Poison Control Centers and Toxicosurveillance: Real-time National Surveillance for Outbreaks of Chemical-Associated Illness
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Coordinator: Thank you for standing by.

At this time all participants are in a listen-only mode. After the presentation we will conduct a question and answer session. To ask a question at that time you will press star, 1.

Today's conference is being recorded. If you have objections you may disconnect at this time.

I'd like to turn the meeting over to your first host today, Alycia Downs. You may begin.

Alycia Downs: Thank you. Good afternoon and thank you for joining us for today's COCA conference call entitled Poison Control Centers and Toxicosurveillance: Real Time National Surveillance for Outbreaks of Chemical-Associated Illness.

We are very pleased to have Dr. Josh Schier present on this call.

The PowerPoint we will be using for this call was updated at 10:15 AM today. If you downloaded your slides before this you may want to download the updated version now. Please go to www.emergency.cdc.gov/coca, C-O-C-A. Click on conference call information summaries and slide sets. The PowerPoint can be found there.

Dr. Schier is a medical toxicologist in the health studies branch within the Division of Environmental Hazards and Health Effects in the National Center

for Environmental Health here at the Centers for Disease Control and Prevention. Dr. Schier serves as a primary medical toxicology subject matter expert for all of his branch's response and research activities.

The objectives for today's call: after this activity the participants will be able to understand the role of Poison Control Centers in cases of clinical illness, understand the role of Poison Control Centers for surveillance of chemical associated illness. And understand the potential benefits as well as the limitations of using poison control centers in national surveillance for chemical associated illness.

In compliance with continuing education requirements, all presenters must disclose any financial or other relationship with the manufacturers of commercial products, suppliers of commercial services, or commercial supporters as well as any use of unlabeled product or products under investigational use.

CDC, our planners, and the presenters for the seminar do not have financial or other relationships with the manufacturers of commercial products, suppliers of commercial services or commercial supporters. This presentation does not involve the unlabeled use of a product or products under investigational use.

I will now turn the call over to Dr. Schier.

Josh Schier: Thank you. Thank you for that introduction.

Good afternoon and it is a privilege to be able to talk to you today about Poison Control Centers and their role in toxicosurveillance for real time national surveillance of outbreaks of chemical associated illness. This is a

joint product between scientists at the CDC and the American Association of Poison Control Centers.

I would also like to take a minute to acknowledge the large number of people working on this project. Both at CDC and AAPCC as well as at all of the local and regional poison centers, who are among the people responsible for managing the individual cases of illness as well as entering data into this system.

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There are about 61 Poison Control Centers all over the United States that participate in the system that I will be describing. They can be further broadly classified into three categories: local, state, and multi-state. This classification basically describes their particular catchment area. Local poison control centers are responsible for calls in a defined region within a state, whereas state poison control centers typically cover an entire state.

Some poison control centers, as we shall see, actually are responsible for covering more than one state. This being said, there is nothing to preclude individuals from anywhere in the world from calling a specific poison center if they want. And many local poison centers receive calls from all over the country and even the world.

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In front of you, you should have a crude map demonstrating the location of all 61 poison control centers. As you can see, many states have more than one poison control center and some have none. The states that do not have a poison control center typically route their calls to a neighboring poison control

center as part of a pre-existing agreement between health authorities of the two states.

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Poison control centers are staffed by specialists in poison information. These are typically health professionals such as nurses, pharmacists and even physicians that undergo advanced clinical toxicology training. There is also a separate Specialist in Poison Information or SPI certification process.

Each poison control typically also has a Managing Director who is usually responsible for managing the SPIs and daily activities of the poison control center and a Medical Director. A Medical Director is a physician usually board certified in a sub specialty of medical toxicology and who often has completed a formal fellowship in medical toxicology. A Medical Director provides medical back up for clinical issues as needed. They may sometimes overlap between some of the roles and responsibilities of these two individuals.

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The American Association of Poison Control Centers has established a toll free number that will connect the caller to the closest poison control center automatically by dialing 1–800-222–1222 if calling from within the United States.

Poison control centers received more than 4.2 million calls in 2007. Of these, about 2.6 million were actual calls regarding human exposures, and 1.6 million were information only calls. Information only calls may be about a

wide variety of issues including drug interactions, teratogenicity, adverse drug reactions, poison prevention, weapons of mass destruction, or other issues.

About 132,000 calls were also in regard to animals. Although there is a poison control hotline for animals staffed by veterinary specialists, this is a separate number and separate organization. There is a charge associated with the use of this service. So many people chose to call the existing poison control center network established for humans.

Of note, is that there was more than 4.2 million follow up calls to confirm patient safety, provide additional information and obtain outcome data for exposures in 2007 alone.

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As you can see from the slide here, over the last 23 years or so, the number of populations served by poison control centers, as well as human exposures, has increased dramatically. In 1983, there were only 16 participating poison control centers that accounted for approximately 250,000 human exposures. Whereas as of 2006 there are 61 poison control centers and now account for approximately 2.4 million human exposures.

Now I would like to talk a little bit about the day-to-day role of SPIs, or Specialists in Poison Information, in regards to data collection. I will take a minute to emphasize now that the primary responsibility of the SPIs is for providing clinical guidance and managing actual cases of illness.

However, after this has been done SPIs do enter much of the collected information into a local server. The type of information entered includes a variety of things, including basic demographic data as well as clinical data.

The SPI is somewhat limited as to the type of data that can be collected and entered into the system, as there are limitations on the datas in the system.

For instance, there are 131 pre-coded clinical effects, or signs and symptoms, that the SPI can chose from when it comes time to choose the clinical effects for the particular case. In addition there are 72 pre-coded treatments, decontaminations, and management options that the spy can code.

Some of the examples of data that a SPI can enter includes things like patient age, substances involved, route of exposure, reason for the exposure, location of the event, signs and symptoms resulting from the exposure, and medical outcomes.

In addition, there is a comment box where specialists in poison information can make comments and notes about the case and also include relevant details that may not have a pre-coded option available, such as including a descriptive narrative of the exposure scenario. Information is stored locally on the local server and not uploaded to the national database. I will talk more about this shortly.

Data entered by the SPI is stored on the local server and is uploaded in near real time to the National Poison Center database. This electronic database is managed by the American Association of Poison Control Centers. The database was formally known as The Toxic Exposure Surveillance System or TESS, but it has been rebuilt and renamed as The National Poisoning Data System or NPDS.

All 61 poison control centers contribute data to the national database in the manner which was just previously described. Additional details coded by five

in the comment box are not included in the upload and they are not available through the national database.

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This is a schematic illustration of the data flow within the National Poisoning Data System. Queries to local poison control centers come from members of the general public and from health professionals. These are most commonly located in hospitals. Local poison control centers collect this information, provide clinical guidance and follow up activities, and then enter data into their local server. Information is then uploaded in near real time to the National Poisoning Data System.

So what exactly is NPDS and what does it do? Well, NPDS monitors and analyzes real time data from individual poison control centers to detect intentional and unintentional chemical exposures and illnesses.

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There are a number of different utilities for the National Poisoning Data System. It serves as a repository for case information from calls. It is the only comprehensive acute poisoning surveillance database in the US. It can help focus prevention education efforts and guide clinical research.

Finally, it can also be used to identify trends. Both in known types of exposures, but also in not previously documented types of exposures.

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For instance, the recreational use of Gamma hydroxybutyric acid, or GHB, which causes transient coma-like systems, bradycardia and apnea came to light as a result of poison center based observations. The reference is below for the audience in case they wish to learn more.

What I have described thus far is mainly the structure, operations and utility of the National Poisoning Data System as it has been used up until the last several years. I would now like to discuss more in depth how the National Poisoning Data System is being used for toxicosurveillance activities.

In 2003, the charge came to CDC to create a national chemical terrorism surveillance system. What resulted was a collaborative effort between the American Association of Poison Control Centers and the Centers for Disease Control and Prevention to use the National Poisoning Data System for this purpose. And hence toxicosurveillance was born.

The primary goals of toxicosurveillance are as follows: To improve public health surveillance for chemical exposures. To identify early markers of chemical events including characteristic symptom complexes, temporal and regional increases in hospitalizations., and sudden increases in case frequency or severity with the objective of providing a rapid and appropriate public health response. A third goal is to track ongoing events.

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The remarkable temporal consistency of data from the National Poisoning Data System allows detection of outliers and aberrations. These aberrations could represent chemical or bio terrorism incidents, but they could also represent other types of incidents of public health significance.

Some examples include: contaminated products, new drug or product hazards, and emerging drugs of abuse.

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Here we see that the frequency of human exposure calls over a three-year period is remarkably constant with an overall increase in call volume that occurs over the summer and has its lowest peak on Christmas Day each year.

Next slide.

Now we see that pesticide exposures are relatively constant over a ten-year period as well. They peak in summer and have their lowest point during winter. This is consistent through out every year.

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In this slide we see that three different years are superimposed on the same graph over approximately a ten to twelve month time line. Calls about cough and cold preparations in children under age 5 years of age peak in winter months and fall off to their lowest point in the summer months. These are represented by the peaks and troughs shown on the graphs.

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Here is an example of data graphs about a specific clinical effect contained in the National Poisoning Data System, conjunctivitis or “red eye”. In this graph we see that, in general, calls about red eye increase in the summer months and decrease during the winter months.

Next slide.

Here we see that calls about carbon monoxide cases by day increase consistently during the winter months.

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Finally, this is another example of a graph illustrating calls about a specific clinical effect. In this case, vomiting. We see that over a three year period calls about vomiting are constant showing non predilection for time periods, seasons, or other relative high points. In other words, calls about vomiting do not really vary with time.

Next slide.

We have talked a lot about the structure and function of the National Poisoning Data System and the consistency of the data contained in that media. I would now like to talk a little bit about the toxicosurveillance methodologies used in evaluating this data.

The American Association of Poison Control Centers and the Centers for Disease Control and Prevention perform three different types of surveillance. Surveillance for outliers on call volume is performed hourly and at each local poison control center, as well as nationally. The threshold used to determine if there is an outlier consists of comparison with a historical baseline average and three standard deviations.

Surveillance on the number of each of the 131 clinical effects contained in the National Poisoning Data System is also conducted on a continuous basis. In this case the daily national cumulative total number for each clinical effect is

tabulated and compared to a threshold value which is obtained by comparison of a historical baseline average plus two standard deviations.

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Finally, we have the capability to perform case based surveillance, which includes organizing collections of specific clinical effects and other items in regard to specific agents. This is however limited to the pre-coded options contained already within the system. Case based surveillance can also be used to track exposures to a particular product and we'll talk more about this later.

A detailed description of the early methodologies used in toxicosurveillance activities can be found in this manuscript which was published in the Annals of Emergency Medicine in 2006.

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In 2006 and 2007 the National Poisoning Data System underwent a complete rebuild. This rebuild was primarily funded through the Centers for Disease Control and Prevention and created an enhanced capability for data management. It is incorporating GIS functions and maintains local access for each poison control center to their data. However, officials at the American Association for Poison Control Centers and the Centers for Disease Control and Prevention do have access to all data for toxicosurveillance purposes.

Here's the National Poisoning Data System. It is live, web based, and is accessible online.

Next slide.

Routine National Poisoning Data System surveillance activities are primarily conducted by members of the American Association of Poison Control Centers Toxicosurveillance Team. When the system identifies an outlier by one of the three aforementioned surveillance methodologies, an email alert is generated to notify all members of the American Association of Poison Control Centers Toxicosurveillance Team and other subscribers. A very partial example of the alert is below. Please note that this is a redacted photo of such an alert. With identifying information about the cases and the subscribers removed.

Next slide.

Clinical effects surveillance outlier alerts come with an attached Microsoft Excel spreadsheet illustrating the clinical effects count and the amounts above the threshold value. In this case, the blue represents the area under the threshold and the shaded area represents the amount above that threshold. More information is contained below, including the actual case counts, the historical base line means, and the standard deviations for that outlier. This information is coded for each outlier. The illustrations are made based on the utilization of a logarithmic format for data analysis.

Next slide.

I would like to emphasize that routine call volume and clinical effect monitoring is performed daily by members of the AAPCC Toxicosurveillance Team. Although CDC scientists do have access to the data.

The AAPCC Toxicosurveillance Team is responsible for investigation of all alerts and outliers. They typically follow up with representatives of the local poison control centers regarding outliers and monitor trends. They also can

identify potential events of public health significance, and the team members themselves are located at different points in poison control centers around the country.

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There is also a multi disciplinary CDC Toxicosurveillance Team. Made up of scientists with expertise in epidemiology, statistics and medical toxicology. CDC scientists are able to conduct their own data searches for events of public health significance. They can create their own case definitions or call volumes for clinical effect based surveillance as needed for outbreaks of chemical associated illness as they occur.

CDC scientists mainly use clinical effects-based case definitions for our purposes, as we are typically conducting for surveillance for cases of illness associated with a specific product.

Next slide.

I will briefly take you inside the National Poisoning Data System for a bit. To demonstrate the utility of the system. I apologize in advance for the small print on the screen shots, hopefully they will be readable.

When you enter you have three basic options. As you can see at the top of the screen shot. One can chose reports, toxicosurveillance activities or utilization of the anomaly monitor function. We will talk about all three.

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The reports function offers a wide variety of functions allowing one to download different types of information from the National Poisoning Data System over a designated time period as needed. As shown in the screen shots there are numerous ways to look at the various different types of information in the system.

Next slide.

The toxicosurveillance activity function allows you to build case definitions for toxicosurveillance activities such as case-based definitions. Here you see that we are building a specific clinical effect case-based definition. And one is able to put as many different types of clarifiers on the case-based definition itself. For example, an age, which is checked above, a variety of choices is presented that can be used in building a case-based definition. One has the option to choose more than one category or to choose one or another category. Or even to exclude a particular category, as can be seen under the header at the bottom of the screen shot, Boolean expressions and it's labeled and, or, not with parentheses.

In this screenshot you can see that one can also chose a number of different clarifiers for reasons for exposure, which is checked at the top of the picture. Some examples of reasons for exposure that can be selected include abuse, bite, sting, contamination, tampering, drug, environmental, or any of the other particular pre-coded items that exist within the systems. Of course, one can also choose not to use any particular clarifiers in any or all of these particular categories.

Next slide.

This is an example of the clinical effects screen in which we have the ability to include any number or combination of the listed clinical effects shown here in a case based surveillance effort. The clinical effects button or box is checked at the top of the screen. That highlights or creates a number of options that can be chosen from the clinical effects menu. Several of the clinical effects are listed below for your viewing. They include things like burns, chest pains, coma, creatinine increase, cyanosis and many others that are part of the pre-coded clinical effects options that exist within the system.

Again, one can choose from any number of these or any combination of these by using the expressions below at the bottom of the screen shot: and, or, not, and using the parentheses function.

Next slide.

So how are these case-based definitions used in a practical setting? Well, you may remember from earlier this year that Ricin was discovered in a hotel room along with an Anarchist's manual. The occupant had called 911 for the rapid onset of severe respiratory distress and was transported to a local hospital where he progressively worsened and rapidly became unresponsive and unable to answer questions. In this case, the potential risk for a chemical terrorism event was real and the motive unclear. As a result CDC scientists set up their own case-based definition for inhalational Ricin exposure.

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The components of the inhalational Ricin case-based surveillance definition are listed above. Note, that we are limited to using the pre-coded criteria already contained in the system. In this case, the case-based definition used the following criteria. It had to have been a human, the patient had to have had

dyspnea and coughing or choking. In addition, the person had to have respiratory arrest, or pulmonary edema, or x-ray findings, or excess secretions or a coma. And it had to have been an exposure call.

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And more recently, an extraordinary high amount of selenium was found in an over the counter dietary supplement which was linked to almost 200 cases of selenosis in the United States. While this was occurring CDC scientists set up a case-based surveillance definition for selenium-associated illness.

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The case definition that was used to identify cases of selenium-associated illness is listed above. It had an exposure and clinical effect component. We also worked with the American Association of Poison Control Centers to create a temporary code for this particular product. This meant that when SPIs did receive a call about it, they could check this box and the information would be immediately captured via a separate mechanism. This turned out to be a much better way for this particular instance to collect case information but required pre identification of the implicated product. Information that we fortunately had.

The case-based definitions for selenium-associated illness which was used included the following components: It had to have been a human, as well as an exposure call, and an ingestional exposure. The patient had to have diarrhea and nausea and any number of the following symptoms listed under the third bullet of your slide.

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CDC scientists can also use the National Poisoning Data System to create call volume case definitions but do not routinely do so. As shown, we do have the ability to set a variety of limits on it, such as minimum and maximum thresholds.

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The system allows you to pick the subscribers for a specific case definition that you have built. By choosing any number of the pre listed subscribers or adding new subscribers to the system, once an email alert is generated for an outlier that the system has identified, it will be sent to those subscribers so that they may be notified of an aberrancy that needs to be checked.

I would now like to provide – next slide, sorry – I would now like to provide an illustration of the practical utility of using the National Poisoning Data System data as a chemical outbreak surveillance system.

In 2003, NPDS toxicosurveillance activities identified a call volume outlier at the Northern New England poison control center. The call volume average for the hour of 7 pm to 8 pm at this poison control center was calculated to be 3.2 with a standard deviation of 3.2. That established the threshold at 12.8 which consisted of the mean plus three standard deviations.

Now, the counts for this hour was actually 17. Subsequently an outlier alert email was generated which notified both CDC and AAPCC scientists.

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When CDC and AAPCC scientists looked more closely they discovered that on that Sunday afternoon approximately 16 attendees of a church social fell ill with nausea, vomiting, and diarrhea. Many mentioned to healthcare providers that the coffee tasted unusually bitter. But since the residents of this small New England town love their coffee very bitter, they drank it anyway.

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On day 1 the first case presented to the emergency department at around 3 pm with nausea, vomiting, and severe GI disturbances. An astute clinician notified the affection control staff and the first reports to the poison control started coming in around 7:30 pm. By 3 in the morning on the following day, the clinical toxicologist on call had been paged and informed and later that day the National Poisoning Data System was updated with the information.

By 8 pm that day, arsenic had been identified in the implicated coffee and urine specimens of ill patients. These efforts facilitated rapid mobilization of antidote stockpiles and operationalization of local and regional and state agreements to share and transport antidotes for public health emergencies such as this.

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Some examples of call volume outliers that have been identified by the National Poisoning Data System include methane exposures, riot control agent releases, and terrorism exercises [such] as TOPOFF 1.

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So in conclusion, the primary utility of the National Poisoning Data System and toxicosurveillance is to improve public health surveillance for chemical exposures, to identify early markers of chemical events with the objective of finding an appropriate public health response, and for CDC in particular, to track ongoing events. There are a number of limitations to toxicosurveillance activities that should be considered, including the fact that it is built upon a voluntary passive reporting system and it does have questionable utility in its ability to identify a single sentinel event as a larger release.

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There are a number of future plans for the National Poisoning Data System including integration with Biosense, the addition of GIS capability and the development of protocols for reviewing alerts and disseminating information.

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Finally, I would like to acknowledge the members of the American Association of Poison Control Centers and CDCs Toxicosurveillance Team, as well as the individual SPIs and directors of regional poison control centers without whose efforts we would not be able to do these activities that we are doing.

Thank you and I will be happy to take any questions.

Coordinator: Thank you. If you would like to ask a question please press star,1. To withdraw your request you may press star,2.

Once again to ask a question press star,1.

And the first question today, you may ask your question.

Question: Yes, hi. Good afternoon. I am trying to ascertain the existence of the ATSDR, CDC for deployment team that can be utilized it seems of either accidental or intentional chemical releases and how this ties into the National Poison Surveillance System. And I was wondering if that team is being extended? Or do they participate often in exercises? And also what is their usual lead-time if needed at the scene of an acute hazardous materials release?

Josh Schier: Thank you for that question. Unfortunately I'm not too familiar with those teams that you are talking about. And I don't know the answers to those questions. At this time, to the best of my knowledge those teams are not really integrated with the National Poisoning Data System. The National Poisoning Data System is more of a surveillance tool mostly for tracking chemically associated illness and hopefully identifying a multi state or multi local outbreak of chemically associated illness which then could potentially trigger a number of activities, including possible deployment of these teams. But that would depend on the specific situation and certainly would never occur without the formal request and approval and consent of state health authorities in a particular region.

Question Cont'd: And how often is the – for example – for an acute hazardous materials release – the accessibility of the poison control data monitoring system or poison control centers in general from the field? Is that a feasible option and how often do you think it may have been used?

Josh Schier: Well there is definitely potential avenues for collaboration between HSEES, which is I believe the [Hazardous Substances Emergency Events Surveillance system] – I'm sorry I'm not familiar with the acronym. But there is a hazardous events surveillance system here referred to as HSEES and there is

definitely some interest and some activity regarding exploring how to best integrate those two surveillance systems. You know NPDS and HSEES, but at this point it's all very early and nothing's been done. Does that answer your question?

Question Cont'd: Yes it does. Thank you very much. Appreciate it.

Coordinator: Once again to ask a question press star, 1.

There are no other questions sir.

Oh, pardon me, your line is open.

Question: Yes. I am a veterinary toxicologist. And I was wondering if the animal information has been queried in your system?

Josh Schier: Well the animal information, you know, we can query it. We can look at animal exposures. We have that capability. And the American Association of Poison Control Center staff, they have the capability of looking at animal exposures as well. Usually all of that data is at the end of the year collected and published in an annual report which is available off their Website, AAPCC.org, I believe it is. So that information is available.

If there is specific information in regards to animal exposures that are of particular interest that are not published in that report, typically that information can be made available through the AAPCC to the public for a small fee. I'm not sure how much that is, but you can do that.

And certainly CDC does have the capability to look at animal exposures within the system as it relates to, you know, possible public health threat if we

wanted to. But obviously, you know, we're going to be, there'll be even more limitations on using this data for this event. Because, you know, more humans call the poison control center base for more human calls than probably veterinaries.

Question Cont'd: Certainly. And so are there any plans to use this for toxicosurveillance or do you have enough call volume to do that?

Josh Schier: Yea. That's an excellent question. The idea of you know, surveillance among animals and veterinary routes to look for – you know – to look at animals as possible sentinel events is a very popular item here I think – an item growing interest here at CDC. So I could say at this particular time there is not a large amount of effort or energy right now being expended for exploring the system for that capacity. And I would say that is mainly not for a lack of interest, but because that the system itself was just released. The new system was just released a little while ago, and we're still building it to refine human capability and human capacity and to sort of maximize that potential. I think that the exploration of this system to use it in more in a veterinary manner to look at animals in sentinel events – if that's what you're referring to – is something that we're going to be doing in the future. I just couldn't tell you when right now.

Question Cont'd: Okay, well that answers my question. Thank you.

Coordinator: And the next question.

Question: Hi, I had a question to who has access to this system and the analysis capabilities within this system. We have one of the 61 centers here, and I'm wondering about our ability to run analysis of this data.

Josh Schier: That's an excellent question. One of our goals I think at a larger CDC level is to definitely encourage interaction and collaboration between local, state health departments and poison control centers. The degree to which data sharing is even, you know, able to be done isreally dependent and determined at a state level.

So I encourage you to contact your state health authorities and you know, look into that a little bit more closely. I know that Florida in particular has a really strong state health department and in terms of their relationships with the poison control centers and they do share their poison control center data, I believe, quite freely and frequently. So, I think that level of collaboration and connectivity already exists in Florida, and it may be accessible to you. But you would have to check with your state rep. You did say Florida, right?

Question Cont'd: Yes. Thank you.

Coordinator: The next question.

Question: Yes, hi. I'm calling from California and I was curious on the mean and standard deviation statistics. How often are those recalculated as the data is near real time?

Josh Schier: That's a good question. It goes back – it goes back – the data itself will go back to I believe, 2000. And the historical thresholds are – the historical thresholds are I believe based on three to five years worth of data. They typically look at seven days behind the day of interest and six days in front, for anywhere from three to five years in the preceding period. Now, how often that is actually recalculated, you know, is it done on a continuous basis, that is a good question and I don't know the answer to that. But if you were to send

me an email I could find out the answer to that relatively easily find out for you. And I believe COCA has a mechanism for you to do that.

Question Cont'd: Okay. Thank you.

Coordinator: There are no other questions.

Alycia Downs: Well, I want to thank Dr. Schier again. That was a very informative presentation. And I want to thank our listeners for joining us today.

If you have any additional questions please send an email to COCA@CDC.gov. That's C-O-C-A at C-D-C dot gov.

The recording of this call and the transcript will be posted to the COCA Website at www.emergency.cdc.gov/coca as they come to us. You have one year to obtain continuing education credits for this call.

All continuing education credits for COCA conference calls are issued online through the CDC training and continuing education online system. www2a.cdc.gov/tceonline. I want to thank everybody again and have a wonderful day.

Josh Schier: Thank you.

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