

CDC Ebola Response Oral History Project

The Reminiscences of

Oliver W. Morgan

David J. Sencer CDC Museum

Centers for Disease Control and Prevention

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Oliver W. Morgan

Interviewed by Samuel Robson
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Interview 3 of 3

CDC Ebola Response Oral History Project

Q: Hello, this is Sam Robson with Dr. Oliver Morgan. This is July 13th, 2016, and we're here in the audio recording studio at CDC's [Centers for Disease Control and Prevention] Roybal Campus in Atlanta, Georgia. This is my third interview with Dr. Morgan as part of our CDC Ebola [Response] Oral History Project, and today, we're going to tackle the large subject of Oliver's involvements in the various scientific initiatives that CDC had going in its Ebola response. So Oliver, I think maybe we were going to start with STRIVE [Sierra Leone Trial to Introduce a Vaccine against Ebola]?

Morgan: Yeah, maybe we can start a little bit with a kind of broad picture.

Q: Oh, sure.

Morgan: And the essential dilemma, I think, that CDC faced, which was: how much scientific work do we do? How many scientific investigations do we do, versus how much effort do we put into the response? There's a balance, and there's a tradeoff. While we want to learn more, and the more we learn, we hope that our response will be better. But at the same time, we had to make a lot of decisions about what was the right balance. We had a finite amount of resources for the size of the problems we were trying to get on

top of. There was a constant internal debate, sometimes transparent and on the table, and sometimes the kind of discussions you'd have in private, about whether we were getting it right. Whether we had enough people at the response—because you could always argue that we should send more people out in the response—versus how much we should put into doing some scientific projects.

You can argue both sides of that coin pretty convincingly. You can say, if we put a lot of effort into learning scientific information about Ebola, and the way Ebola epidemics happen and are controlled, then that will pay dividends in the long run, in the future. Like, over the next decades. But then, you can equally argue a similarly strong case for saying, we should do all we can to stop this current outbreak because of the suffering and the deaths that it was causing. And we shouldn't divert any of our limited resources to other, slightly more lofty ambitions. So that was an ongoing challenge.

Personally, I feel fairly strongly that, as a science organization, we definitely needed to be applying scientific approaches to our work. So, doing response, absolutely, making sure that we were responding. But at the same time, not forgetting our scientific portfolio, as a science agency, and learning some of those important lessons. Some of them are very operational. And some of them are purely scientific. But it's the pursuit of more systematic learning, I think, is the kind of overarching theme. In Sierra Leone, I made quite a big effort to encourage structured learning. Some of it with formal scientific investigations. Others were maybe less formal science, but certainly we were making an effort to properly document things or do on-the-go analysis of the situation.

And that came out, I think, in some of your conversations with Kathy Hageman, about using our scientific pedigree and resources and learning from other disease areas, such as HIV, and applying those in the emergency setting of Ebola response. I feel that we had that unique strength. It really was a unique strength of CDC. I spoke with many, many people, and many institutions who wanted to go to West Africa to do research and investigations, and almost overwhelmingly, they were unable to get into the country and do anything, and that was largely because the operating environment was so, so difficult, especially when there was widespread transmission. People couldn't really come into the country and operate very easily. There were either restrictions from their universities about doing that, or they just didn't have enough of an operating platform to get in and do stuff. They didn't know the right people in-country. They didn't have the relationship to the right people in the Ministry of Health [and Sanitation], in the government, to really set something like this up or know the right counterparts in partner organizations in-country. So CDC is really uniquely placed. And then, because we had such a strong response presence there, we had logistics, we had on-the-ground knowledge. I'll mention a little bit about that with the ZMapp trial. But it was something that we were pretty uniquely placed to do.

In the end, looking back on it, I think generally we failed to do as much as we wanted to do. I think in Sierra Leone, we did more than—certainly more than the other two countries. I'm not entirely sure the reasons for that, whether it was—I think some of it was my enthusiasm for doing it, and some of my predecessors'. The previous team leads

were also very science focused as well. I think we kind of got going with that in mind. But also, close collaborations with our other colleagues. In Liberia, the situation was a bit different, in that by the time anybody could think about doing some scientific work, the outbreak was really at an end in Liberia. In Guinea, because of the French language need, it was just not so practical to do scientific projects in Guinea. Sierra Leone was kind of the right place at the right time for doing a lot of science work. There was this big peak at the end of 2014, which we managed to get on top of, but then there was this very long tail, with—all the way through the first quarter of 2015, up through March, April. We were having one hundred cases a week. That's a lot of Ebola in a normal setting. And then we were going on a long tail from, what, March 2015, all the way through to effectively the end of that calendar year. That was actually, in a way, just the right moment to do the research, where there was ongoing transmission but there was enough stability in the country to get in and set something up. So we did a couple of projects, which I'll talk about a little bit later.

I think in Sierra Leone, we actually managed to do quite a few things, compared to the other two countries. Some of it was a contextual reason that we could do it. Some of it was also because, like I said, I was pretty keen and there were some other people who were pretty keen on doing things. But I think, you know, big picture, the scientific community globally probably didn't manage to leverage as much opportunity as we could have. That being said, to be balanced about it, in May 2015, I went to a meeting in Geneva with some other colleagues from CDC about research and development of Ebola vaccines and therapeutics. It was a meeting of people to really review where we were.

And one of the participants in that—I mean, it was a meeting of several hundred people. It was like a conference. One of the participants there from a pharmaceutical company said something which has stuck in my mind, which was that during the SARS [Severe Acute Respiratory Syndrome] outbreak in 2003, I think it was, almost no science was done. It's very, very little, in terms of developing vaccines and therapeutics. There was some work, obviously, done on the laboratory diagnostics. Then you go to the pandemic influenza in 2009, quite a lot was done, and a new vaccine was developed, and new tests were done quite quickly. So when you now look at the Ebola outbreak, although I think we beat ourselves up about not doing as much as we should have done, which is also true, we did do quite a lot in a very, very difficult environment. It's kind of a mixed picture. That's, I think for me, that's the kind of big, contextual thing.

The other challenge about doing research in an emergency setting is an ethical one. Again, you can argue both sides of the argument, which is that the only ethical way to behave in an emergency, especially an outbreak, is to contain the outbreak as quickly as possible, and that it's not ethical to be doing research in those settings. But again, it's necessary to do research so that in future outbreaks, they will be controlled better and quicker, and you'll have better tools to do that. I think a direct example of the kind of collateral benefit for CDC and the global community for doing research in emergencies is the Virus Persistence Study, which I'll talk about in a minute. But that study was looking at the virus in the semen and sexual transmission of the virus. We found then in 2016, with the Zika virus, that this was also a virus that could be sexually transmitted. So a lot of the approaches that we used to do a study about sexual transmission of Ebola virus

were immediately applicable to doing that in the field for Zika virus. A lot of the colleagues I worked with in WHO [World Health Organization] are now on sexual transmission of Ebola, are now working on sexual transmission of Zika virus and things. So that's just one example, but you can imagine, there are lots of other examples.

Q: I have had the great opportunity to have interviews with Dr. Anne Schuchat, and Amy Callis, and Jane Seward about their participation in STRIVE. I'm wondering if you can give me a picture of your involvement in CDC's vaccine trial in Sierra Leone.

Morgan: Yeah, STRIVE was an extraordinary undertaking. Almost like everything else in CDC's response to the Ebola outbreak. It was a kind of first, and it was a kind of landmark event. I think STRIVE was a heavy lift. It was a lot of work. My engagement with it was from the perspective, really, of being the country director and being CDC's representative and responsible person on the ground. And making sure that the STRIVE trial and the response worked together correctly, and that everything was in balance. When I arrived in November 2014, there were—I think it was Amanda Cohen who was there for STRIVE. I think there was just the one person in-country. They were starting to develop the protocol, at that stage. Quite early days. It was really quite a lot of work.

I think the vision of the STRIVE team, very early on, was to do this scientific study, this trial of a vaccine, and essentially try and isolate itself from the rest of the response so it didn't negatively impact or draw resources or attention away from Ebola response. Which I think the spirit of that was correct, but when it came to the actual application, I

think that caused more problems, really, than it solved. The kind of issues that I was thinking about, or keeping an eye on, from the position of being the country director, was to make sure that what we did in the STRIVE trial was in line, or synced up with what we were doing in the rest of the response. There could be some fairly arcane administrative issues, such as the salaries that the STRIVE trial were paying people. If they were too out of the range of what we were paying people for other jobs in the response, then you can imagine the kind of dynamic that might create. So there were some of those kind of administrative type things that I wanted to keep an eye on, and there were particular challenges with one of STRIVE's contracting partners, eHealth Africa. And eHealth Africa was a non-governmental organization that worked also on the response pieces. I think the STRIVE trial overheated eHealth by putting too much pressure on them, which had potentially negative consequences for our response work. There were some fairly subtle relationships between what STRIVE did and what our response did that I was very interested to make sure I was addressing.

There were also important relationship issues. Clearly, at the Ministry of Health level, the people at the Ministry of Health, when they thought about CDC, they didn't make a distinction between the STRIVE trial and our response. An activity undertaken by the STRIVE team was perceived as a CDC activity. And quite rightly. I mean, they were the same thing. But it just meant that, again, making sure that what the STRIVE team did was in sync with what we were doing in the rest of the response, and those relationships were not in some way, kind of—there was no distraction, or no impingement on some of

those relationships. There was also very interesting dynamics with the UK [United Kingdom]. I don't know if this was raised by your other interviews.

Q: I don't think so.

Morgan: The UK was furious, and the fact that there was a senior politician who I think had the nickname of “David Cameron’s brain,” who was a quite—it’s a guy called Oliver Letwin, who’s a quite well-established, quite well-known politician in the UK.

Apparently, he was absolutely furious that in Sierra Leone, which was a large British response and a British undertaking to respond there, that the US was doing a vaccine trial and the UK was unable to get a vaccine trial up and running. He actually came out to Sierra Leone at one stage and requested that we meet with him. We did a lot of coordination work with the UK. In the end, they did get a vaccine trial up and running, but only towards the end of 2015, after the outbreak essentially had been finished, and they did a different kind of trial, looking at the safety issues.

But if you go and look at the—there’s a Parliamentary Select Committee report for science and technology. Select committee of the UK Parliament. They did an evaluation, or a review of the Ebola response from the UK’s perspective. It’s pretty critical about the lack of capacity that the UK had at the time to do scientific investigations out in Sierra Leone. So there was a very interesting dynamic there, which obviously, because it’s really now in the diplomatic sphere, involved the US Embassy. Those were the kind of

issues that I was engaged in, rather than exactly some of the more detailed scientific pieces.

Just an anecdote about the meeting with this British politician. It was quite amusing because there was myself as the country director, being English, the lead PI [principal investigator] for the STRIVE trial is Marc-Alain Widdowson, who's also English. He's half English, half French, but he sounds English when he speaks English. And we had Jane Seward, who's originally Australian. So we went to go and meet with this British politician, and there was—I mean, he's a senior guy, and they're obviously senior people from the British Embassy, and also the DfID [Department for International Development] at the meeting. And you could see the guy was confused as to who we were [laughter] because we were all speaking with non-American accents about this US project. It took him a while to figure out that actually, we were there on behalf of CDC and the US government. [laughter]

Q: Can I clarify, was he angry at the United States for impinging on territory—

Morgan: No, no.

Q: —or just at the UK government's anemic scientific response?

Morgan: Correct. He was frustrated by the UK's inability to get scientific projects done on a timely basis. And that frustration was somewhat aggravated by the fact that we were

getting on and doing it. And it just so happened to be Sierra Leone as well. There was a little bit of territoriality involved. There was some negotiating about which parts of Sierra Leone we could do the trial in, versus what parts they wanted to do their trial in. So, it wasn't just a theoretical issue. I mean, it really had real implications on how we ran the study.

Q: Would those different divisions have been based in any way on science?

Morgan: No.

Q: Okay.

Morgan: I mean, I say no. Essentially, you didn't want to have the two trials happening in the same populations, because then it's more difficult to measure what's going on, if you're doing two interventions in the same population or similar population. So, there are scientific rationales behind it. But largely, it was a matter of convenience and logistics.

Q: And not political motivation?

Morgan: I don't think it was political.

Q: Okay.

Morgan: I mean, I think it was just the practicalities of running different trials.

Q: I understand. I understand.

Morgan: Actually, quite early on in the STRIVE trial, the idea was that we were going to partner with the UK. It started off with their offer on the table was quite large, in terms of logistical resources from the UK military and other resources, and maybe financial resources. But as time went on, those offers just seemed to dry up or fall off the table. In the end, I think the only thing that the UK provided for the whole trial was a single bottle of oxygen. [laughter]

Q: Oh, my. How do you—

Morgan: For the Connaught [Hospital] ICU [intensive care unit] There was just—it was kind of ridiculous. It started off with offering helicopter air support, and all sorts of things. And then when we got to—when we actually got to the implementation, in the end, really nothing transpired. [laughs]

Q: Wow. It's kind of remarkable that even that one little thing, versus nothing. Was it one oxygen tank?

Morgan: Yes. I know, it's kind of bizarre. Again, it's difficult for me to really assess my contribution to some of the design of the STRIVE trial, but I'll give you my side of the

story, and you have to investigate whether others remember it in a similar way. But I do remember a very specific engagement when Marc-Alain came out in January 2015, I think it was. We met with Dr. [Mohamed] Samai, who's the Sierra Leonean principal investigator at COMAHS [College of Medicine and Allied Health Sciences], the university in Freetown. We were discussing the study design and how it was going to be implemented. There were two issues that I actually disagreed with and raised at that meeting. The study design, up until then, had been what's called a stepped-wedge design, and maybe Anne and Jane—

Q: They did.

Morgan: —spoke about it. I raised two issues that—and this is where that synergy between the research and response really comes into play—but again, I don't think people really understood it. The study team, the STRIVE study team, I don't think really understood what was going on in terms of the epidemic. There were two aspects which essentially invalidated their study design. One is a major one, and one was a minor consideration, or—yeah, I would say a minor consideration. The major issue was the fact that we were dealing with outbreaks of Ebola in healthcare settings, day in, day out, and had been for weeks and months. I and other people on the response team had a fairly good idea about how those happened, and the way they happened is that you would have several colleagues within a healthcare setting, within a healthcare facility, getting infected. What you would have is, you would have these clusters of cases within hospitals, essentially. The stepped-wedge design, the study design was going to

randomize hospitals and use randomized hospitals as their sampling unit, as their study unit. But if you had your cases clustering within those hospitals, you lose your ability to measure the impact because everybody's going to have the same intervention. That was a kind of a major thing that I raised with him. I said, "I don't think your study design is going to work because your cases are clustering, and then you're also doing cluster randomization, effectively, for your trial." I don't know whether that's what prompted them to re-think and do individual-level randomization. Or maybe there was some other factor there. But that was, I think, one aspect about how really understanding the dynamic of the response is important for the science.

The other minor issue that I raised with him was—which luckily never came to pass, so maybe it would have been major but in the end it was minor—was that just at that time, we saw a few new cases occurring in the eastern side of Sierra Leone. The outbreak started in the east, spread across to the west, and then we saw a few more cases going back into the east. It raised this possibility of, maybe we were going to see a resurgence in Ebola in different parts of the country. And the stepped-wedge design was very geographically fixed. In the end, the final STRIVE trial was also quite geographically fixed, but for logistical reasons, but it could be moved. So that was the other issue I raised was that, you don't want to set up your trial and then suddenly your outbreak wanes in the west and then picks up in the east, and you can't implement your trial where the outbreak is. You need to have enough flexibility to take into account shifting patterns in the epidemiology.

There was also another dimension there, which is subtle, and is—well, the job of the country director, which is to understand the context of operating in Sierra Leone. There are political party differences between the east and the west. And there were concerns from various quarters that it could be seen as being politically motivated, the choice of where to do the study. By at least putting some flexibility into where the study could be done, I think it injected a little bit of a sense that this wasn't too politically motivated. But those were some of those considerations that's also worth putting into the mix when you're doing it, because if you think back to the time, people were pretty keen on getting vaccinated, especially healthcare workers, because they'd seen so many of their colleagues die. People really wanted this intervention. There were interests involved. So, the engagement with STRIVE—you know, my engagement was really in that kind of big picture, trying to feed in these different elements into their considerations.

There were also the somewhat mundane but important practical aspects of having so many people in-country, and how they would interact with the rest of the CDC team. There were some interesting dynamics. I've got to say, at times, somewhat negative dynamics, and there was a period—I think it was probably around January, February, March time, where we had a very large number of people coming to work on the STRIVE trial, a lot of really excellent CDC scientists, really high-caliber people. And we were struggling to staff up the response. To make it even more kind of difficult to swallow at times was that it was at a phase in the STRIVE trial where they were putting together all of the standard operating procedures, and other documents. So people were sitting around the hotel for most of their deployment, writing these documents. It gave the

impression that there are a bunch of people sitting around in the hotel when there was a big outbreak raging outside. Literally, all of the area around the hotel was quarantined because there was an outbreak outside the hotel. [laughs] So, there was a perceptual challenge internal to our team that people who were doing the response were like, hey, what's going on? And it was, at times, frustrating when I would see colleagues of mine who had lots of experience, who would be great doing the response, essentially coming in and working on documents. In the back of my mind, I knew the logic, and I could understand the rationale, but emotionally, sometimes it felt a little bit difficult.

That being said, I've got to say that we had a very good arrangement, or dynamic developed with STRIVE in the response, in that, on many occasions, we had people who worked for STRIVE essentially put their STRIVE work on hold and come and help on the response. There were many great examples of that. And the STRIVE team's knowledge about some of the hospitals were really useful for us in the response. So I think that issue turned around, and in the end it became a very good kind of symbiotic relationship. But it wasn't easy at the beginning.

There were some other interesting challenges, from my perspective. Like I mentioned, the STRIVE trial endeavored to isolate itself from the response, in the hope of not pulling our resources away. But then they set up separate systems for everything. They had a separate set of vehicles. They had a separate process for getting hotel rooms. They had a separate process for all sorts of logistical activities, which became quite problematic because the embassy only saw one CDC, but then suddenly had two people requesting

the same type of services and support. In the end, we had to pull those two things together, which made it manageable. But then essentially, I had to assume a lot of that responsibility of making sure the administrative side of the team was big enough to support the STRIVE trial. Even though they were recruiting and deploying people, they were essentially sitting within the country office's management section. It was an additional responsibility, and one that I was more than happy to take on, but it did have resource implications.

I'll only say one more thing about—and more anecdotal. It was really my last big engagement with STRIVE was at the start of the STRIVE trial. I'm sure Jane must have spoken to you about the challenges we had with the minister of health.

Q: A bit.

Morgan: I think this is where our setup failed a little bit, because once we got close to the launch of the STRIVE trial and the first vaccines given, it became apparent that the person that the STRIVE team had engaged from the Ministry of Health to be their focal point was not briefing the minister, was not passing information on. I feel that's something I should have picked up on. I should have made a better effort, or more concerted effort to make sure that those loose ends were tied up, because that's really part of the job of the country director, is to make sure those dynamics work. I feel a little bit guilty about that. Because then what happened is, we got to within a week or so of launching, and we went to give a final presentation to the minister of health about the

launch, and he basically said he didn't know anything about it. Which is politically a really disastrous situation to be in. Then, he wanted to really think about the implications of this. And this is despite thousands of hours of work—tens of thousands of hours of work by many people from the university and from CDC. We got to this point, and the key person hadn't been briefed, and he basically called a halt to the trial.

We had a window of opportunity to launch the trial. Otherwise, essentially it was going to be too late. And to compound all of that pressure, people had been contracted—you know, the contracts had limited terms. There were all sorts of constraints, which meant that the trial had to start within a three- or four-week time window. Not to mention the fact that the number of cases were going down, so we needed to get on with it. And the minister, he said, “Look, I want to think about this.” And then he came back with a number of questions. Some of them were quite reasonable in terms of planning about the indemnity available. Some of them were not so reasonable. It turned out that there was a very challenging dynamic between the minister and the principal investigator from the university. Although they had been school friends and studied together and were very close acquaintances, there had developed a negative dynamic. I think probably, looking back on it, the main concern from the minister was—I think he thought that CDC was pumping millions of dollars into the university, and the ministry wasn't getting any benefit from their participation in the STRIVE trial. I think there was some of that dynamic going on.

In essence, he blocked the STRIVE trial. And he came back with three or four big requests, including increasing the indemnity for individuals. Some of the requests were manageable. I think there were only three big requests. One was the insurance. I can't remember the second one. The third one was that he wanted the ICU at Connaught Hospital to be totally refurbished before the trial could begin. Which was well outside the scope and the budget of the STRIVE trial, and would have been impossible to achieve in the timeline. So I'm sure Jane spoke to you about that.

Q: She spoke a bit about that. I think, as part of it, there was a dialysis unit that he wanted to—

Morgan: Correct.

Q: Yeah.

Morgan: So, the request was really not reasonable. But he really wouldn't proceed, and he wanted lawyers to review things. It was really a kind of disaster for the trial. So I started at least a week or ten days of really almost all of my time spent—or good chunks of my time spent working with Jane and the ambassador [John Hoover] to try and unstick this. We had rounds of meetings with the minister and his teams. Jane did an amazing job at seemingly fixing everything overnight. You know, when he asked for it. Really, she did—it was an extraordinary effort. The ambassador was at many of these meetings, giving the US government's weight to the importance of doing the STRIVE trial. It got to

a point where we actually—well, I had discussed this with a guy called Professor Monty Jones. Professor Jones is the chief science advisor to the president of Sierra Leone. He is an individual who's familiar with CDC and very supportive of science. He himself, I believe, won some kind of Nobel recognition for his work in agriculture. So he is, in his own field, quite distinguished. I discussed it with him on many occasions, and he then convened a meeting with the president of Sierra Leone. And I'm sure Jane must have mentioned this to you. This issue went all the way up to the president. And the president basically said to the minister, "Look, you're going to start next Thursday." And the minister argued back, and said, "No. It's not." And the president said, "Yes, you are." And then, even still, we weren't—by the time we got to Tuesday, it was apparent that we were not going to be able to launch on that Thursday. It took quite a lot of back-channel negotiations with Professor Jones, and through the ambassador, to make this thing happen. And it all culminated in a fairly dramatic last-minute negotiation with the minister, which I'm sure Jane has given you.

Q: Indeed. [laughs]

Morgan: —an account of. But I mean, it was an all-out—we would do anything to get this trial started, if we could. I think we were probably within a few days of calling it off. If we hadn't got that agreement within that day, or maybe even the next day, we would have dismantled the study and not have done it. But we did everything, including I—somewhat against my better judgment, and luckily nothing bad happened to it. I signed an agreement, or a letter of intent to do what we could to help get the dialysis unit up and

running. Which really exposed me to kind of—we didn't make any financial commitments or anything. But saying we would—the spirit of assistance to help. One small thing, we actually—I gave the STRIVE trial the AED [automated external defibrillator], the automatic defibrillator that I had purchased for our team's office as part of our medical kit in our office. I gave it to the STRIVE team so they could put it into the ICU, so that they could get the ICU serviceable enough to get their—you know, it was really anything and everything that we could do, we tried. It was just an amazing experience, really.

So that's really my engagement with STRIVE. Once it got up and running, things stabilized. I did some relationship management support between the STRIVE trial and the eHealth Africa, which is one of the main partners. And that was it, really.

Q: Actually, I wanted to go back and ask about, would you mind kind of giving a bit more detail about how STRIVE started to strain eHealth's infrastructure, and your part in any of that?

Morgan: There were two aspects, I think. Well, there were three. There was one which was the financial administrative side, which was difficult because CDC's financial mechanism with eHealth Africa was somewhat burdensome, and eHealth Africa wasn't capable, really, of managing all of the funds, in terms of the administrative turnaround. I think there was a money flow problem, a major one, in the sense that eHealth Africa didn't have its administrative systems sufficiently in place.

Q: To make sure that certain people get paid, or—

Morgan: To have cash flow to buy things for the project—

Q: I see.

Morgan: —to do things for the project. Now, this is a point that I've made several times to the STRIVE trial, and it's easy to look back and forget the context of the time, but at the end of 2014, when we were setting out on this endeavor, there were no other partners in the world who wanted to get involved in a vaccine trial, or very few, in the middle of this enormous outbreak. A lot of people had worries about safety for their staff and so on. So, eHealth Africa was pretty much the only group that was willing to take this on, and it had no prior vaccine trial experience at all. I made this point a few times that we have knowingly got engaged with a partner which—this was kind of their first rodeo, as it were. And it was necessary, because they were the only ones who were really in a position to try and do this. But we knew of their limitations when we went in. So, I think, personally, that some of the CDC team were overly critical, and their expectations that eHealth could do all of these things were unrealistic. And eHealth did their very best, given that they were not in-country before the outbreak. So I think there were some challenges there, even that the eHealth team didn't know how to submit the vouchers to get reimbursed. They were fronting a lot of the—putting the money up front. So they

actually ran out of money, essentially. That had an impact on the response program, because the solvency of the organization was at risk.

I think the other way it got very overheated was that the demands of the STRIVE trial were extraordinary. You know, eHealth needed to pay lots of people, and that's not so easy in somewhere like Sierra Leone. And sort out even small logistical items, like paper and pencils and paperclips. Things like that. You know, to get them in and then get them out into the field. Again, it's much harder than in a US setting, for example.

I think they did a really extraordinary job. I think in retrospect, everybody thinks they did a pretty extraordinary job. But it came at a cost. I had several meetings with Jane, and with the director of eHealth, to try and cut through some of these—I mean, it got pretty tense.

Q: Who was the director of eHealth?

Morgan: Adam—I can't remember his second name [note: Thompson].

Q: Oh, it's okay.

Morgan: I have to—

Q: It's because I put you on the spot.

Morgan: Yeah. [laughter] Adam—it will come to me in a minute.

Q: That's alright. Well, thank you. I've—given the hours that I've spent talking about STRIVE in this room so far, I'm really happy that these few additional ones were actually this great, and this—added this much. I'm glad—

Morgan: Sure.

Q: —you came in for this. Thank you.

Morgan: I'll give you the less glamorous underbelly of the STRIVE trial.

Q: [laughs] I don't know. And so, again, looking at the broad picture of CDC's scientific efforts as part of its Ebola response, not only was STRIVE a big part of it, but so was the Virus Persistence Study. And you said that, in some ways, it might actually have been the most important in terms of maybe the scientific output. Is that what you were—

Morgan: So, the STRIVE trial, its initial objective was to measure the effectiveness of the vaccine. Which it was unable to do, because the cases fortuitously went down to a point where they could no longer measure if the vaccine was effective or not. Even if it had been able to measure effectiveness, and I'm sure you know that there was a trial in Guinea that did manage to do that. The vaccine is still not licensed. We still can't use the

vaccine for this current outbreak. Even if things went 100% according to plan, we would never be in a position of using the vaccine for this outbreak. So, in terms of the outbreak control, the impact is limited. It was certainly important to vaccinate healthcare workers. No doubt. And if the outbreak had continued, I think we would have maybe expanded the trial and vaccinated more people.

The Virus Persistence Study was, by design, set up to answer essentially an operational question. That question was, how long does virus—live virus—persist in survivors? We knew already, at the beginning of the outbreak, that some male survivors had virus in their semen, maybe up to ninety days after their acute infection. And we knew that with the very, very large number—thousands, like eleven thousand, twelve thousand survivors across West Africa, that there would be what we'd termed as a residual risk, that there would be enough people who had virus in them that they could transmit it to somebody else, even after a chain of transmission had finished. What we didn't know was how long this virus could survive. We didn't think it was going to be so long until there was a sporadic case in Liberia in January—January, February—which was we thought at least six months out from the individual's initial acute infection. That really opened the Pandora's box. Then we went from being fairly confident to being not at all confident about what kind of problems—whether you could have pop-up outbreaks. We had some inclination, intuition about it, in the sense that when you looked at the epidemiology, we weren't seeing lots of outbreaks that were unassociated with other chains of transmission. So when I say we didn't know anything, that's not quite true. When you looked at the epi [epidemiology], it gave a fairly reassuring picture. But you only need one new chain of

transmission in an area to start a whole new outbreak. The implications are quite significant.

At the beginning, in January, really—January, February, myself and Sarah [D.] Bennett got together with one of our colleagues, Dr. Alie Wurie from the Ministry of Health, and Dr. Jackson Amone from—he was WHO, but seconded to the UN. Essentially, we put together a protocol to look at this issue. We had a pretty complete protocol by, I guess, the end of February, early March. We shared the protocol with Atlanta just around the time, I guess, that they were investigating the case in Liberia. And it had suddenly become of key interest to people in Atlanta. My perception, which is very different from the Atlanta perception, but my perception is that all of a sudden, a whole lot of people in Atlanta weighed into this topic, and took basically—we already had a plan in place to get it started. But then, I guess, went and rewrote the whole thing, or put forward their plan, which is a much more complex study protocol. Which, okay, that's fine. That was okay, I guess. And then we went back and forth, and revised the protocol, and had a new protocol in place. That delayed things by a few weeks. Then, we went to give the presentation at the Ministry of Health to a number of other members when we were essentially ready to submit the protocol for ethical approval in-country. At that meeting was a WHO colleague, who we'd never met before, who'd come from Geneva. She had come to present her protocol for studying exactly the same thing, which they had developed totally separate from CDC. The CDC Atlanta and WHO Geneva hadn't been talking to each other on this topic. And they met at this meeting in Freetown. The Ministry of Health basically turned around and said, look, guys, you sort this out. Get

your act together. You coordinate amongst yourselves. When you both have come to an agreement, you come back to us, and present your joint plan. The Ministry of Health knows better than to get into the middle between WHO and CDC. So now we were in this protracted, very difficult process of trying to harmonize these protocols with a team in Atlanta with quite strong opinions, a team in Geneva with quite strong opinions. And then us on the ground, kind of being sidelined in this whole process. That, in the end, took several weeks or months, and in the end, we just went back and forth, back and forth, negotiating. It got to a point where I reached exhaustion on this—I mean, on top of all the other things that are going on, this took up huge amounts of my time. And I was very, very unhappy about it. Barbara Knust came out. We had several other people who spent, again, hundreds of hours or more. Christine [E.] Ross from [the Division of] Global HIV [and TB] came out. She was fantastic. And it was this very acrimonious relationship with the WHO team.

Q: These hours are just spent in discussions with WHO, or how is this time spent?

Morgan: More or less discussing and negotiating, and then—part of the problem is that WHO didn't have any people out there. We were fielding all the people. So I'm looking at this from a number of perspectives. One of them is, using our resources, is this a good use of our resources? Should we take that person, and all the time that we're spending on this project, and put it elsewhere, maybe? These are the kind of tradeoffs that I'd be making all the time. It was very frustrating that CDC Atlanta and WHO Geneva were not getting on well, and we were trying to have to broker this in the middle of it all. We

eventually did get to an agreement, but it had a couple of casualties along the way. We had a very talented young scientist from CDC come out who got basically nowhere because of the political differences between Atlanta and Geneva. I think in the end, anyway, she dropped out of that project. Sarah Bennett ended up dropping out of the project. Christine Ross, she really was the one person who saved the project, if anything, because she was able to establish a good enough rapport with the WHO team.

Eventually, the project got off and running, I think in June or July. It really cost us four or five months, this whole process. And a lot of lost sleep, and we lost a lot of goodwill. I think it's definitely been one of the most difficult scientific projects I've ever worked on. And the least pleasurable. Then, we kind of got off and running. Eventually, the WHO team built out a bit, and they got people in place. They did a good job. I've got to say, I think in the end, things went very well. The actual study itself was fantastic, and critically important. What we were able to do when we finally got off and running, was we were able to test semen samples from initially a group of one hundred men. I'm sure Barbara Knust has spoken about this, and I'm sure she can articulate very clearly what the importance of that was.

Q: Oh, absolutely.

Morgan: An area that is difficult to discuss, because it's caused a lot of tension, was: who would test these samples for this study? And VSPB [Viral Special Pathogens Branch] really didn't want to do a lot of the testing in their lab in Bo. Did she mention any of this?

Q: Yes. She did.

Morgan: I ended up having many difficult discussions with Stuart [T.] Nichol, and kind of got, I think, put in the middle between the study and Stuart. I think it created a lot of unnecessary tension between him and myself, which I think was unfortunate. I mean, it wasn't a lingering or long-lasting issue, but it created a problem where one maybe didn't need to exist. I think that was just down to difficult or poor communication at the Atlanta end, between the people involved in the study and Stuart. It created some real challenges for me, and all through this whole project has been—it's been tough. But it's been really important. Like I mentioned earlier on, what we learned in terms of implementing the project in Sierra Leone has been used immediately in the next big outbreak, which is Zika. So I think it's been a big success. But at a big cost. I still feel frustration about the speed at which, or the slowness I should say, of getting some of the results out. There was essentially a fundamental difference in point of view, in that my approach to the issue and the study was really one that we needed to get this information for public health reasons. But there were others who were very much interested in this from a research point of view, and so were happy to go slower on some of the issues than I wanted, just because I wanted to get the public health answer.

Q: Within CDC, those were disagreements?

Morgan: Within everybody involved. Within CDC, within WHO, within Ministry of Health. Different people have different takes on it.

Q: I know it's impossible to quantify something like this, but would you say that that time spent in discussions with WHO impacted CDC's ability to do its response?

Morgan: I think not, because by the time I was kind of—you know, at that time, I was transitioning over to Sara Hersey. So I don't think it—too negative. By that stage, the outbreak had really dropped. We had systems in place. I had more bandwidth than I did earlier on. So, I would like to think not.

Q: Okay, yeah. And Sara, also, in our interview, one of the phrases I remember was—she's very passionate. I loved Sara.

Morgan: Sara Hersey?

Q: Yes. It was something like, when compared to the importance of the response, the research part of it, she just didn't really care too much about it. She seemed very focused on the response side of things.

Morgan: Right. And like I said previously, people view it in different ways. I've had the fortune to have done a fair amount of scientific work in my career as well as a fair amount of response work. So I have a passion for both of those. It's hard to do both at the

same time, but it is possible. And it's important. Like I said before, CDC is uniquely placed to it. I personally disagree that doing the science detracts from doing—at least at that stage in the outbreak. We had extra bandwidth to focus our science work. But I'm aware that she and I differ in opinion on that issue.

Q: Okay, gotcha. Yeah, it makes sense that, to some degree, that it's a false division, that in some ways, the research can help the response efforts.

Morgan: Right. I think especially if people who are involved in the response can formulate the right questions to ask, then it's really impactful. It's really effective. I think you would have heard from Martin [I.] Meltzer, his frustrations about needing information to help quantify and plan and model. And just not getting that information. I think that's, again, is a breakdown of communication in many ways. Also, when you're out there in the thick of it, it is very difficult to think about other things like that. I would probably say that in November, December, when things are at their most stressful, I had no extra capacity to think about scientific issues, at that stage. Or very little.

Q: Sure.

Morgan: Yeah, so, I'm not too critical. I mean, it's easy to be critical in hindsight.

Q: Right. Okay. Well, thanks for talking about the Viral Persistence Study, Oliver. Shall we move on to the Household Transmission Study?

Morgan: Right, so this is another kind of quite significant effort. We, in fact, for both—I'm pausing a little bit. In the Household Transmission Study, that was funded from CDC Foundation money. I guess in theory, money that could have gone to response work. It's just worth thinking about that. Some of our other things, like our KAP [knowledge, attitudes, and practices] surveys, that Kathy would have spoken about. Which is not like—I mean, that's a good example of operational science, actually, where you do something to get some operational data and then use that to tweak your response. Household Transmission was meant to be that.

I've done household transmission studies before. In the 2009 influenza outbreak, I deployed to San Antonio, Texas, where the two—the first cases of H1N1 in the US occurred simultaneously. One in San Diego, one in San Antonio. I led the team in San Antonio, and somebody else went to San Diego. In the few weeks that we were there, we did a number of critical studies for understanding the outbreak of H1N1, including a household transmission study. We did a virus persistence study. All of this sounds familiar, right?

Q: Yes, it does, indeed. [laughter]

Morgan: So, that's why I'm saying, I've been involved in responses where we could drive the response with the science, using scientific approaches. So the Household Transmission Study, initially, was perceived or conceived as a quick thing to try and

understand some of the dynamics of transmission within households. It ended up being a bit of a behemoth, a really big undertaking, much, much more complex than I had thought about. It's an obvious question to ask, especially as an epidemiologist, and there were several people who had thought about the project kind of simultaneously. Several people had started working on protocols in Sierra Leone, and then rotated out, and then they—it was one of those situations where people had put effort in, and then nothing had come of that. Then, a protocol appeared suddenly one day, written by a team in Atlanta and without really that much engagement with anybody in Sierra Leone. So then I was faced with this situation of having one group in Sierra Leone who had written a protocol, and who felt quite close to this issue. And then one group in Atlanta, who had written essentially a competing protocol. I was then again in the situation of trying to adjudicate, and make nice [laughs] for everybody. Again, it was a matter of compromise. I was fairly insistent about reducing the complexity of the protocol that Atlanta put forward. But it was still way, way more complex than what was drafted in-country. I wasn't really involved that much in the drafting in the country, but I obviously knew the contents of it. Anyway, in the spirit of compromise, we found an accommodation. Then in January, February, March, the data were collected. Even the fact that it took three months to collect all the data gives you an idea that—I mean, this was something that we did in H1N1 in a matter of two or three weeks. But at a much simpler level. It was a really bare-bones kind of thing.

Q: So, what were the main things that caused it to spread across three months?

Morgan: There were a number of things. Again, because of the intensity of the study, it could only be implemented in a fairly limited geographic location, which was just in Freetown. So just the number of cases—again, it positively was quite low. For the number of cases to accrue to the number that they needed for the study, it took three months, more or less.

Q: I understand.

Morgan: That was one main reason. The other was that it was—they had a big study team. Everything quickly, exponentially gets complex. You suddenly have a bigger team, then you have to have another big number of vehicles and motorcycles, and then you have—I mean, instead of ten people, you're going to then have like twenty or thirty, and then you've got to pay all these people, and so on and so forth, and equip them. You can imagine it gets complex quite quickly.

Q: Right.

Morgan: But they did a good job. They did a great job doing the study. They collected data to this very fine, granular level. Which nobody has done. And then we did it prospectively, which is important, because previous studies have looked at this for Ebola, have done it retrospectively. You're more likely to have people who are remembering things incorrectly or their perceptions change. The great thing about the Household Transmission Study, which is unique, is that it really involves people in the study just as

soon as the case is identified in the household. They get information about what kind of exposures the individuals had, and then prospectively follow people up to see if there were secondary cases. That's a really strong component of the study. But it's taken forever. And the results are still not published, today. And where are we now? We're—where is it? July 2016.

Q: Yup.

Morgan: A year and half later. Which is—it's totally inadequate. I mean, great for research. If you want to do research, that's great. Fine. There's no real problem, it being a year and a half later, that it'll get published. That's fine. In fact, we're working on the manuscript right now. But from a response perspective, it just wasn't useful.

Q: No, not at all? There were no things that even were unofficially maybe learned?

Morgan: Well, towards the end of the outbreak in Sierra Leone, when there was a renewed interest and vigor for quarantining, they did use some of the information from the Household Transmission Study to try and make a case against quarantining by demonstrating some of the transmission risk of being in a household. But that's something we knew—you don't need to quantify it to be able to make a policy decision. We know that being close to somebody with Ebola when they're acutely sick is not good. It's a risk for getting Ebola. Locking people in their houses with somebody else who's sick with Ebola is not the way forward. So, anyway. I don't want to be too pessimistic,

but I think my vision about the Household Transmission Study and the utility of it was different from maybe the rest of the study team. I'm sure it'll be useful going forward, for future outbreaks. But as a responder first, maybe in this instance, when the science is second, my passion would always be science to support response, rather.

Q: Right. That makes sense.

Morgan: But all that being said, it has been a very interesting and important study.

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