

Community-Wide Outbreak of Pertussis — Reno County, May 2015



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Background

On May 15, 2015, the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) notified the Reno County Health Department (RCHD) of a seven-year-old female suspected of having pertussis. Investigation revealed that this person was a student at a school in Hutchinson, Kansas. This was the second pertussis case reported from the same school in one week. RCHD 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 Reno County Health Department investigated pertussis cases to obtain setting-related exposures, identify additional cases, and carry out prevention and control measures. 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, post-tussive vomiting, 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, post-tussive vomiting, 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, or the Kansas' Immunization Information System. In accordance with Kansas Administrative Regulation (K.A.R.) 28-1-6, each case of pertussis was in respiratory isolation 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 the updated recommendations regarding pertussis contacts that was distributed from KDHE in March 2015, susceptible contacts were to be monitored closely for 21 days following exposure and persons who developed symptoms consistent with pertussis were excluded from school or child care until pertussis was no longer suspected.

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. High-risk contacts included 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 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, between 15-18 months of age, and between 4-6 years of age. One dose of Tdap should be administered between 11-12 years of age.¹

In addition, the Reno County Health Department disseminated testing and treatment recommendation letters to healthcare providers in the community as well as press releases to inform the public about the ongoing outbreak. RCHD also held multiple vaccination clinics at the health department.

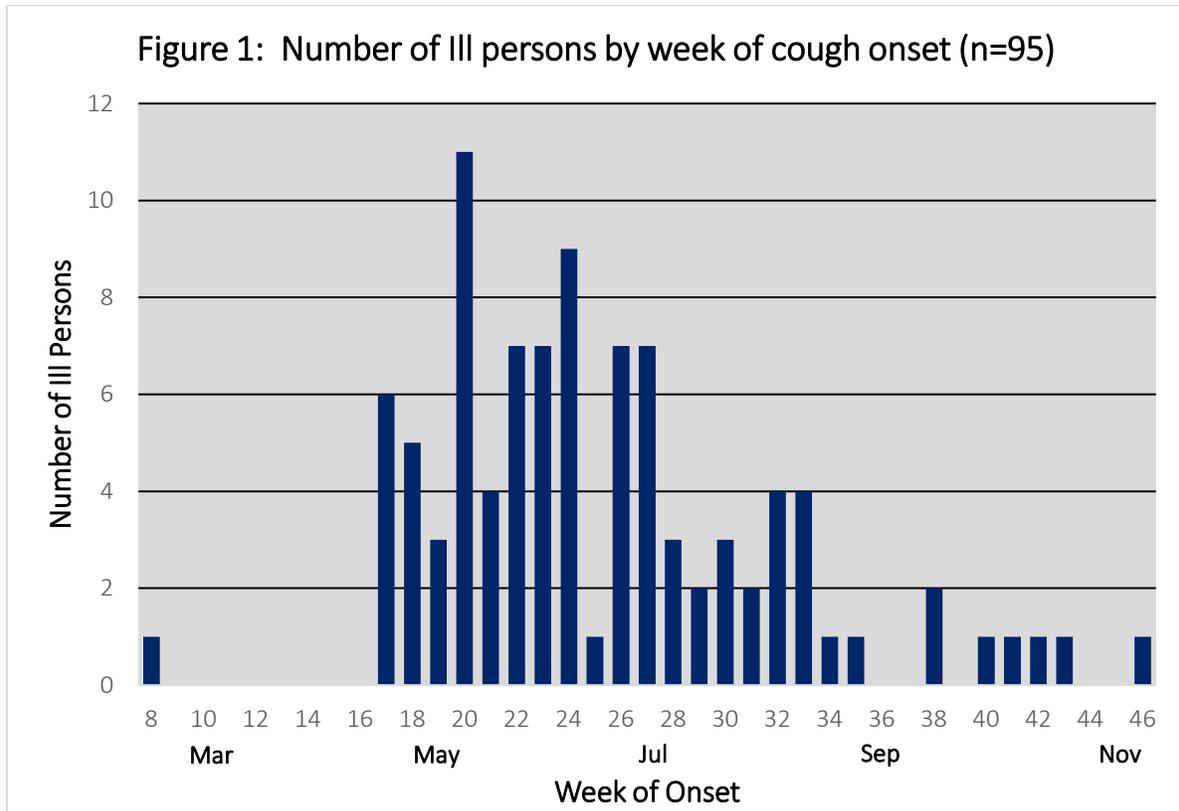
Results

Ninety-five cases of pertussis were identified; 68 were classified as confirmed and 27 as probable. Twenty-six cases had documented exposure at school, thirteen at home, eight with other exposures (i.e., softball team, babysitter, different household than their own, support group), three at daycare, and the remaining 45 had unknown exposure. The median age of those ill was 8 years with a range from 4 months to 60 years (Table 1). Sixty (63.1%) cases of pertussis were female.

Table 1: Distribution of ill persons by exposure setting and age (n=95)

Exposure Setting	# of Ill Persons (%)	Median Age	Age Range
School	26 (27.4%)	8 years	4 – 17 years
Home	13 (13.7%)	9 years	4 months – 36 years
Other	8 (8.4%)	9 years	2 – 60 years
Daycare	3 (3.1%)	10 years	4 – 11 years
Unknown	45 (47.4%)	7 years	9 months – 54 years

The earliest illness onset was February 23, 2015 in a student and the latest onset, November 15, 2015 was also reported by a student (Figure 1).



Clinical information was complete for 93 (97.9%) of the pertussis cases (Table 2). The exact duration of cough was reported for all pertussis cases with a median duration of 21 days and a range of 14-53 days. Eighty-nine ill persons were diagnosed by a healthcare provider. Sixty-one cases were positive for *Bordetella pertussis* via polymerase chain reaction (PCR). One ill person was hospitalized, but no deaths were reported.

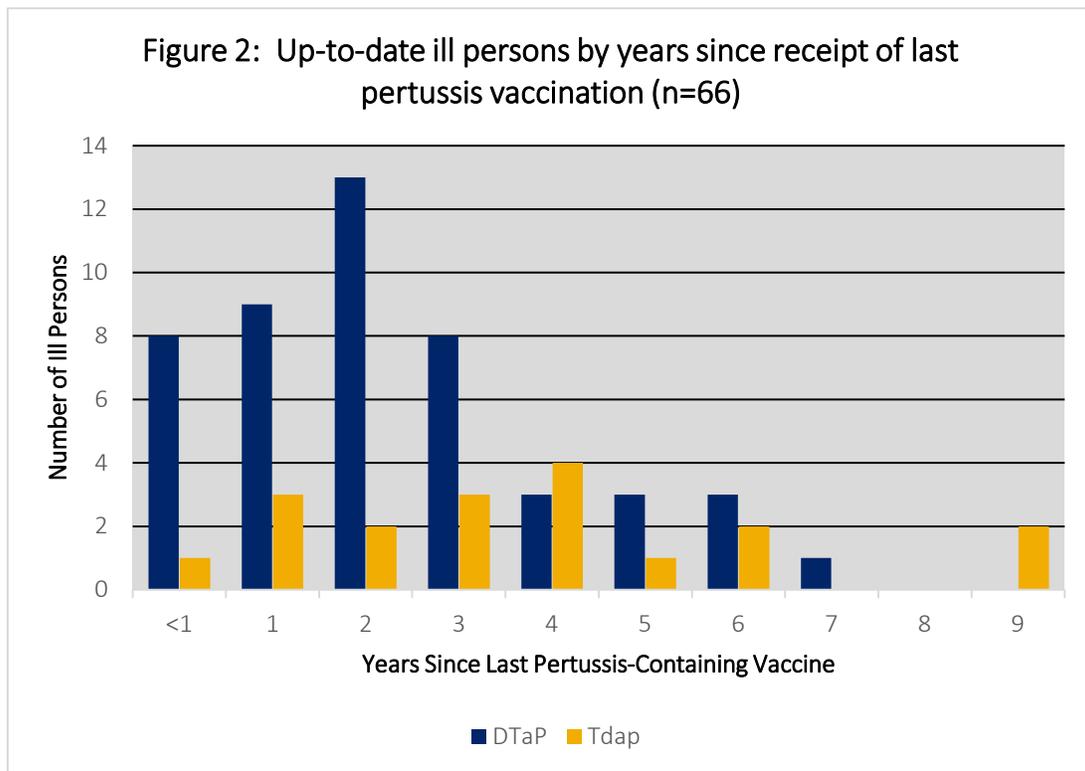
Table 2: Clinical information reported among ill persons

Symptoms	# of Ill Persons/Total	% of Ill Persons
Cough	95/95	100.0%
Paroxysms	95/95	100.0%
Post-tussive vomiting	42/95	44.2%
Apnea	29/94	30.9%
Whoop	10/94	10.6%

Four-hundred close contacts were identified; 301 household contacts, 54 non-household contacts, 22 school or daycare contacts, 17 other contacts, 4 social (e.g., friend, church, extracurricular activity) contacts, 1 work contact, and 1 healthcare worker contact. Susceptible contacts were identified by RCHD and were followed for 21 days to monitor for development of pertussis symptoms. One school district did not allow students to enroll for the 2015-2016

school year unless they were age-appropriately vaccinated against pertussis or had an up-to-date exemption on file. Chemoprophylaxis was recommended for 354 individuals.

Vaccination histories were obtained for 90 (94.7%) ill persons. Based on ACIP recommendations, 66 (73.3%) were considered up-to-date on their pertussis-containing vaccinations, 20 (22.2%) were not considered up-to-date, and 4 (4.4%) were completely unvaccinated. Of the up-to-date persons, 64 (97.0%) had documentation of DTaP/DTP series; 18 had received a Tdap. Three 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 18 pertussis cases that had received a Tdap, a median of three years (range: <1 year-9 years) had passed since receipt of the vaccine. A median of two years (range: <1 year-7 years) had passed since receipt of last DTaP for the other 48 ill persons.



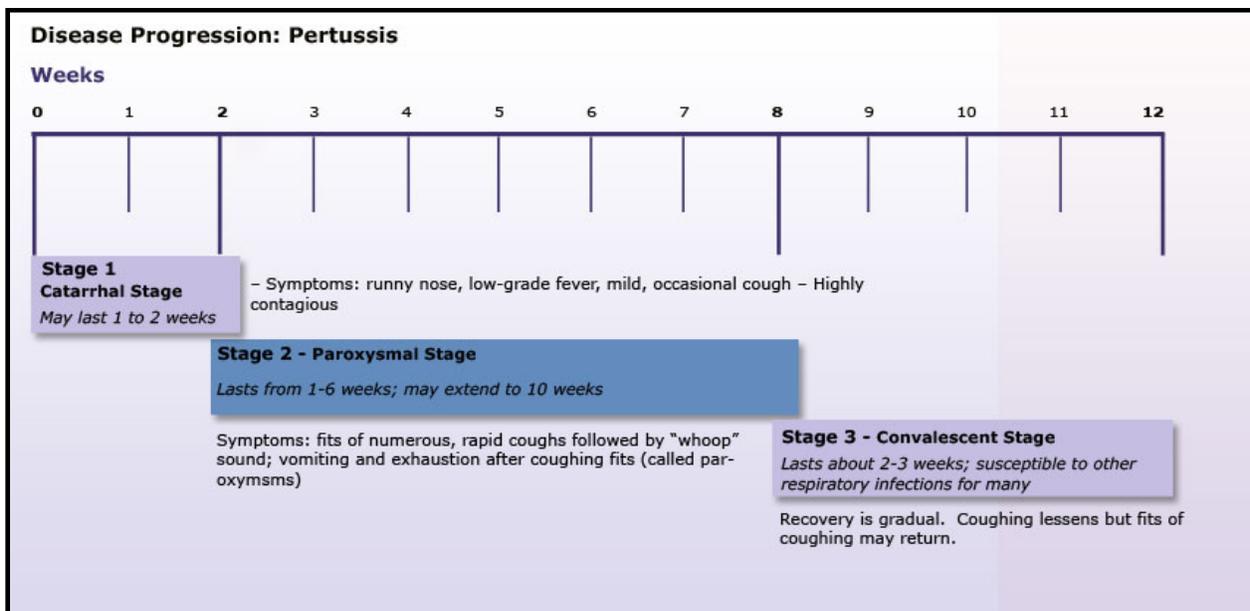
Multiple vaccination clinics were held at RCHD. Unfortunately, the exact number of doses given in response to the outbreak is not known; however, a total of 2,550 pertussis-containing vaccines were administered between May and December 2015 compared to 1,698 vaccines administered during the same time frame in 2014 when Reno County did not experience a pertussis outbreak.

Discussion

During the course of the outbreak, 95 cases of pertussis were identified among school students, daycare attendees, and other persons within the community of Reno County. This outbreak was detected after two cases of pertussis were reported within the same week from one school. This outbreak lasted for approximately seven months and affected persons ranging in age from 4 months to 60 years.

A majority of the 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.² Considering a median of two years had passed since receipt of the last DTaP for 48 ill persons and three years had passed since receipt of the last Tdap, waning vaccine effectiveness could have contributed to the spread of disease. However, pertussis vaccination has shown to lower the likelihood of severe infection.² The typical duration of illness ranges from 4-15 weeks (Figure 3) and the median cough duration for ill persons in this outbreak was 21 days (range: 14-53 days).

Figure 3: Progression of pertussis disease³



There were some significant challenges the RCHD encountered during this outbreak, which made it difficult to manage. Physicians did not report cases to RCHD or KDHE when they were suspecting pertussis and testing patients for pertussis. Under Kansas Administrative Regulation (KAR) 28-1-2, pertussis cases (including suspect cases) are required to be reported to KDHE within four hours of suspicion. During this outbreak, public health was only notified when positive test results were reported to KDHE by laboratories. Relying exclusively on laboratory reports for notification of an infectious disease causes a delay in implementation of appropriate control measures to prevent further spread of disease.

In addition to underreporting of cases, physicians did not treat household and high risk contacts prophylactically likely resulting in additional cases. Specifically, physicians did not feel comfortable prescribing medication to persons who were not their patients, but were not recommending these persons consult with their primary care physicians. This continued to occur even after the RCHD provided treatment recommendations to physicians in the surrounding area. Antimicrobial prophylaxis given to asymptomatic contacts within 21 days of exposure can prevent persons from developing pertussis or lessen severity of disease in those that do develop pertussis.⁴ Eventually, Reno County's medical advisor activated standing orders for RCHD to prescribe treatment to household and high risk contacts.

The RCHD did not have the capacity to dedicate staff solely to working this outbreak, which presented another challenge. A pertussis outbreak involves extensive time and manpower to control and prevent further disease transmission. RCHD became overwhelmed very quickly as staff who were conducting case and contact investigations for the outbreak were also managing the daily duties of the local health department. Maintaining surge capacity for events such as an outbreak allows for local health departments to take immediate action and respond quickly when necessary.

In the midst of these challenges, there were efforts that were successful during this pertussis outbreak. The Reno County Health Department fostered a good working relationship with their school districts. Before school started in 2015, RCHD had in-person meetings with school districts to establish exclusion policies and determine how they would handle symptomatic children in class. This was successful as the schools served as a reporting agency and kept the RCHD up-to-date on any suspect cases and allowed for the RCHD to immediately follow-up on cases and assess contacts for further transmission.

The RCHD held multiple vaccination clinics during the course of the outbreak to vaccinate un- or under-vaccinated individuals. They were efficient in that they combined many of the pertussis vaccination clinics with their influenza clinics. Even though pertussis vaccination cannot

prevent disease if already 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.

Lastly, a KDHE epidemiologist provided on site assistance at the local health department during this outbreak. The epidemiologist worked with RCHD investigators to identify true pertussis cases and contacts, to provide communication strategies for use in their community, and to assist with some case and contact investigations. This assistance allowed the RCHD to prioritize case investigations and to target key stakeholders for information distribution, which enabled them to utilize limited resources most effectively.

The Reno County Health Department was presented with a very difficult task of controlling a pertussis outbreak in a community where medical professionals were resistant to reporting requirements and adapting recommendations to help prevent further spread of disease. 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. RCHD persisted through and made efforts that were successful in stopping transmission.

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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>

³Centers for Disease Control and Prevention. Pertussis (Whooping Cough). Accessed November 6, 2015. <http://www.cdc.gov/pertussis/about/signs-symptoms.html>

⁴Centers for Disease Control and Prevention. Pertussis (Whooping Cough): Postexposure Antimicrobial Prophylaxis. Accessed January 5, 2016. <http://www.cdc.gov/pertussis/outbreaks/pep.html>