

Community-Wide Outbreak of Pertussis — Barton County, January 2015



Background

On January 23, 2015, the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) was notified by the Barton County Health Department (BCHD) of a six-year-old female suspected of having pertussis. Investigation revealed that this person was a student at a school in Great Bend, Kansas. On January 26, two additional cases of pertussis were reported from the same school. BCHD and the school, 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 at the school, other schools in the area, and daycares within the community.

Methods

The Barton County Health Department coordinated with school nurses and daycare providers to identify additional cases, investigate setting-related exposures, and carry out control

measures at each setting. Potential cases were investigated and followed until three 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 probable 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
 - absence of laboratory confirmation, and
 - no epidemiological link to a lab-confirmed case.

Reported cases of pertussis or their guardians were interviewed to assess symptoms, onset date, duration, transmission setting, and vaccination status. Immunization data was retrieved from patients or their guardians, the ill persons' primary care physician, and/or the Kansas' Immunization Registry. 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 to 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 a pertussis case 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 in age, 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 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. ²

In addition, the Barton County Health Department coordinated with healthcare providers in the community to provide testing and treatment recommendations and provided multiple vaccination clinics at the health department as well as school-located vaccination clinics.

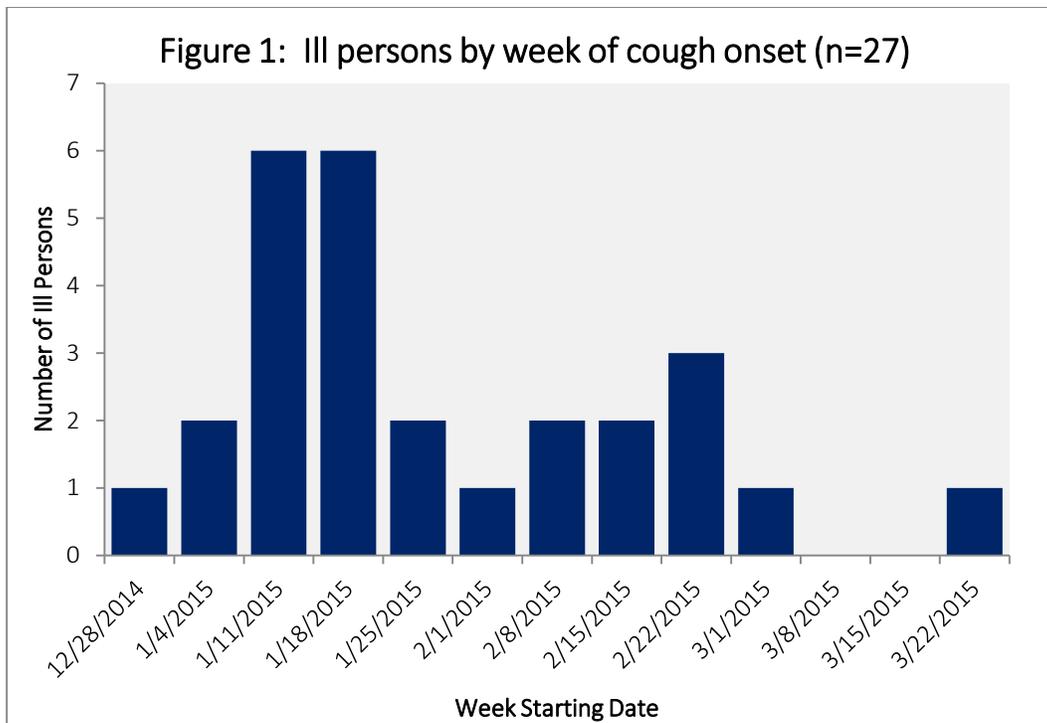
Results

Twenty-seven cases of pertussis were identified; fifteen were classified as confirmed and twelve as probable. Seven cases had documented exposure at school, two at daycare, six at home, and the remaining twelve had unknown exposure. However, twenty-one ill persons attended school and three attended daycare while ill. The median age of those ill was 11 years with a range from 7 months to 55 years (Table 1). Sixteen (59.3%) cases of pertussis were female.

Table 1: Distribution of ill persons by exposure setting and age (n=27)

Exposure Setting	# of Ill Persons (%)	Median Age	Age Range
School	7 (25.9%)	28 years	11 – 55 years
Daycare	2 (7.4%)	15.5 months	7 months – 2 years
Home	6 (22.2%)	7.5 years	6 – 48 years
Unknown	12 (44.4%)	9 years	1 – 35 years

The earliest illness onset was December 29, 2014 in a student and the latest onset, March 27, 2015 was reported by a school staff member (Figure 1).



Clinical information was complete for 26 (96.3%) of the pertussis cases. Information for post-tussive vomiting, whoop, and cyanosis was unknown for one ill person (Table 2). The exact duration of cough was reported in all pertussis cases with a median duration of 15 days and a range of 14-33 days. All ill persons were diagnosed by healthcare provider. Eight cases were positive for *Bordetella pertussis* via polymerase chain reaction (PCR); the remaining 19 were not tested, but were epidemiologically linked to another confirmed or probable case. One ill person was hospitalized, but no deaths were reported.

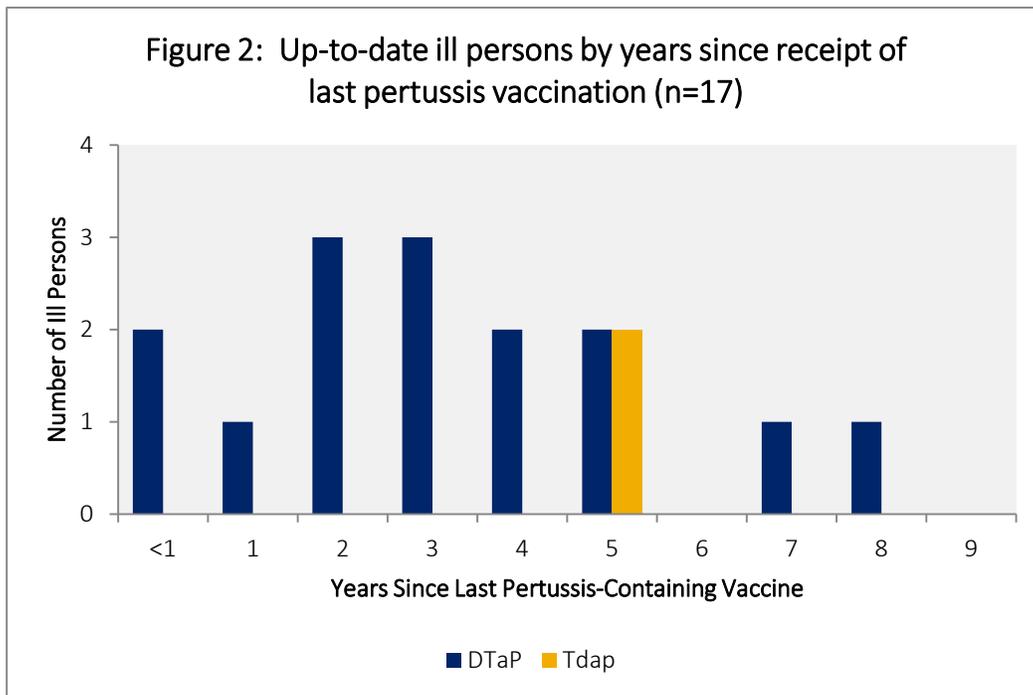
Table 2: Clinical information reported among ill persons

Symptoms	# of Ill Persons/Total	% of Ill Persons
Cough	27/27	100.0%
Paroxysms	27/27	100.0%
Whoop	5/26	19.2%
Post-tussive vomiting	18/26	69.2%
Apnea	6/27	22.2%

Four-hundred and forty close contacts were identified and followed for 21 days following last exposure to a pertussis case for development of symptoms. There were 210 school or daycare contacts, 94 household contacts, 45 social (e.g., friend, church, extracurricular activity) contacts, 43 work contacts, 34 non-household contacts, and 13 healthcare worker contacts.

Susceptible contacts were identified and either vaccinated within 24 hours or excluded from school or daycare for 21 days. Chemoprophylaxis was recommended for 185 individuals.

Vaccination histories were obtained for all (100%) ill persons. Based on ACIP recommendations, 17 (63.0%) were considered up-to-date on their pertussis-containing vaccinations, 3 (11.1%) were not considered up-to-date, and 7 (25.9%) were completely unvaccinated. Of the up-to-date persons, all had documentation of DTaP/DTP series; only two had received a Tdap. Three of the up-to-date persons were of age to receive Tdap, but had not at time of cough onset. The number of years since last pertussis vaccination was examined for ill persons that were up-to-date (Figure 2). For the two pertussis cases that had received a Tdap, five years had passed since receipt of the vaccine. A median of three years (range: <1 year-8 years) had passed since receipt of last DTaP for the other 15 ill persons.



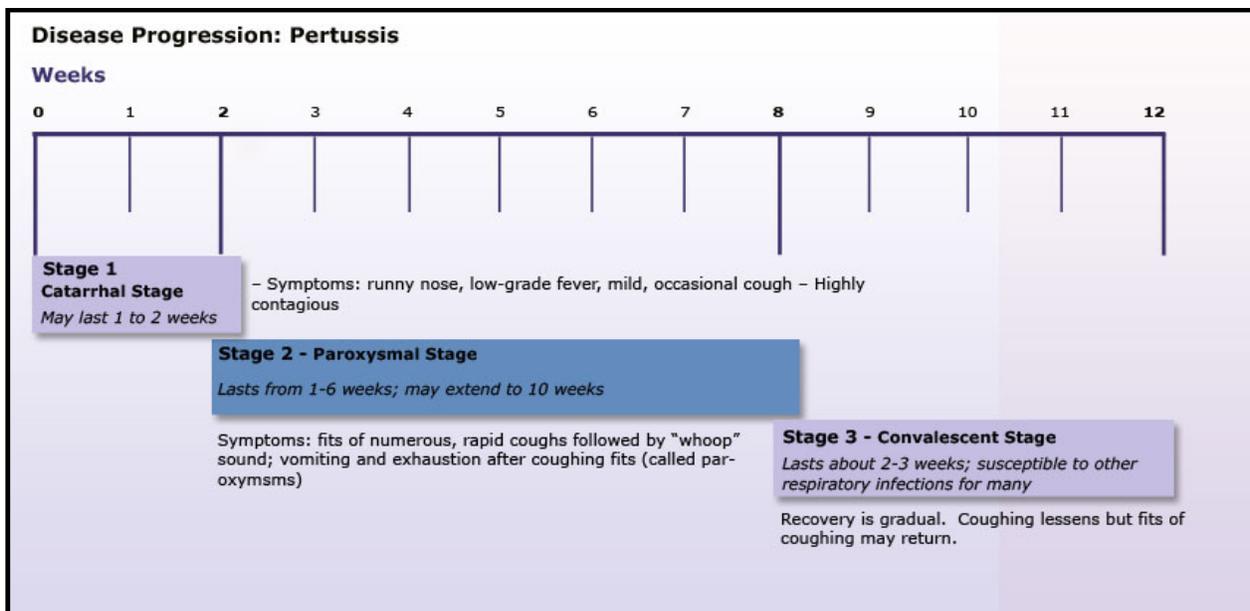
Two vaccination clinics were held at BCHD and the local health department provided on site vaccination clinics at three different elementary schools during the outbreak. The Barton County Health Department reported that a total of 804 doses of pertussis-containing vaccine (788 doses of Tdap and 16 doses of DTaP) were administered at these clinics from January 26 to January 30, 2015.

Discussion

During the course of the outbreak, 27 cases of pertussis were identified among school students and staff, daycare attendees, and other persons within the community of Barton County. This outbreak was detected after three cases of pertussis were reported from January 23-26, 2015 from one school. This outbreak lasted for approximately three months and affected persons ranging in age from 7 months to 55 years. One person was hospitalized. No deaths were reported in the outbreak cases.

Seventeen (63.0%) pertussis cases were considered up-to-date on pertussis vaccination. The Centers for Disease Control and Prevention (CDC) estimates that five doses of DTaP are 80-90% effective in preventing disease. 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.³ Considering a median of three years had passed since receipt of the last DTaP for fifteen ill persons and five years had passed since receipt of the last Tdap for the other two ill persons, waning vaccine effectiveness could have contributed to the spread of disease. However, pertussis vaccination has shown to lower the likelihood of severe infection.³ The typical duration of illness ranges from 4-15 weeks (Figure 3) and the median cough duration for ill persons in this outbreak was 15 days (range: 14-33 days).

Figure 3: Progression of pertussis disease⁴



There were some significant challenges the BCHD encountered during this outbreak, which made this outbreak difficult to manage. Due to heightened awareness of pertussis after a few cases had been identified and information on a recent pertussis death was released, BCHD received a significant increase in reports of suspect pertussis cases. Physicians were testing asymptomatic persons who reported having contact with a pertussis case and any person with a mild cough. This outbreak occurred during the typical peak season for influenza, but coughing ill persons that sought care were only being tested for pertussis and no alternative diagnoses were being considered. This outbreak was very time-consuming and challenging for the BCHD because of over-reporting and testing for pertussis. Many persons suspected to have pertussis tested negative for pertussis. KDHE conducted additional testing for other respiratory diseases and influenza and parainfluenza were confirmed to be circulating in the community in addition to pertussis.

Another challenge the BCHD faced was coordination with the schools that had pertussis cases. Instead of being able to report cases directly to the school nurses, the school board wanted to be notified first, which delayed the investigation process. This resulted in longer response times to implement prevention and control measures and more time spent by the local health department reporting to multiple staff at the schools. In addition, one school did not consult with the BCHD about the pertussis outbreak and incorrect treatment recommendations were provided to parents of an entire school by the superintendent. The BCHD had to delay case investigations in order to correct this misinformation through communication with these parents and physicians in the community.

In the midst of these challenges, there were many efforts that were successful during this pertussis outbreak. The Barton County Health Department held multiple vaccination clinics on site and at several schools during the course of the outbreak to vaccinate un- or under-vaccinated individuals. They vaccinated 804 persons in the community. Even though pertussis vaccination cannot prevent disease if you have already been exposed, it can protect if exposed in the future. Maintaining a highly vaccinated population before an outbreak occurs is the key to stopping transmission of pertussis.

Another success for BCHD was their communication efforts. Heightened awareness resulted in over-reporting and over-testing for pertussis in the beginning of this outbreak. The local health department provided letters to physicians in the area on testing and treatment recommendations and there was a noticeable difference in the number of suspect cases being reported, but true cases were still being identified. The BCHD had a good working relationship with their medical community prior to this outbreak, which facilitated the rapid response from physicians following distribution of this information.

BCHD's developed surge capacity was successful in effectively controlling the outbreak and preventing further spread of disease. Once the outbreak was identified, the BCHD assigned two nurses to specifically work the outbreak while other staff managed daily duties of the health department. This allowed for BCHD to take immediate action and respond quickly when needed during the outbreak.

Lastly, a KDHE epidemiologist provided on site assistance at the local health department during this outbreak. The epidemiologist worked with BCHD investigators to identify true pertussis cases and contacts, to facilitate communication with the Kansas Immunization Program to order pertussis vaccine, and to assist with collaboration with schools that had pertussis cases. This assistance allowed the BCHD to prioritize case investigations and to obtain vaccine in a timely manner, which enabled them to utilize limited resources most effectively.

The Barton County Health Department was presented with a very difficult task of controlling an outbreak and preventing further spread of disease during the peak season for many other respiratory illnesses. Even though this pertussis outbreak was not the largest or longest vaccine-preventable disease outbreak in Kansas to date, it was one of the most challenging and labor-intensive outbreaks. BCHD was successful in stopping the spread of pertussis in the community as only 27 cases were identified and 804 persons were vaccinated against pertussis.

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¹ Kansas State Department of Education. Kansas K-12 Reports-County, District, and School. Accessed May 5, 2015. <http://online.ksde.org/k12/k12.aspx>.

²Centers 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>

³ Centers for Disease Control and Prevention. Pertussis: Frequently Asked Questions. Accessed May 5, 2015. <http://www.cdc.gov/pertussis/about/faqs.html>

⁴ Centers for Disease Control and Prevention. Pertussis (Whooping Cough). Accessed November 6, 2015. <http://www.cdc.gov/pertussis/about/signs-symptoms.html>