr. Dan Jernigan. Dr. Jernigan, do you remember what you were working on right before getting involved in the Ebola response?

Jernigan: Hmm. [laughs] I mean, I was doing my job in influenza. The thing was happening, and we were participating through the division by providing staff, by other kinds of supports and diagnostic supports, some other different things. Because of the way our division is structured, and the kinds of things that we've done in the past, and because of 2009, when there are things that happened, a lot of times we'll get asked to help out with different things because we have people that have gone through a lot and know what to do. So we provided folks. But this, the Ebola one is very different than anything that I'd ever worked on, or that anyone else I think here had. But—

Q: In what ways?

Jernigan: It's just bigger. The scope is much larger. The access to infrastructure within the country where the problem is, it just wasn't there. We didn't have a country office. There were just a number of factors, and the scope of what we were trying to do from a domestic and an international side was just very large. There are federal agencies that do large responses, like USAID [United States Agency for International Development] and others, that are structured to do that, and it's largely through providing resources to others, partners, etcetera, who then do the work. For us, the work that needed to get done

was public health activity, which is Ministry of Health type work, and there wasn't anyone from our standpoint that we could easily bring in to do that. We ended up doing a lot of the operational side of things. Historically, we're a technical group. Our interventions are guidance, usually. But here, because of the situation, the scope, the severity, all of that required us to be not only the technical part, but also the operational—the active side of things, which is often done by others that we provide guidance to.

Q: No doubt. Are you referring to CDC as a whole, or to the Influenza—

Jernigan: Yeah, no, CDC as a whole.

Q: CDC as a whole?

Jernigan: Yes.

Q: Were you involved in some of those conversations early on about—

Jernigan: Early on, I think we did get asked—God, I forgot about that—when they did stand up the EOC [Emergency Operations Center], we did get contacted. We provided some input, and others from the Influenza Coordination Unit that had been deeply engaged with 2009, Toby [William T.] Crafton and some others, Steve [Stephen C.] Redd, were asked about structure and things like that. But after that initial engagement, I did not get involved, in part because the NCEZID [National Center for Emerging and

Zoonotic Infectious Diseases] is the one that's in charge of the thing, and so it's best for them to take on that leadership role. Also, I think my sense was I was prepared to help whenever the real need occurred. Because a lot of people show up early, and then they all do their time, and then you've got a big outbreak that you still need to do, and there's a need for folks throughout that outbreak response.

Q: What's the next big step on your road to getting deeply involved in the Ebola epidemic?

Jernigan: I talked several times with Barb [Barbara J.] Marston, who's a saint. Who really is responsible for the fact that we finally got—or are very near zero in West Africa. But had talked with her about assisting. That's where I thought, when do you need people the most? And it really came around the holidays. For that reason, I said, just let me know wherever you want me to go. That's where she assigned me to Sierra Leone. It was a nice time because people needed a break. Nobody else wanted to be deployed during that period. A lot of people had helped us during 2009, so we needed to help out as well. I did that period of time, from middle December to middle of January.

Q: Yeah, did—[pauses] What's the question I want to ask you? [laughter] It's—what was it like preparing to enter the country? You were entering as country director?

Jernigan: Yeah, it was listed as “response team lead.” That's in part because of the structure of how they set up the responses. There was a DART [Disaster Assistance

Response Team] team lead, which was supposed to be coordinating across USAID and CDC, because I think technically we were there as a part of a DART response. There was an Ebola response team lead, and then this sort of country director DART-y kind of person. Since Oliver had really started to be there as a permanent fixture in Sierra Leone, we rearranged that, so he assigned me as his principal deputy. Most of my focus was on where most of the cases were, which was in the Western Area, which is Freetown area.

Q: I'm wondering if you can take me through that month, about a month, more or less chronologically. What happens once you arrive?

Jernigan: I arrived in the middle of December. Some issues that came up pretty quickly were that the turnover of staff was a real issue. The fact that Oliver and eventually Sarah and others were able to be there, Sarah [D.] Bennett, especially, Sara Hersey, that was critical because the turnover itself was necessary. Because people can't just leave their regular jobs that they're paid to do, and for which the taxpayers are expecting work to be done, and simply spend a year somewhere. Some people were able to end up doing that, but the turnover itself was necessary because of the availability of staff. But that turnover, there were times when the handoff just could not account for all of the different issues. So there's a little bit of a credibility issue from the Ministry of Health staff and from WHO [World Health Organization] and others who were there for the duration, with us continuing to turn over. But many different groups had the same need.

Anyway, that's one thing. We did set up some better ways to have handoff and orientation, and things like that, which was good. The other thing you see immediately is the structure of the response, which largely followed the pillars or other—these things that got stood up by UN [United Nations], in order to try and respond. Our own emergency operations center in the Radisson Blu [Mammy Yoko] Hotel, which Oliver I'm sure talked about, was structured in the same way. Understanding those structures before going over helped out a lot. But for a number of folks, it was the first time they'd ever done a response, and it may have been a new thing for them.

Q: I'm interested, do you recall some of the ways in which you were able to improve the transitions between deployments and handoffs, etcetera?

Jernigan: Yeah. People would come in, we'd have a meeting where they all would meet. We ended up having a PowerPoint presentation that turned out to be a good thing because you could hand that PowerPoint off to other people. There were deployment support staff that were there that began to take on that role too, which was good. The thing is, the numbers of people that had been needed were rapidly coming up, and so there were times when people were arriving and you weren't quite sure which position they were expected to fill, and the positions that were needed when the request went in probably are not necessarily what's needed at that point. We would communicate to everyone coming in that flexibility is your number one trait right now, and I think people got that. What you want are people that you can put in a direction and give them some instructions about how to be safe and how to be appropriate, and what the objectives for the work is, and

then hope that your motivated individual will then find the problems that need to be solved and solve them. That's what ended up happening a lot, which is a different approach than, say, the Department of Defense or others might achieve a mission.

Q: I'm wondering how your own transition goes. I suppose, you're not really filling a position, am I correct, that had someone previous—there wasn't an Ebola response lead there before?

Jernigan: There was an Ebola response lead, yes.

Q: There was, okay.

Jernigan: I think it was Ermias [D.] Belay. But I think mine was the last where the title was used. It just reflected a growing, maturing country office. And also, I think, it was important for a single, long-term CDC staff person who then interfaced at the higher levels with the UN [United Nations] and WHO leadership and the country leadership.

Q: What was it like meeting those folks?

Jernigan: Those other—

Q: The partners?

Jernigan: Oh. Some of them, I had actually worked with in the past. I had done a month in Taiwan in 2003 for SARS, and so it's funny how many people that were with me there were also in Freetown. Then others that I had worked with on flu in WHO that were based in Geneva were now based in Freetown, so that was good. The other thing too, the complication with the country at the time was that the Ministry of Health had initially been in the lead for the response in Sierra Leone, but was replaced by the department of defense, the Sierra Leone [Ministry of] Defence [and National Security]. It was an unusual situation where you did have a fairly rigid and more structured response with folks in military suits, both from the Sierra Leone military as well as the UK [United Kingdom] military. Oliver probably talked some about that. But that was a complicated situation where the group that needed to be most empowered to respond were somewhat marginalized, the Ministry of Health folks. I think part of the time of us there was helping to support the Ministry to move back into that space where they needed to be in order for this thing to be handed off at some point to them. That was, I think, largely Oliver, Saras' [Hersey and Bennett] role that they played over the several next months.

That was interesting. There's a lot of interesting overtones with the NERC. Did Oliver talk about the National Ebola Response Center?

Q: He didn't.

Jernigan: Okay. It was stood up in the facilities where they had done the courts for the war crimes.

Q: Oh sure, tribunal?

Jernigan: Yeah. The UN essentially set up all the different structures for the response in that setting, so there were a lot of interesting overtones that were constant in terms of the military, the tribunal court, all of these things that made for a very complicated kind of response, because in the middle of all that, you're trying to stop Ebola. That was mostly where the engagement—your question was about engaging with those leadership folks. There was the national and UN engagement that would occur at the National Ebola Response Center, and then each district would have their own Ebola response center, which was essentially an EOC, and then there would be iterations of WHO and the UK and other folks at each of those different district sites.

Q: When you think about the first, say, week or two weeks that you're there, what memories really stand out to you, or what conversations maybe?

Jernigan: In the first two weeks?

Q: Yeah, in the first two weeks.

Jernigan: I think the main thing was just trying to get a handle on what actually was happening, where are the pain points, and how could you fix them. My main focus really

became the Western Area. Prior to me being there, Desmond [E.] Williams—I don't know if you have him on your schedule or not.

Q: I do, absolutely.

Jernigan: He was instrumental in working with the Ministry of Health, James Bangura and Charles Keimbe. James had been in Kenema, which was the city that first exploded after the Guéckédou cases moved down into Sierra Leone in 2014. Am I getting this right?

Q: Right.

Jernigan: He's a Ministry of Health person, but he had been there the whole time. Desmond had really helped empower him and Charles Keimbe to put together a Western plan. My role was really taking over for Desmond and working with those folks in the Western Area Ebola Response Center, which was actually in the old British consulate, which is another—[laughs] more overtones. But nonetheless, that Ebola response center then became the nidus. The entire response was essentially iterated in tables. You'd have a table for quarantine, table for safe burials, table for laboratory, table for clinical management, table for case detection. All of that was being stood up, and trying to respond to this enormous number of cases that were happening every day. We took that structure and literally drew it in PowerPoint, and then tried to identify what actually was the flow of information, patients, specimens, etcetera, and then identify what are the

metrics that we can look at to see if that machine is actually working correctly, and if we see that there are gaps or slow points, how do you improve that?

We had UNHAS, the UN Humanitarian [Air] Service, I think it's called, which is helicopters that the Russians would fly. They would fly around the country, picking up specimens and then dropping them off for testing in Bo. In Western Area, I think we had up to thirteen different laboratories. We set up systems for picking up specimens and shuttling them from the Ebola treatment units where they were collected to the laboratories where they were tested. We mapped that all out, identified the path by which a person in the community would be identified by a community monitor. The community monitors, there were two thousand of them, and they became a way of supporting the community which was out of work with a paid job to help find Ebola cases and to support the little jurisdictions with case detection. The community monitors would find them. They had a cell phone, they'd call the call center that would then prompt a district rep [representative]. These were out-of-work med students, so we were able to take those guys that were no longer able to go to school and put them to work as well, and they're clinicians. They would then go assess the patient, determine that they were a suspect case, fill out case report forms, and then manage them to getting to either a holding unit where they would get tested or an Ebola treatment unit, usually by calling an ambulance. CDC had purchased—Jesus, I don't know, forty? I don't remember how many ambulances total. I don't focus that much. Certainly that many motorcycles. We would provide motorcycles, cell phones. We would get the ambulances, all that stuff.

They would get to the holding unit, or the treatment unit; get their blood drawn; and then they'd have to wait there until the blood test would come back. The blood would then go by courier to a lab [laboratory]. The lab result would be called into the clinical team, and if it was positive, we would then figure out what treatment unit do they need to go to where we had beds. The people that were exposed to that case had to be registered, so we would have a team do that with contact tracing, and then they would be put in quarantine. For each family, we would provide oil, fish, rice, and some other stuff so that they could stay at home. And then the military and others would monitor them to make sure that they were staying in quarantine. So that's an enormous enterprise.

We, working with Andy [Garrow], who was the sort of incident manager from the UK's DoD [Department of Defense] side, and somebody from King's College, we were able to put together a set of metrics. We would monitor how many functional beds were available, how many had people in them. How many specimens were coming through, what was the turnaround time for each of those specimens to be tested. What was the positivity, how many dead people were positive. There were multiple different places where you could capture existing information and use that to determine whether or not you were being most efficient. Because you're trying to stop the thing, and so you need a system that is as efficient and robust as it could possibly be.

We did that, and we focused a lot on contact tracing because if you don't do appropriate contact tracing, if you don't keep the numbers of generations of illness down to one or two generations, you'll never get out in front of it. That was the main thing where we

tried to do the most improvement, and that was in laboratory specimen turnaround and in contact tracing improvement. That's the hardest one to do because you'd have people that probably weren't that well-trained having to go out and collect information from people that did not want to be found. [laughs] That made for a complicated situation.

Q: Some of this system already exists by the time you arrive, I assume?

Jernigan: Yes.

Q: Are you focusing on building it then in the Western Area, or also looking at the entire country?

Jernigan: We were looking at the entire country, especially for the specimen management piece and for achieving increased numbers of available treatment units. The vast majority of people in Sierra Leone and the majority of cases at that time were in Western Area. Our national focus was Western Area. It's on the coast where most of the people for the country live. Focusing on that space was a national effort. But yeah, the Ebola response center was already set up. There wasn't a concerted effort to try and evaluate it as a system, because you had different UN agencies that were responsible for each one of those different pillars. World Food Programme doing the quarantine, and WHO doing the clinical management. Getting the coordination sometimes was not that easy. That's why we instituted small groups and things where it was just easier to communicate with each other. But then also, really trying to see, can we monitor this like you might monitor a

campaign, by monitoring the different components, not just how many cases were going down, but all of the process measures? I think that's a good way to address a complex, you know, uncertain environment, by trying to break down each one of the different pieces into solvable bits. [laughs] And also identifying individuals whose responsibility it was to fix those problems. Otherwise, everyone's just running around, putting out whatever the most recent fire is.

Q: Right. Who are some of the most important—I know you've already mentioned them, but can you, again, some of the most important people that you were working with and looking at this system-wide perspective of how to—was it James Bangura and Charles Keimbe and—

Jernigan: Yes, definitely James and Charles. And then Desmond, who was instrumental in setting up a thing we called the Western Area Surge, or WAS, which is the same word as “wash” in creole. [laughter] They came up with great things. Which brings up another point, and that is that all of this stuff couldn't happen unless you had what was called “social mobilization.” That's a concept that I had not had to use previously because the outbreaks that I had done in the past, they're kind of obvious. [laughs] If it's a foodborne thing, stop the food, or whatever. This one, you had a population that were suspicious of the government and of the interventions that were happening. You had to address that full-on with communications, engagement, key opinion leaders, imams. Everything you can think of had to be mustered together, and so they came up with these “message of the week” things, or “big idea of the week,” I can't remember the—big idea—

Q: Big idea of the week, I think, yeah.

Jernigan: —that, rather than say, “Hey, let’s build some communication messages,” and then that’s what we use for the response, they recognize that people quit looking at things. If you change it each week and coordinate it across posters, videos, YouTube, TV, broadcast, radio, whatever, and push that even down to the community monitors and others, then you have a coordinated weekly message to pregnant women, or to the elderly, or to kids, focused on soccer or whatever. Those were critical, I think, for making sure that people were constantly being reminded of the potential for infection and what to do if you got sick, but also such that if you did get sick, if you heard a survivor on TV or whatever, you’re more likely to do something than not. Because if a survivor said, “I’m fine, it was okay, they didn’t poison me with the food,” which there was so many rumors going around. Social mobilization was key. Desmond, I think, was very important for that.

We’ve mentioned Charles, James, Desmond, and Oliver, of course. Sarah Bennett was critical from the clinical side of things. There were a number of people that had done incredible things. There were those that were working on the Ebola treatment unit side of things from King’s College that were actually quite helpful in Western Area. And then, the UK military actually, and the UK international development group, DfID [Department for International Development], they were very helpful. And of course, USAID. I’ve worked with USAID in certain roles, but this one, it was the first time I’d

ever seen the breadth of what they can do and the ease from which they can do certain business functions that really made it happen.

The last major force that was absolutely critical was the CDC Foundation. If they had not been there, we just could not have done all that we did. And that's through the generous donations of a few prominent donors.

Q: Was the WHO also part of the conversations?

Jernigan: Oh yeah, yeah. [laughs] Yes, of course.

Q: And I'm wondering, other nations like China and Cuba that pitched in, are they taking the lead from you guys after you figure the system out, or are they in the conversations—

Jernigan: It depended, based on the scope of work. If the work was surveillance, contact tracing, and all that stuff, CDC, that was our thing. If it was the clinical management side, that was WHO's thing, even though they weren't providing the clinical care, but they were the group that facilitated the partners to do that. But we would work very closely with WHO, either in the districts or in Western Area, Freetown. Yeah, we were there together, through the whole thing. They also did have people that were rotating through, somewhat similar to us, and so some of the same issues there. But yeah, from the coordination of the in-field work, a lot of that, I think, was CDC-driven, and WHO-supported.

Q: Thank you, that's exactly what I was looking for.

[break]

Jernigan: By the middle of January, I think we were through with the first wave of the Western Area Surge, and we were able to show that the numbers of beds increased.

Q: That's what I wanted to ask.

Jernigan: The turnaround times decreased. I think it was really good. We were able to, through CDC Foundation, bring in administrative support people. Poor James and Charles were having to manage the staff and the lists and the payments, and all these things that epidemiologists shouldn't have to do. But there was no one else to help them, and so I think we recognized that, so we got them office furniture and [laughs] just things to make their lives easier, but also to make the thing function better. That was good to see, by the time that I left, that it felt like things were more efficient and more supported. You could feel like things were getting better because the numbers of cases were really starting to go down.

Q: No doubt. Those metrics that you start tracking start to come in really handy when you're able to actually see change.

Jernigan: Yeah, yeah. I think it was a critical thing, if you're going to have a big campaign that had all the different components, that you have something to measure those. Desmond was actually critical in helping to identify what those things would look like, and then have those be the means by which you knew whether or not you have been successful.

Q: Right, absolutely. Any memories that come to mind about your time in January, latter half of your deployment in Sierra Leone?

Jernigan: Not that really jump out. [laughs]

Q: No, that's okay. I'm asking about personal things, like, I remember seeing this guy, and talking to this guy.

Jernigan: Oh. [laughs] Yeah, we did do a lot of visits to the Ebola treatment units, and it was incredible to see the staff that were working very hard and often not being paid, just because of the bureaucracies and the difficulties and the timing and so forth. In that sense, there were a number of stellar folks that were saints for the kind of work that they continued to do. There were a number of situations that were not perfect in terms of pregnant women who were Ebola-positive, known to be Ebola-positive, and not able to get to any facility where they could get appropriate delivery—end up with awful situations where the mother would die, the newborn would die, and there was just no way to fix that. That's why trying to get better testing, earlier, etcetera, was critical, and

having specific facilities for maternity and things like that. But yeah, there were a number of awful situations.

Q: Middle of January, you come back to Atlanta. How was adjusting back?

Jernigan: It wasn't that hard, I don't think. [laughs] My wife was ready for me to be back. I came back and did a little bit of transition, working still with the EOC, trying to finish off things and hand off things, and then went back to my real job. At that time, the former director, Nancy Cox, had retired. I had applied for the director position, and so eventually got that in April—or actually March, can't even remember now. Unfortunately, or fortunately, however you want to say it, I was asked to assist with the incident management piece. I had taken the position as the director but then immediately left for five months [laughs] to work in the EOC. It was good having been in Sierra Leone, and then subsequently in Guinea. I think it was really helpful to have that experience in order to inform the incident management role.

For the 2009 H1N1 response, I was epi [epidemiology] and lab task force lead, and Steve Redd was the incident manager. There were a lot of the same kind of issues that were happening then that I was able to call on for the Ebola response. It was complicated. A lot of domestic issues, a lot of international issues, a lot of tracking of travelers. It had a lot of effort from a number of people that needed to be expended.

Q: You were in Guinea?

Jernigan: I went with Dr. [Thomas R.] Frieden and Inger [K. Damon] to—

Q: Oh, so it was in March, is that right?

Jernigan: Yeah, so I had agreed to be the incident manager and then went with Dr. Frieden and Inger Damon and a couple of other people. That's where I got to meet folks like Ben [Benjamin A.] Dahl and others, who are just stellar folks working in Guinea, Pierre Rollin and others. That was a different situation than Sierra Leone, managed different, had more of a WHO lead there than in Sierra Leone. But many of the same issues of diagnostics needing to be sped up, of people needing to be moved faster, all of those things. But the character of the outbreak was different. It started in Guéckédou, which was on one side of Guinea, and when I went to Conakry and regions around Conakry, it was mostly down in Conakry, similar to how Freetown had a lot of transmission. A lot of the same issues, but there you had language differences as well, which we didn't have to worry about in Sierra Leone or Liberia.

Q: I think you already started on this list of things that you're working on immediately once you take the incident manager position. Some of it's the travel, looking at that. Can you describe more about what you focused on the first, say, month of your job?

Jernigan: For the incident manager role?

Q: For the incident manager role.

Jernigan: The main thing is trying to identify, what are the priority activities that need to be done? What are the things that need to be planned for that need to have a formal plan? [laughs] Or where can things go wrong that you can prevent by identifying that, and assigning someone to prepare for it? There are the needs for maintaining the deployment, which is huge. And then there's the overall goals that you're trying to have.

For us, the priority issues were characterizing sexual transmission of Ebola and setting in motion studies to verify that, and to get the information that would be most useful for policy development around prevention. It was a concern that it might be happening, but it became pretty clear that that was a real component. A lot of effort was spent on that.

Others were trying to keep the engagement with WHO happening so that there was good dialogue between what they were doing from their response side and what we were doing, and then working with the director, because the director really was deeply engaged. Of the people that had long-term memory for the response, Dr. Frieden has the longest memory, and really was critically involved in many of the decisions and issues that were having to be addressed.

Q: Can you tell me more about looking at the sexual transmission and learning that that's a real possibility?

Jernigan: When you think about trying to prevent a large outbreak where the transmission is occurring through contact—you know, contaminated surfaces, individuals, that kind of thing, you have in your head a certain way that you can prevent that. When you throw in this additional type of transmission, it really changes what you think about because even in a situation where Ebola was—there were no Ebola cases, in that situation, you had individuals that had the potential to re-ignite the outbreak. The question was, how long did they have the capability? How efficient is that form of transmission? How often is it occurring? That kind of thing, and so having things like genomic sequencing in place really helped characterize that.

I think in retrospect, I probably should have had a little more push to have better genomic sequencing occurring in-country. Once you start talking about sexual transmission, then it really becomes important to know, if I have a case that suddenly appears in a region that hasn't had cases, if I look at that Ebola virus, what virus does it match from the past? What you were finding is that, in the most recent cases, even fourteen months after that person was infected, they have the ability to cause another case. It changes the messages, it changes the dynamics. The actual role of sexual transmission probably is most important at the tail end of the outbreak. Whether it's important or not in the earlier parts, I don't know—it's hard to know. But certainly, when you're really trying to stop it, that's the one piece that you have to also account for. That's one thing that we did have to change in our response.

Q: Which cases, and where were they, that really brought this to the fore?

Jernigan: There was a cluster in Liberia, and that's the one that was most—it really made it clear. There still was some uncertainty around some of it, but it became likely.

Throwing into it also the US survivors—Tim [Timothy M. Uyeki] may have talked about them, of the persistence of Ebola virus in Ian Crozier's eye, that says that immunologically-protected areas could harbor the virus. That, in addition to the sequencing result and other information, really pointed it out. It helped explain things that had not been explained, or were not understood previously, so it probably was happening periodically throughout the outbreak. But luckily, near the end, the vast majority of the men were many, many months after their infection, and so the potential for them to cause another outbreak was dwindling over time.

Q: Were you at all involved in helping set up the Men's Health Screening Program for looking at viral persistence in Liberia?

Jernigan: Personally, no. But it happened while I was in the incident management role. Desmond ended up taking the position as the country director in Liberia, and so he was involved in that, and others were involved in that. Again, it just represents the complexity of the outbreak, but also the expanded role that CDC had in that not only were we providing technical guidance, and not only providing the operational logistics and all that other stuff that was needed, there was the support for the long-term sequelae of the infections. We were also trying to make sure that that was in place as well.

Q: Looking back over your five-month tenure as incident manager, what are some of the other events that you could stick a little flagpole in, like this was an important time, this was a turning point, perhaps?

Jernigan: There were issues that we had to deal with, certainly. One was in characterizing the boundaries, or the role of screening of travelers. That was an issue where we needed to balance the need for individuals to travel from the affected countries with the potential that cases could occur in the United States. That interplay of those two risks required a lot of discussion and time and planning and so forth. That was a major effort that I think we worked through, and by figuring out that path, we were able then to say, Liberia can now be turned off. Here's the criteria at which the federal government is comfortable with the risks that are posed by individuals coming from that region.

The country had never had to deal with anything quite like this, where a person could bring over a highly fatal illness to the US. It required us to have responses that we simply had not had previously. I think the lasting lesson from Ebola is going to be on having plans in place for how we handle those kinds of situations for the next outbreak—that some pathogens will require that kind of thing, other pathogens will not. You need to have a flexible, proportionate response to the risk of the pathogen. Entering into whatever the next new emerging thing is with the understanding that the transmission dynamics and the severity of the illness need to help us determine what the proportionate kinds of control measures would be.

Q: I remember when I was talking with Dr. Frieden, and also, maybe Inger brought this up a little bit, that dismantling or winding down the system for—monitoring and movement guidance, the traveler, was harder in some ways and longer and drawn out compared to when it was set up. Did you—

Jernigan: You mean, that the way it was eventually implemented in its stepdown was a more lengthy process than was anticipated when it was stood up, yeah. Yes, you're correct.

Q: I'm correct on that? Okay, gotcha. Do you have any thoughts about that, or any memories about that?

Jernigan: No, it just required CDC to be very explicit at what we were expecting to have happen, what we thought the risks were, and how we would coordinate the multiple different partners that were responsible from the state health departments, Department of Homeland Security, Customs and Border Protection, CDC quarantine stations, airline companies. It all had to be structured and acceptable to the White House.

Q: Looking back, any other important moments that you'd like to share about when you were incident manager?

Jernigan: There were a number of folks that were there for months and months, Barb Marston in particular, that—they were unflappable, just anchors. There were a number of

those folks, including folks in the Division of Global Migration and Quarantine, who had been dealing with this issue of all the different issues for months and months. There was a huge amount of knowledge in those individuals. The persistence and the resilience for those folks was just—it's incredible. I was not there for the first part, which I think was a much more complicated, even more complicated period. There are a number of folks that were there for that part, and continue doing their duty, and if those folks had not had that drive and loyalty, this would never have happened.

Q: When did you step down as incident manager?

Jernigan: I was kind of a—[laughs] yeah, August sometime.

Q: August sometime, gotcha. And straight back into—actually, probably your new role as—

Jernigan: As director, yeah, yeah. I've been doing that role since, and it's an opportunity to get back to the critical priorities for our division with vaccine virus selection and things like that.

Q: Right, okay. Any other thing that you'd like to make sure that we have on the historical record regarding Ebola?

Jernigan: [laughs] I don't think so.

Q: Okay, well I really appreciate your time, Dr. Jernigan. This has been great. Thank you.

Jernigan: You're welcome.

END