

Outbreak of Pertussis in a Unified School District — Harvey County, December 2014



Background

Routine infectious disease surveillance on December 6, 2014 conducted by the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) identified three laboratory-confirmed cases of pertussis in Harvey County. Harvey County Health Department (HCHD) was notified about this increase in pertussis and another laboratory-confirmed case of pertussis was reported to HCHD. During the initial investigation, it was determined all four cases attended a grade school or high school within a Unified School District (USD). The HCHD and USD, with support from KDHE, began an outbreak investigation to identify additional cases, exposed individuals, and to implement prevention and control measures. Further investigation revealed additional epidemiologically-linked cases among the grade school and high school.

Methods

The Harvey County Health Department coordinated with both nurses at schools to identify additional cases, investigate setting-related exposures, and carry out control measures at each school. Potential cases were investigated and followed until two weeks after cough onset.

A confirmed pertussis case was defined as:

- a cough illness lasting ≥ 2 weeks with paroxysms of coughing and/or post-tussive vomiting, and/or inspiratory whoop, and
 - laboratory confirmation via polymerase chain reaction (PCR) testing, or
 - an epidemiological link to a lab-confirmed case.

A suspect pertussis case was defined as:

- an acute cough illness of < 2 weeks with paroxysms of coughing and/or post-tussive vomiting, and/or inspiratory whoop, and
 - laboratory confirmation via polymerase chain reaction (PCR) testing, or
 - an epidemiological link to a lab-confirmed case.

A case was considered primary if identified in a person whose exposure to pertussis was most likely at one of the two affected schools, and secondary if the illness was in an individual who, prior to symptom onset, had an epidemiological link to a coughing student who attended one of the two schools.

Reported cases of pertussis or their guardians were interviewed to assess symptoms, onset date, duration, transmission setting, and vaccination status. Immunization data was also retrieved from the ill persons' primary care physicians. In accordance with Kansas Administrative Regulation (K.A.R.) 28-1-6, each case of pertussis was excluded from school for three weeks following cough onset or until a five-day course of antibiotics was completed.

A close contact was defined as a person who was exposed to a pertussis case through direct face-to-face contact or in close proximity (≤ 3 feet) of a pertussis case for an hour or longer. A susceptible contact was defined as a close contact who had not received any doses of pertussis-containing vaccine. In accordance with K.A.R. 28-1-6, susceptible contacts are to either be vaccinated within 24 hours of notification to KDHE or excluded from school or child care for 21 days after the onset of the last reported case.

Antibiotic prophylaxis was recommended for household and high-risk contacts of ill persons. A high-risk contact was defined as an individual who was exposed to pertussis in such a way to put the individual at risk of developing severe disease or developing illness that could transmit

pertussis to those at high risk of developing severe disease. This includes infants less than 12-months-old, pregnant women in the third trimester of pregnancy, all persons with pre-existing health conditions that may be exacerbated by a pertussis infection, and contacts who themselves have close contact with any of these described persons.

Vaccination status was determined for each ill person based on the Advisory Committee on Immunization Practices (ACIP) recommendations for pertussis-containing vaccines. According to ACIP, a dose of DTaP should be administered at 2 months, 4 months, and 6 months of age, again between 15-18 months of age, and again between 4-6 years of age. One dose of Tdap should be administered between 11-12 years of age.¹

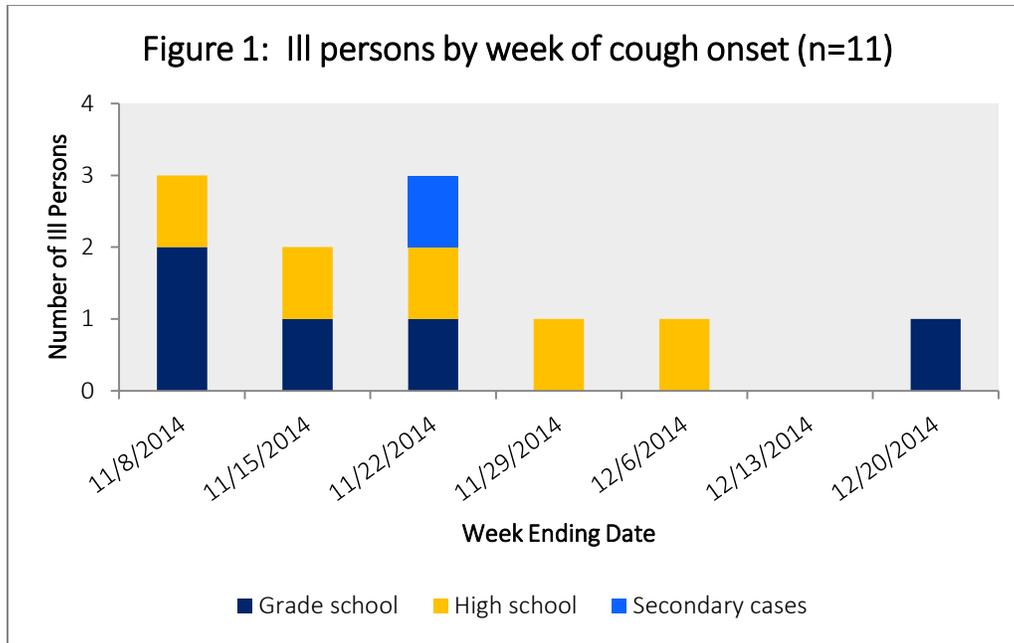
Results

Eleven cases of pertussis were identified; eight were classified as confirmed and three as suspect. Ten were primary cases that were most likely exposed at school and one was a secondary case with exposure in a household. Five ill persons were associated with the grade school and five were associated with the high school. The median age of those ill was 15 years with a range from 10 to 37 years (Table 1). Seven (63.6%) cases of pertussis were male.

Table 1: Distribution of ill persons by exposure setting and age (n=11)

Exposure Setting	# of Ill Persons (%)	Median Age in years	Age Range in years
Grade School	5 (45.5%)	11	10-12
High school	5 (45.5%)	15	15-16
Household	1 (9.0%)	37	N/A

The earliest illness onsets were on November 4, 2014 in both schools. The latest onset, December 15, 2014 was reported by a high school student (Figure 1).



Clinical information was complete for nine (81.8%) of the pertussis cases. Information for whoop was unknown for one ill person and information for cyanosis was unknown for another person (Table 2). Even though cough was documented for all persons, cough duration was unknown for three ill persons. All ill persons were diagnosed by a healthcare provider. Ten cases were positive for *Bordetella pertussis* via polymerase chain reaction (PCR); one was not tested, but epidemiologically linked directly to a case confirmed by PCR. No hospitalizations or deaths were reported.

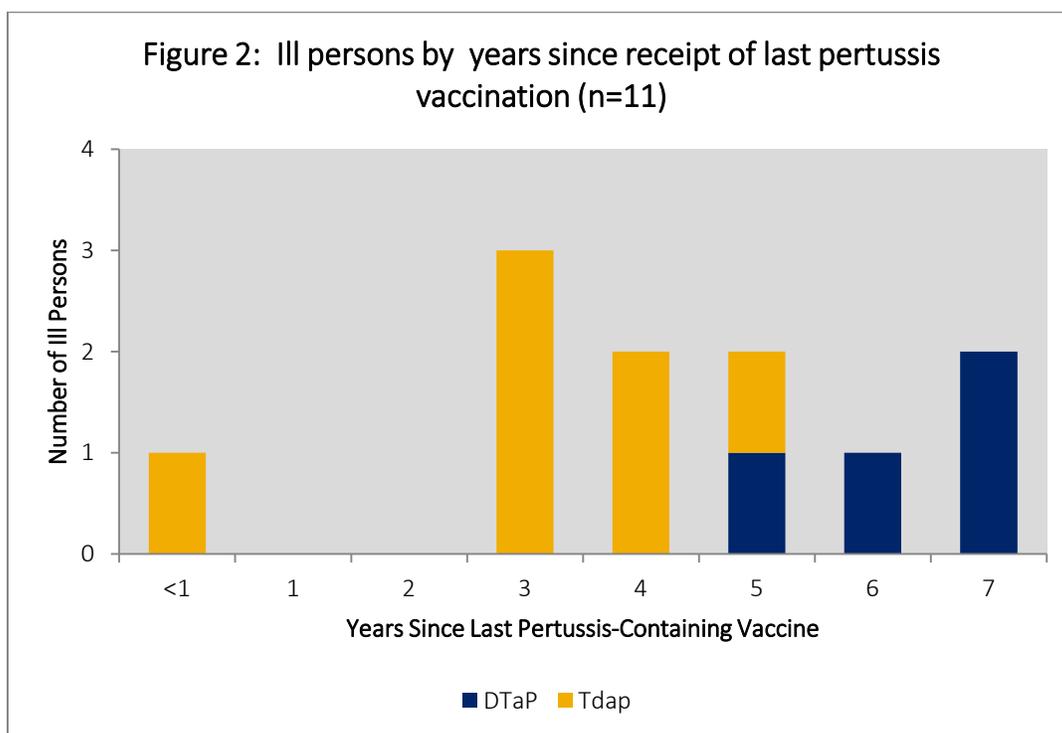
Table 2: Clinical information reported among ill persons

<i>Symptoms</i>	<i># of Ill Persons/Total</i>	<i>% of Ill Persons</i>
Cough	11/11	100.0%
Paroxysms	8/11	72.7%
Whoop	4/10	40.0%
Post-tussive vomiting	3/11	27.3%
Apnea	3/11	27.3%
Cyanosis	1/10	10.0%

Chemoprophylaxis was recommended for 34 individuals. Thirty (88%) of these were household contacts and the other four (12%) were high-risk contacts.

A complete vaccination history was obtained for ten (90.9%) ill persons. One adult had an incomplete vaccination history but did have documentation of a Tdap. All ill students at the grade school had at least 5 doses of DTaP. Four (80%) students were of age to receive a Tdap,

but only one had received it. Ill students at the high school had received all the recommended DTaP and Tdap. Based on ACIP recommendations, all ill persons were considered up-to-date on their pertussis-containing vaccinations. The number of years since last pertussis vaccination was analyzed for all ill persons (Figure 2). With the exception of one ill student who received Tdap less than 4 months before symptom onset, at least five years had passed since receipt of last DTaP for the grade school students and at least three years had passed since receipt of a Tdap vaccine for all other ill persons. No susceptible contacts were identified; therefore, no close contacts were vaccinated or excluded from school for 21 days.



Discussion

During the course of the outbreak, 11 cases of pertussis were identified among students at two schools within a school district in Harvey County. This outbreak was detected by routine surveillance when three laboratory-confirmed pertussis reports of school-aged children were reported to KDHE on December 6, 2014. Upon investigation, HCHD discovered that two of these cases were epidemiologically linked to two pertussis cases that were previously reported in November.

The HCHD and school nurses worked together to implement control measures and prevent further spread of disease. Pertussis cases were excluded from school until completion of antibiotics and immunization records of all close contacts to persons with pertussis were

reviewed to determine susceptibility status. All were up-to-date on pertussis vaccination, but were still actively monitored for symptoms for 21 days after exposure. Post-exposure antimicrobial prophylaxis was recommended for all household and high-risk contacts. Additionally, HCHD issued a press release on December 9, 2014 to increase community awareness of pertussis.

The pertussis vaccine is a safe effective way to prevent disease. The Centers for Disease Control and Prevention (CDC) estimates that five doses of DTaP are 80-90% effective in preventing disease, and vaccination will lower the likelihood of a severe infection. Unfortunately, there is a modest decrease in vaccine effectiveness each year following the completion of the five-dose series resulting in previously vaccinated individuals becoming at risk for developing pertussis. ACIP recommends a Tdap booster at 11-12 years. Tdap is estimated to be 70% effective; however, long-term protection is not known.² Considering that at least five years had passed since receipt of last DTaP for all but one grade school student and at least three years had passed since receipt of Tdap for the other ill persons, waning vaccine effectiveness could have contributed to the spread of disease.

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July 28, 2015

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¹Centers for Disease Control and Prevention. Pertussis: Summary of Vaccine Recommendations. Accessed May 5, 2015. <http://www.cdc.gov/vaccines/vpd-vac/pertussis/recs-summary.htm>

²Centers for Disease Control and Prevention. Pertussis: Frequently Asked Questions. Accessed May 5, 2015. <http://www.cdc.gov/pertussis/about/faqs.html>