Geospatial Methods for Public Health Professionals

CARL KINKADE: I'm going to go through this part really quickly and what this is, is sort of an overview that I've done for various things that I've presented on, on GIS. Quick examples of public health, just to get your mind sort of going on why we use GIS on public health. Some of these slides are actually stolen from the other, I pulled them from my other presentations and so I'm getting similar slides of ESRI when I can just go past them. So it's not completely duplicative, I'll just skip past them when we get to the ESRI part of it.

So for you all, I mean, most of you know this is an information system. The key that I want people to think about it, is it's not just a mapping tool, I think you all realize that. You know, it's actually an information system.

I was on a global health call the other day and Steve Blaunt, who is the Center Director for the Center for Global Health for CDC, made a comment that sort of raised attention in my mind, you know, was that as we were talking about GIS and global health, we were really talking about programs and global health and someone brought up GIS on the call and he sort of said, "Well, you know, why are we talking about GIS, because that's just a little program like Excel or Word." You know, I didn't say anything on the call and so it is a tool and it's meant to be a tool to use. But it's really bigger than Excel or Word and it's an information system that contains a lot of data and database systems and really, if you have organizations that have done a really good job of integrating GIS,

it becomes part of the business workflow and it's not just a, "Gee, I need to make a spot map and move on with life," type of thing, because it's not that easy. And so we can't think of it as something like Excel. It's a lot bigger than that. I mean, there are entire Master's degrees now in GIS. And, you know, so it is a quite broad area.

And there are different kinds of GIS people. That's something I've been trying to educate people who run CC on. They'll say, "Hey, we want to hire a GIS person." What kind of GIS person do you want? Or they'll hire a GIS person and they'll say, "This person can't do the stuff we want them to do," and I'll go, "Did you ask them that when they hired them? What their experiences were and their knowledge?" So there are different types of GIS people. There are desktop people, there are server people, there are web people, there are spatial statisticians, there are photographers. So people emphasize and sort of specialize in different areas. I've been around GIS for a long time and there's a lot of things I don't know. I mean, I learn stuff all the time from other people.

So the first thing I always get, raises my attention when someone tells you they're an expert. I'm like, "Really?" I mean, because I'm not sure I know what that is, because everyone I talk to, they'll specialize in an area and know much more than I do in that area of what it is and so I think that you have to know how to ask for the right people when you're doing work. If you want a spatial statistician or spatial geographer, than you have to ask for that, you can't ask for a GIS person, because who knows who's going to show up.

But if you want to do web mapping, you've all seen some of the really nice spatial mapping on the web right now, that's a whole different breed of cat. Because these are really IT people, sort of, that have gotten into GIS and then sort of bring all this stuff to you. So, it's not the desktop person, I can't do that. I've dabbled in it, but, you know, I wouldn't do that for someone.

So just to know, you know, GIS is a computer system that allows you to manipulate and analyze data. Analyze is the key part. You know, this is what we do in public health all the time. This is the reason I love doing this work in public health. You know, when I first started my job at the City Health Department in Lincoln, Nebraska, I went to a GIS operational meeting for the city county. The health department had never represented in that meeting, been represented in that meeting. And I showed up and they all looked at me like I was out of place. They're like, "Who are you and why are you at our meeting?" This is planners, I mean, this is GIS people from their plan department, public works, assessor's office, engineering, all this, utilities office, all this stuff, right? A very physical GIS, what I call physical GIS. Physical infrastructure GIS. And so I got in the meeting and they all looked at me like, "We don't get it, what do you do with GIS and health?" Because in their mind, GIS is roads and manholes and zoning areas for planning or land use, you know, areas, or zip codes or, it's very physical things. What does the health department have that's physical? They have one building over there, maybe a primary clinic over there and access Medicaid over there, but that's it. I mean, what do you map?

And so the next meeting, I brought back a presentation on what we do with GIS and I showed them, here's how we use GIS. And we really need everyone else. We're a bunch of takers and not very good givers, because we need everyone else's data, but we really can't give them our data and they don't want it anyway, I mean, the assessor's office doesn't want our health data, you know, but we need their data for our background data and our analysis areas.

And so I showed them the presentation on what we do and how we use it for analysis and they were floored, they didn't realize that. All the stuff we do, when I went to the health department in Lincoln, we had environmental health using GIS. When I left there, every program, epidemiology, the primary clinic, primary dental, maternal child health, WICK, our indoor/outdoor program, animal control, emergency response, and all of our environmental health programs were using GIS. And every program can use GIS one way or another, whether it's just looking at populations or actually doing better, you know, more sophisticated analysis. And so they didn't know that. So you really have to educate other people on how public health did it and you have to remind them that we're the ones that sort of started it, it was John Snow. We came out of the gate first and we're last now. So public health is behind everyone else. If you want to look at the folks who are really good at GIS? Look at the Intel Defense Group. I know public health hates looking at them and we even talk about them, in meetings when I come and talk about, in federal meetings when we're talking about DOD, people immediately

want to close their ears, “Well, that’s defense, you know, we’re public health.” Its technology and it’s analysis, it’s irrelevant of the industry and we have a lot to learn.

All right, let’s hop into this, how GIS works. We have the real world down here and we sort of take the real world, we divide it up into layers of information. So we take the real world and sort of simplify it to its most simple levels. Of every single individual component, whether it’s a house or the **** or whether it’s a subdivision or a shigella case or a cancer case. And we want to know, is there a relationship between these things? And so when we take the real world and we divide it up into these layers of information, what we’re saying is, that we have our population health information. We want to know, is there patterns around neighborhoods? Is there patterns around, you know, states or counties, etc? And how does that relate to other information? You know, demographic information? Social economics information? And so how does that relate to other environmental, you know, whether it’s air pollutants or ground pollutants or point source pollutants, how do these things relate together? And so you take the whole world, you divide it up in the most simplest form and then you have a database about each of those individual things.

So, in this example, we see we have, you know, six layers of information that represent the world. Each one of those has their own database behind it, of whatever you’ve put in there. And so when people talk to me, you know, about doing analysis for them, they’re always like, “Well, Carl, what information do you need?” And I say, “Well, I need geography, at the lowest level that you have it. The rest of it is what you need, not what

I need. So what is it you want to do and that's what we have to have on the database side of it to do the analysis."

And that's actually the biggest thing, too, is when you collect data, try to collect data at the lowest possible level. The lowest reasonable level. We can't always GPS data, but in a perfect world, if you could GPS every case, then I would GPS every case.

You can have that level of the data. You know, people are concerned about identifiable information, but an address is indefinable. There's no difference between an address and GPS unit, really. And so if you have an address in the database for the person, you can also have a GPS coordinate for the person in the data, it's the same thing. So, you don't have to release it that way, which for programmatic use, you can do analysis at that level and then you can get aggregate information by whatever geography and then share it at the appropriate level. But if you start at the highest level you think you need it, you can't go the other direction. So if I start at county, people always at **** "Oh, you need it by county or state." Fine. If you collect it at county or state, then you have county or state, you can't go the other direction then. If you start at the lowest level, I can aggregate to a level that I can share it, but I can also go back and do more analysis at a lower level.

So what do you need? You need computers, you need software, you need people trained on their stuff. So if you're out doing data collection, you need, you know, GPS units, etc.

So data sources, there's lots of them, there's lots of bad data out there. So you've got to be careful. We'll talk more about data later, but there's lots of data that you can, buy, there's lots of data for free. If you go onto Google on the internet and you go out just say, "I want GIS data for George," there's tons of data from various people. You just got to be careful because some of it's good and some of it's not very good and you don't know what the difference is. And unfortunately, we run across that at CDC all the time, people just don't know. They'll get what they think's good data ad they'll use it and it potentially could have bad analysis results. So I would say that as you get into more, learn how to read the meta-data, we'll talk about that shortly, or later in this class, but know how to read the meta-data, it's data about data. Who made it, when it was made, you know, can you trust it? And it's not always that easy.

I ran across data in Kenya through the International Livestock Research Institute, ILRI, that had data from USGS. If there's data from USGS, I'm going to trust it, right? They're a pretty darn good GIS agency. They do a lot more than we do at CDC. And so I got data from ILRI, we're doing stuff **** yellow fever outbreak when I was in there, what was it 2006 or '07, whatever year it was now, you were there, too, Henry? I was there, too.

An so we were doing analysis and I opened the meta-data for some of the stuff from ILRI and it was USGS data, fine, but it was in North American data 1927, which means that the data they were using for Kenya was data that was locally accurate for North

America, hmm. Which is kind of fun if you're doing thematic mapping, where you sort of look at rates by area, okay, fine. You know? But if you're in a, sort of doesn't matter, because you're not doing sort of spatial analysis. But if you go to do spatial analysis, it's going to be wrong, and you're going to have errors in there a datum that's not appropriate for Kenya. We'll talk more about projections and datums later, what that means. But just you have to know to look at that stuff and you have to know to ask those questions. So, know the source. And if you know the source, still check.

Okay, so conventions information systems, to kind of answer these questions, except for the one component of where? That's where GIS comes into the sense of place, right? One of our key three things for epidemiology, a person, place and time, this is our place piece, you know, and so how we do our analysis by place and time.

So we add GIS in, we're asking, you know, the location information of where it happened, when it happened, we can our spatial/temporal analysis and look at trends over time. You know, we've all seen these maps, we've seen this analysis. And I know that's the reason you're here, because you want to do it. And the key is to collect the right data as you're doing the analysis. And making sure that Geographies involved. Whenever I work with people on surveillance or sort of doing survey design. My mind, I'm thinking geography first. And then what happened there?

And we tend to, as epidemiologists, think of geography last. It's always like, "Oh, yeah, we got to add some place thing in." You know, and to me, I know the direction, I start

with geography and I work the other direction. What level do we need the data? Where do we need it and then what do we want to know about it. And so maybe when you leave here, you'll think like me, or geographers, and think of a place first.

So you like we said, data, you know, there's all kinds of data out there and it ranged from local to global and it depends on what scale you need, and we'll talk about scale more coming up. But at a local level, it means you have more local content, in other words, it's more locally accurate. If you want to do analysis of point source pollutions along the other river, that it may be appropriate to have a very detailed version of the rivers. If you go to the ESIR dataset and you pull in the **** , there's a little line squiggly line going down there, because its very generalized, because it was at a scale that represents hydrology at a continental level. IN other words, I can look that whole US and see the, sort of blurred squiggly lines, And that's kind of fine, right? For the US, because you won't want all the details of the Ohio river on the us map. But if you wanted to do analysis for Ohio, then you need more, approximate scale of the rivers and that's information we're—we need the access information to know to ask that question. I'm going to do an analysis of this level so I need a detailed version of the river, not just little squiggly lines you get from the generalized dataset from the ESRIC.

When you have data by, like this, it's tough to interpret. You know, if you walk into one of your leaders and you hand them this, they're not going to be happy with you. Because they want quick information, they have to make decisions, they have a lot of stuff going on. And what they want to see is, give me quick information that tells a story

and then more on with life or the next problem. And if you walk in and expect them to interpret a database or a table, that's not good stuff.

So if we walk into our EOC, that's the emergency operations center at CDC, you won't see, you know, like tables up on the screens, you'll see maps and you'll trends maybe, or bar graphs. Because they want to be able to look at the information and make a decision.

So you can look at this information and sort of know a couple things right off the bat. You know, do we have high pollutants around areas of higher black population? So for environmental justice, this type of analysis is done all the time. And so what we're asking is, you know, at a quick glance, I see the population, the black population, I see the pollutant areas and can I tell if there's a higher than normal, higher, you know, do we seem to have trends of higher pollutant areas around certain populations.

So how do you do that? Well, within the GIS road right, we simplify the geography to the most simple level, right? Each of those are called a layer in the GIS world, so when you get into the software, whenever you look at layers, this is one layer, this is the municipal layer. And here you have the municipal boundaries, and behind that, you would have the database about the municipalities. And on top of that you have census tracks, I'm sure you guys have all used census track data, you know, for all your denominator information. And again, it's just another layer that we lay on top of that

one. So now it's census data on top of the municipalities. And then some hydrology just to, for context, **** to get into.

And our polluting companies, again, behind these are that databases that represent information behind this, would be, you know, who they are, where they're located, what they emit per year, at least what they're reporting to the system. You know, that kind of pollution company they are.

And within GIS, you have all these layers, so this is a map display area, we'll talk about more coming up, your table of contents and all those layers you have are each individually lined up down the table of contents, you guys will get to play with all that stuff coming up. If I click on one of these things, then I get the database about that. I could see all the information about that particularly feature that you select. So I just sort of go on this screen and click on things and see what's in the database about those features. The only thing that's in the database is what you've put there. So don't expect there to be a bunch of information if you haven't entered it, or you haven't jointed in, or you haven't gotten that from someone else. Some people always ask, they'll click on and go, "Where's all this, we want to know all this stuff?" Well, you have to provide that. It doesn't just magically appear in the database. I wish it did, believe me, I wish it did, because that's where the time is. The time is really spent on the database side. We spend hours and hours and hours getting the data in for stuff. Collecting data from people, joining it in, getting it right, because that's what the majority of the time is, on data, not GIS. The GIS part is pretty straightforward.

I can select a feature and it selects that record from the database, so I can see which one I'm sort of talking about.?

And then if I want to know specific things about it, I can click on this selection menu up here and I could just select attributes and I can go in and say, "Well, which of these businesses have more 50,000 pounds per year of omissions. They will select those out.

Say you want to go in and simple queries, or spatial queries. You see attribute and spatial queries both and we'll talk about those more as we go on through the course. Then it comes back and it shows us, you can map by those different areas. On here we have, you know, from 0 to 25,000, 25,000 to 50,000, 50,000 and above, of these businesses that emits air pollutants of ****

You can buffer those areas really quick, and again, these are pretty simple GIS things. You buffer it and say, okay, within the buffer distance, how many potential, you know, people are affected? In this case it's schools, how many schools around this area?

Interesting part of this is that when I was in Lincoln, a similar thing like this sort of popped up. I was driving to work one day and there was an article on the news, there was a spot on how the Lincoln Public School System was considering putting a, moving the schools over into a warehouse, in a business called **** Motors and housing these elementary schools in this warehouse district while they renovated the schools. So

what they were going to do, this business was going to lease the warehouse to the school system for a buck a year and for 15 years, there was 15 elementary schools. So we were going to take an elementary school, put them in this warehouse, renovate their elementary school and then when they were done, put them back, bring the next elementary school in. So in theory, it's a good idea, right? Sort of good deal for the city, I'm sure the business got some nice tax write-off, they could renovate their whole school and get them back in and everyone's happy. So as I'm driving to work, I hear this on the radio and they're going to vote on it the next day, the city council was, and I'm thinking, "Man, I'm pretty sure I know where that business is at and it's not a good area for an elementary school." It was right smack-dab in an I-1 zoned area, which is the worst of the worst for industry. And so I get to work and I sort of open GIS up and I pull in this stuff. I pull in, you know, where the tier 2 sites are at, where the title 5's—so title 5's are businesses that omit air pollutants, toxic release inventory, TRI, are also bigger, bigger ones that omit air pollutants, special waste are ones that house or store chemicals for usage.

And then, so I put all those in, I seen where they're all around this thing, because they're right in the middle of an **** zoned area and right in front of it is a truck bypass for getting, you know, for the trucks out, and that's the only entrance/exit to the school, so we're going to have this truck traffic, you know, in front of the school. And then within 500 feet was a key rail line, so a key rail line means they can haul hazardous chemicals. There's a rail line versus a key rail line. So if you hear the word key rail line, that means that they can haul hazardous chemicals. And not only was it within 500 feet

of the school, it crossed and sort of went different directions just in front of the, just north of the school. And for accidents, for trains, they have a higher sort of rate of accidents at crossings, where their lines cross. They were in a flood plain, the building's in a flood plain, but the building itself is elevated 1 foot above the flood plain. The only place for a playground was next to a Lincoln Electric substation and the area of the flood plain behind the school was a Nebraska sod farm operation, they use the flood plain for a sod farm area and if you've ever been in Nebraska, you know the wind always blows in Nebraska, so you know there's going to be potentially, you know, drift and spray applications.

So here you have a school that's right smack-dab in an industrial zoned area with elementary kids that has a lot of risks around it. And so I documented all this very quickly, gave it to my health director, and he went to the mayor and the city council and sort of presented the potential risk and that afternoon, the owner of **** Motors came in and bitched out our health director and let him know they didn't ask the health department's opinion, but we gave it to them anyway. And then the next day the city council said they were no longer considering the site. So there's an article in the newspaper that said they were no longer considering that as a site, a potential site, but they did not agree with the health department's assessment. So I didn't really give you an assessment, I just told you what was there. You know, it's up to you to decide if you want to put a school of kids at risk. You know, maybe nothing would've happened and it would've been a great deal. But one key rail line within 500 feet crash by the school, so you have a school of dead kids. And you know, who wants to be part of that.

But the point is of that, is that when you're in the GIS world, you sort of have to collect data all the time. If I would've had to go out that day and collect all this data to do that, to put that sort of assessment together and give it back to him, I couldn't have done it, there's no possible way. So you are always sort of a data hound, you're always looking for data sources, you're always sort of getting to know people and you're writing their name down, "Oh, this person works for so-and-so, and I may need to call them," so I document that in some way. And so I was always sort of just getting information, getting links to other agencies so I knew what information they had because that's not health data, right? That's everyone else's data and we really need to be friends with everybody else. Because we again, we're takers and not givers in the GIS world of data and you've got to make a lot of friends.

All right. So just a quick, you know, GIS application, it's used in every industry. I don't know an industry that doesn't use GIS one way or one another. The same analysis that we do for doing site location for a potential summer food program, is the same one that Domino's Pizza does to locate stores. They're looking for the best clientele based on demographics who need access to a pizza. Guess what we do for access Medicaid? We look people who need access to access Medicaid. We put the site hopefully where they can get to it easily, not on the other side of town.

So I'm going to go through some of these pretty quickly, if my mouse will cooperate. I'm clicking, but it doesn't go with me. So just quickly, **** mapping, this is what we're

referring to, just some indicator of variable by some area. So we've all seen this stuff at maps, right? So it's just something we're looking, in this case it's refugee population by country per, you know, per thousand. You know, we can go down to the level of looking at parcel information and know that if you're going to geocode date it and you need the most accurate possible, the most accurate is by parcel. It's also the hardest to do. So you're geocoding to an actual address to someone's land piece. That's not the same as geocoding by street address. I'll talk more about geocoding tomorrow afternoon.

But people think when they geocode data, they're actually geocoding the house location. What they're doing is they're doing an interpellation between notes. In other words, when you geocode by street address, you're saying you have a street segment of this length, x-length, Nebraska, the rule in Nebraska where I grew up? That's a mile long. You know, urban areas, it's maybe 400 feet, 300-400 feet rather. So your best guess is going to be within 150 feet of, in an urban area, 150 feet of the actual address. Mine, you'd be a mile off, but maybe you're relevant because we're the only house on that mile section road.

So, you're usually within the same demographic area, so you're within the same census track, which is an important part for denominator purposes, but the chance that you're actually to hit the house are pretty slim. How many people have put your address in Google? Was it on your house? Really? On your actually house? See, mine's down the block.

SPEAKER: [Off microphone]

SPEAKER: Really?

SPEAKER: [Off microphone]

SPEAKER: Yeah. That must've been the one they drive by, that one? Yeah, yeah. That's kind of funny.

SPEAKER: [Off microphone]

SPEAKER: They've actually had a lot of discussions about that, of people potentially getting caught in, you know, somewhere they're not supposed to be or where people are not supposed to be and there have been discussions about that. But I mean, most of the time, you're lucky, I mean, if you put in your address on just the Google maps, so not that particular one, but on Google maps, does it actually land on your house or sort of down the street? So what happens is, if you have a 100 block and 200 block, if your address is 150, where's it going to put the dot? In the central of that segment of road, right? In the 100 block and 200 block. But 150, the chances that 150 is really the midpoint of that segment of road is probably pretty slim. It's going to be wherever on the street, based on that community and so most of the time it's not exact on your property. Like mine's down the street, my address is 964, but ends up being down the

street aways. It was on the same street, so I can still use the same census track denominator information.

But once you have access to parcel information, you have access to a bunch of other stuff, because then you start accessing the plan department, assessor's office, and access some of their data about the parcel, and about the people who live there. So it's kind of an interesting analysis if you get to that level.

SPEAKER: [Off microphone]

SPEAKER: I mean, it may be hard to get, I mean, I know Tele Atlas offers that, it's part of what they do, but I would question the accuracy, I mean, the currency of it. Because it's hard, I mean, you have a local community who collects it, even at a state level, you know, it changes daily. So unless there's a fee from everybody into Tele Atlas, then it's tough, because even at state level, they don't have state level parcel data that's accurate. I mean, it's historically sort of accurate, but currency, you know what I mean? If you look at Gwinnett County in Georgia, I mean, that thing changes daily.

SPEAKER: [Off microphone]

SPEAKER: So it depends on your application, what you need. But just, you know, quickly, once you have housing information, like this is out of the census data, you can go in and look at simple stuff like rental housing and vacant housing. These are sort of

nice little indicators to look at health of the populations, health of the neighborhoods. And, you know, there studies that have shown where you have a higher number of rental properties, high number of vacant housing, you typically have a more transient population, that leads to other social economic situations. So these type of simple indicators, you can do really easily and map out and start looking at your health of your neighborhoods. You know, where to identify, where to put school programs, you know, after school programs or, etc., you know, geriatric programs. And this is exactly what hospitals do. If you look at pretty smart healthcare systems, like if you look at Jewish Hospital Louisville, they have a GIS planning unit as part of their hospital and they plan where they're going to put their clinics based on sort of demographic and patterns of the community.

You know, you look at a community, this is what Domino's Pizza does, too, you look at a community and say, "What do they need over there?" Is it an older population, younger population, they need a geriatric clinic or do they need a pediatric clinic? You know, what's appropriate for that neighborhood? You know, Domino's and etc., they map out who buys pizza. You know, they sort of target those areas and put a new store. So it's the same analysis.

Here's an Ohio example for the ODH folks, you can kind of look at the Ohio River and where they have the population on the Ohio River and then where they have pollutants along the river and what populations are potentially at risk. So they go in, they do sampling along the river at certain points and they sort of monitor those same locations

throughout the year and see what changes and if there are significant changes and why. Why do we have pollutants in certain locations?

So this is a surface interpellation, this is stuff you can start doing with either, depending on what you're, you can use different programs, not necessarily with RGIS, other programs do this, too, but within RGIS, you can use spatial analyst and geostastical analyst, start doing some of these surface interpellations and what this means, what a surface interpellation means is you don't have continuous points across the US. Right? You have a handful of points around and you're sort of averaging them across the board and creating, well, it's like a weather map. That's what they do, they have weather stations sort of around the US and they sort of average across there to create these weather maps and this is a surface interpellation using **** to say what are our patterns, you know, what is this? Pertussis incident rates.

**** mapping, we've all seen this, you know, by state, we do this all the time. Oh, the machine's so slow today. During Katrina, I was deployed to the Secretary of Health's operation center and every day at 1:30 I had to have this map and another one updated for the Secretary of Health, not a fun, 1:30 has never been more stressful in my life. The door right beside my desk went to the Secretary of Health's office and from that door to open it was like, who's coming in? You know, and it was always somebody they'd haul in there to show around and they'd go back out.

But what we would have, this particular one was the, we were tracking all assets in the, during the hurricane and this one was capacity of shelters. So every day, Red Cross would send an update, I would have to pull that data in and look at how the population was spreading and how we were responding with federal assets to meet that mobility of the population. And these are locations of shelters and as they would, the size is based on the amount of population, the yellow areas are available space, and blue areas are filled space. And so this would change daily as we'd get reports in. And sometimes it was just, I had to go dig through faxes off a fax machine and try to get information to put information together for the Secretary of Health.

The funny part is that one day on a Thursday night, the travel person, I guess that's what his job is, but he came in and said, "The Secretary wants to go on a trip tomorrow and we want your help in mapping this out, where he's going to go to." I said, "All right, well, where's he going to go?" He said, "Well, he's already been to Mississippi and Louisiana, so not there, but it has to be near a federal medical shelter and near other shelters that are being used, you know, just normally these Red Cross shelters or/other shelters, because Red Cross oversees all mass sheltering for the emergency support function. So even though it's not Red Cross, they still report to Red Cross.

And so I said, "All right." So I sort of mapped it out and I'm calling these shelters to see if they really exist any more, because the reality is, we're getting data and who knows if it's really still there, they could've broken up and moved people off. And so I'm calling them all and, yeah, these things are going, whatever. And so I give the, I do the little

trip thing and give it back to the travel person who gives it to the Secretary, the next day the advance team goes to—and one was Atlanta. So, you know, Georgia Tech Coliseum was being used as a shelter for a while and so we had that as one of his stops. And the advance team gets to Georgia Tech Coliseum and they go there, and it's empty. So they call me and the Secretary, "Hey, this thing's empty, you said to come here," you know, I'm like, last I knew it was being used a shelter, you know, they had broken it up and sort of made a bunch of small shelters out of it. But then they used the, I think, was it the Georgia Dome as like a super processing center and so they ended up visiting that instead, and it worked out really well, because they could see how they were processing for benefits afterward but I never want to be the travel person for the Secretary of Health, that's not a fun job. Not during an event.

But just know that data changes and these events like this, you know, you always have to double check and I tried to, I mean, I called people, I called CDC down to REOC and said, "Hey, is the Coliseum still being used?" "Yeah, yeah, it's there, full of people." They got there and there was no one there, empty.

So you know, GIS, when you think about GIS, you think about stuff as being sort of, people typically think of it being communities or states or counties, you know, towns. They don't think about GIS being used in buildings or human bodies or brains, it's all about our scale, right? So, you know, brain surgeons now use GIS to map out brain images, so the whole geography is the human head and that's the extent of their geography, you know, in this case the geography's a building. A postal facility for the

anthrax, you know, situation, the red dots in here are positive swabs of anthrax. An interesting part of this map was it didn't necessarily flow the route of the mail. And so they thought that well, the mail would sort of run this way and the anthrax would sort of follow that way, and it didn't. That sort of threw everybody off, why would that be? Why wouldn't it follow through? And it's because they had a door open down here and a door open down here and the wind was kind of blowing across that way and guess where the anthrax went?

So you may not always, things may not always be obvious until you sort of map it out.

You know, real time surveillance systems, we all sort of know about that. Again, Ohio, they sort of are the, you know, the key to this rabies, you know, spread. I don't know how well you guys are aware of rabies, but Ohio is sort of the firewall for the rest of the US and so they've got this huge surveillance activity in Ohio and this rabies from raccoons ever gets across Ohio, we can't stop it. It's just going to take off. And so we've got a lot of preventative efforts in Ohio of trying to stop this. And to the state patrol in Ohio, GPS the location of every dead raccoon and they pick it up for testing. So they have a lot of GPS location of dead raccoons in Ohio.

You know birth defect clusters around a metro Atlanta area, again, you can, you know, start mapping daily for anomalies in the data.

Again, some more surface interpellation of unhealthy days, so for chronic conditions versus acute in like stroke death rates, this is on a chronic.

Interesting part of this map, whenever I look at this brief series of these maps is that I grew up in Nebraska, in rural Nebraska, and I'm from out here. I went to school in Nebraska right there, University of Nebraska, but then I moved down here. So I went from a very healthy area to a very sort of unhealthy area. And unhealthy again. So see, again, it's a bad mood for my part. Should've stayed in Lincoln, I guess.

You know, another way just to look at data differently? You don't always have to look the data the same way. You know, there are many ways to look at information, just to sort of get an idea of patterns. This is a 3D look at pertussis rates and, you know, it tells you the same information if you look at it in 2D, it's just another way to look at the data.

Some of the stuff I always did when I was in Kenya, we were looking at, you know, human and animal cases of **** fever and suspect confirm cases and so we were tracking cases through the Garissa District, this is where our team was, you know, initially at, was in Garissa. And then we were, you know, working with the Ministry of Health and Ministry of Livestock to see how we could sort of stop this, you know, from spreading across Kenya, but then it jumped over to Berlingo and so it went from, if we back up there, so Berlingo's over here. So we sort of thought we could contain it and there was discussions of immunizing livestock, you know, because there's a livestock vaccine for **** but not humans, and we thought, well, maybe if we vaccinate all the

livestock that don't have it and once they have it, they have it, you're done. So any time there's a confirmed case and it's sort of irrelevant then because, you know, be vaccinated by the vectors. But, you know, if you could sort of put this firewall across here and vaccinate ahead of it maybe, but then that happened and it sort of jumped clear over to Berlingo and they had a bunch of cases in here. And again, it's livestock samples, so it kind of spread ad ran its course.

After the earthquake happened, we went to, well, we were going to, our team did, I ended up not going. I was supposed to go to China for this last year in response to the earthquake when it hit, you know, China. Right after the earthquake hit China, the cyclone hit Myanmar, so I got sent there instead. So I was going to China, got diverted to Me mar doing an assessment of the delta after the cyclone hit, so that's another whole other discussion I have on how we did that assessment.

But this system, we just actually just finished implementing to Saudi Arabia, so I had a trip to Saudi this last fall and set up this mobile surveillance system for Saudi Arabia for **** and this is the same thing we did for China, but it can do assessments in the field using smart technology. So Saudi Arabia for **** right now is doing their surveillance on smart phones and they would collect their data on smart phones, it would send it back to their command center in real time. So they were doing seven diseases with ten different forms, ILI being the main one. So they were tracking ILI in real time, it was pretty cool stuff. And it was using this same set up we did in China.

So does this spur your interest enough to want to learn GIS?