

## Final Project – Outbreak Investigation

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### Initial information

A 7-year-old boy was brought to a University Children's Hospital. He had symptoms of a mild respiratory illness, including runny nose, sneezing, cough, and body and muscle aches. After examination, the physician sent him home. He instructed the mother to get him to drink plenty of fluids and prescribed cold medicine to make the boy comfortable. Two days later, the boy's condition had deteriorated. He had shortness of breath, coughing, and wheezing. His mother brought him back to the hospital. The physician's diagnosis was acute respiratory distress. The boy's physician consulted with the emergency department physician, and the boy was admitted to the pediatric intensive care unit (PICU). Later that night, three additional children, aged 6 to 9 years, were admitted to the PICU. They were admitted through the emergency department with similar symptoms. Two had a history of asthma. One girl, who had especially severe symptoms, was put on a ventilator. Health care providers interviewed each parent about their child's symptoms. All parents reported that the symptoms seemed to get progressively worse during a 3-day to 4-day period. The symptoms suggested a viral infection, perhaps due to the same virus.

**Is there cause for concern? How will you determine if this is an outbreak? Consider what information is needed, where that information would come from, how to obtain it, etc. Record your thoughts below. Notify your supervisor when you have reached a decision.**

There is a cause for concern because we have an unidentified serious illness that appeared rapidly in multiple children and aggressively progresses. If we can identify what this is then we can check the normally expected number of cases, but if we cannot figure out what this is, and it is something new without a previously determined number of expected cases, then that creates a different problem. We need to know more symptoms, if there are more cases, modes of transmission, incubation period, mortality, and if any of these cases have anything in common. This would be found through surveillance data from different cases, their families, and hospitals.

## Update 1

Health care providers collected stool and respiratory specimens for laboratory testing. While awaiting laboratory results, health care providers consulted with the hospital's Chief of the Infectious Disease Department. Because this represented an unusual cluster of patients with this condition in the metro area, they also called the Board of Health to report the cases and to inquire if other hospitals in the area were reporting similar cases. Local health authorities confirmed 13 similar cases were reported by 3 other area hospitals during the past week. Patients were male and female, ranging in age from 6 to 10 years. Two male patients, both aged 7 years, died within a week of being admitted to PICU. The State Department of Public Health requested CDC assistance. Local diagnostic laboratory testing using polymerase chain reaction assay on a multiplex platform was able to determine if enteroviruses or rhinoviruses were present but could not tell which (i.e., specimens were reported positive for enterovirus/rhinovirus). Viral genome sequencing at CDC was able to give more specific results. CDC found samples from all 4 patients from the University Children's Hospital and 10 of 13 patients from the other area hospitals to be positive for EV-D68 (see Moodle for more information).

**What is the next step in your investigation? What activities does this step involve? Record your thoughts below. Notify your supervisor when your team has reached a decision.**

The next step of the investigation is to appraise existing data. A case definition needs to be made or found for EV-D68 to find definite cases in the surrounding areas. Next, clinical observations such as surveillance data from the CDC and hospitals need to be recorded in order to collect all data. There also needs to be information and a visual of the time in which persons began to contract EV-D68, and the locations where the illness spread need to be mapped out through tabulations and spot maps.

## Update 2

CDC was initially notified of 10 patients in County 2 with illness similar to that reported in County 1. Three female children ranged in age from 6 to 7 years and 7 male children ranged in age from 7 to 11 years. Seven patients had difficulty breathing, shortness of breath, cough, wheezing and fever, 3 required a respiratory breathing machine. Specimen testing confirmed EV-D68 in all patients. Five patients in County 3 were also reported. All were males ranging in age from 8 to 10 years and presented with similar symptoms. Clinical specimens were sent to CDC for testing.

Your team developed the following case definition for this outbreak:

- under age 21 years (at time of onset);
- admitted to hospital with severe respiratory illness;
- reported symptoms began on or after November 15, 2019; and
- confirmed positive for EV-D68 in respiratory specimens.

Each county compiled data concerning age, sex, county where hospitalization occurred, symptom onset date, and clinical confirmation into a line list. Teams uploaded their data in a surveillance database accessible to all counties in the state.

**Examine the data in the excel file (see Moodle) and perform the appropriate activities for this step. After you familiarize yourself with the data file, alert your supervisor to confirm your planned activities. Be prepared to describe how you will summarize the data.**

**As you work through this step, please consult with your supervisor if you need additional information. Notify your supervisor when this step is complete. Please be prepared to explain what the next step will be.**

Looking at our team's case definition, we have some cases that does not meet the requirements: A 30 year old man reported symptoms starting 11/23/19, but does not meet our case definition under the age requirement. Another suspected case does not have any clinical information available for us to analyze, therefore we do not have the information to determine if she is or is not a case.

Hypothesis: We hypothesize that these children contracted the disease through contact with each other.

## **Study Design**

**Now that your team has completed the descriptive epidemiology phase, it is time to turn your attention toward the analytic phase. What do you suspect is the cause of this EV-D68 outbreak? Formulate a hypothesis and design an appropriate study to test your hypothesis.**

### **Hypothesis:**

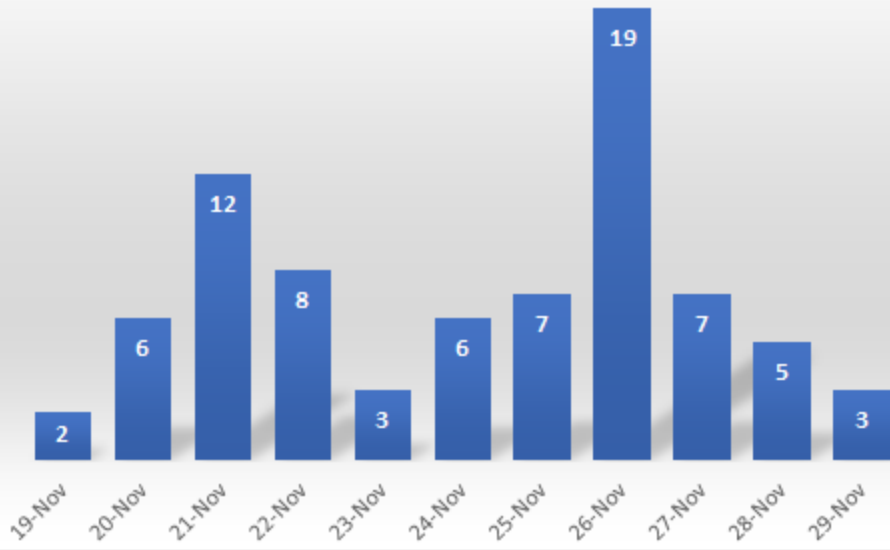
Our hypothesis is that all the children have an exposure in common. We believe that the initial exposure came from county 1, maybe a water fountain, then through an inter-county program other children in counties 2 and 3 were exposed, leading to exposure in teachers, siblings, and other family members which caused it to spread more.

### **Study Design:**

We would like to conduct a case control study beginning with the onset of reports on November 15<sup>th</sup>, 2019. We think that there was an inter-county event where students across three counties participated in.

## **Epidemiological Curves**

### Number of EVD-68 cases



### Number of Cases by Age

