

Community-Wide Outbreak of Pertussis in a Highly Unvaccinated Community — Pottawatomie County, June 2014



Background

Routine infectious disease surveillance conducted by the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) identified an increase in pertussis cases in Pottawatomie County. Upon reviewing of initial cases by KDHE, it was determined several of the cases attended one school. KDHE notified the Pottawatomie County Health Department (PCHD) and 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 a church, which resulted in additional cases in surrounding counties.

Methods

The Pottawatomie County Health Department coordinated with school administration and physicians in the area to identify additional cases, investigate setting-related exposures, and carry out control measures in each setting. PCHD provided testing and treatment recommendations to healthcare providers and held a vaccination clinic for the community. Potential cases were investigated and followed until three weeks after cough onset.

A case was defined as a cough illness lasting two weeks or greater with paroxysms of coughing, and/or inspiratory whoop, and/or post-tussive vomiting in a person associated with one of the affected schools from March 17, 2014 to April 26, 2015. Ill persons with a positive test for pertussis by polymerase chain reaction (PCR) or epidemiologically linked to a PCR-positive case were considered confirmed. Ill persons without a PCR-positive laboratory result or link to a PCR-positive case were classified as probable.

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 of 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, doses of DTaP should be administered at 2 months, 4 months, 6 months, 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

Results

One-hundred and thirty-seven cases of pertussis were identified; 105 were classified as confirmed and 32 as probable. Most (132) cases resided in Pottawatomie County; however, pertussis did spread to three neighboring counties including Jackson (2), Wabaunsee (2), and Shawnee (1) counties. Eighty cases had documented exposure at home, 28 at school, 15 had an unknown exposure, 8 at church, 3 at work, and the remaining 3 had an exposure at a different household other than their own. The median age of those ill was eight years with a range from 3 months to 67 years (Table 1). Seventy-four (54.0%) cases of pertussis were female.

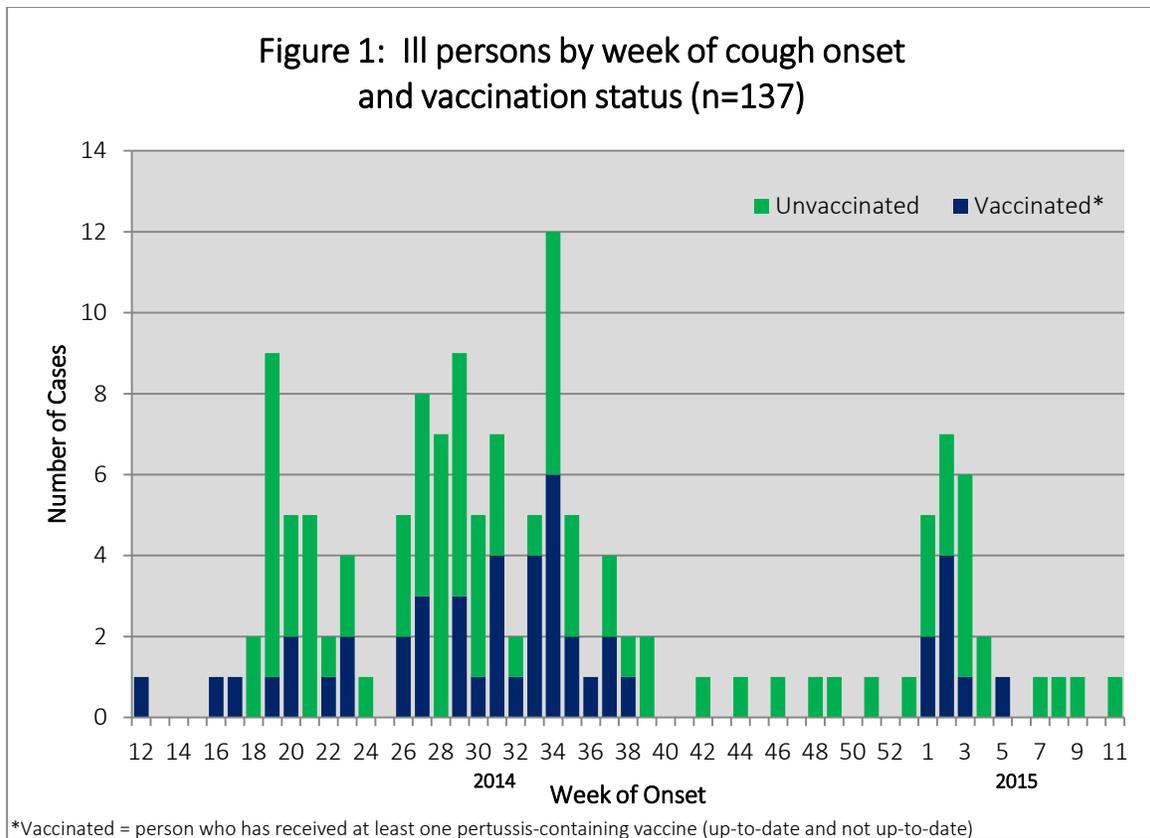
Table 1: Distribution of ill persons by exposure setting and age (n=137)

Exposure Setting	# of Ill Persons (%)	Median Age	Age Range
Home	80 (58.4%)	6 years*	3 months – 62 years*
School	28 (20.4%)	9 years‡	4 – 15 years‡
Unknown	15 (11.0%)	10 years	4 months – 61 years
Church	8 (5.8%)	3.5 years	3 months – 12 years
Work	3 (2.2%)	26 years	24 – 34 years
Non-household	3 (2.2%)	9 years	2 – 67 years

*Missing dates of birth for 11 persons

‡Missing dates of birth for 1 person

The earliest illness onset, March 17, 2014 (week 12), was reported in a student and the latest onset was March 16, 2015 (week 11) in an infant. Vaccination histories were obtained for 127 (92.7%) ill persons. Based on ACIP recommendations, 33 (26.0%) were considered up-to-date on their pertussis-containing vaccinations, 14 (11.0%) were not considered up-to-date, and 80 (63.0%) were completely unvaccinated (Figure 1).



Clinical information was complete for 125 (91.2%) of the pertussis cases (Table 2). Duration of cough was reported in all pertussis cases with a median duration of 25 days and a range of 14-92 days. Sixty-one (44.5%) ill persons were diagnosed by healthcare provider and 41 cases were positive for *Bordetella pertussis* via PCR. No ill persons were hospitalized and no deaths were reported.

Table 2: Clinical information reported among ill persons

Symptoms	# of Ill Persons/Total	% of Ill Persons
Cough	137/137	100.0%
Paroxysms	132/136	97.1%
Post-tussive vomiting	79/135	58.5%
Whoop	60/131	45.8%
Apnea	19/136	14.0%

Two-hundred and sixty-four close contacts were identified and followed for 21 days following last exposure to a pertussis case for development of symptoms. There were 231 household contacts, 17 school or daycare contacts, 4 social (e.g., friend, church, extracurricular activity) contacts, 6 non-household family contacts, 4 other contacts, 1 work contact, and 1 healthcare

worker contact. Susceptible contacts were identified and either vaccinated within 24 hours or excluded from school or daycare for 21 days.

The PCHD held a vaccination clinic off-site on August 18, 2014 for the community and reported that a total of 54 doses of pertussis-containing vaccine (17 doses of Tdap and 37 doses of DTaP) were administered at this clinic.

Discussion

During the course of this outbreak, 137 cases of pertussis were identified among schools and a church in Pottawatomie County. This outbreak was detected by routine surveillance after case review by KDHE identified an increase in pertussis cases that all attended the same school. This outbreak lasted an entire year. Five persons with pertussis that were associated with this outbreak attended school in Pottawatomie County, but resided in Jackson, Wabaunsee, and Shawnee counties.

Pertussis is a highly contagious disease with secondary attack rates of 80% in susceptible household contacts; however, additional pertussis cases were not reported in any of these counties. Pockets of highly unvaccinated persons are not present in these counties and this likely contributed to stopping further transmission.

There were some significant challenges the PCHD encountered during this outbreak, which made it difficult to manage. This pertussis outbreak affected a highly unvaccinated community. Vaccination is the best way to prevent pertussis and considering a majority of ill persons were not vaccinated, this likely contributed to the ongoing transmission of pertussis within this community for an entire year resulting in many additional cases.

Another challenge the PCHD faced was underreporting of pertussis cases. Physicians were examining patients clinically compatible for pertussis and treating them, but were not testing for pertussis or reporting cases to PCHD or KDHE. Under Kansas Administrative Regulation 28-1-2, pertussis cases (including suspect cases) are required to be reported to KDHE within four hours of suspicion so appropriate control measures can be implemented 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 were not treating contacts if the person was not laboratory confirmed to have pertussis even though they were clinically compatible and exposed to confirmed cases of pertussis. 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.²

In the midst of these challenges, there were efforts that were successful during this pertussis outbreak. The PCHD held an off-site vaccination clinic during the outbreak to vaccinate un- or under-vaccinated individuals. They vaccinated 54 persons in a vaccine-hesitant 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 key to stopping transmission of pertussis.

Another success during this pertussis outbreak was communication efforts. The local health department provided letters to physicians in the area on reporting requirements and testing and treatment recommendations. KDHE provided letters on reporting requirements to physicians that were not reporting pertussis cases per the KDHE regulation. In addition, treatment recommendations were communicated to many physicians. These efforts eventually resulted in an increase in reporting of suspect cases and implementation of appropriate antibiotic prophylaxis to contacts of pertussis cases.

Lastly, the PCHD had a good working relationship with the school that was affected by this outbreak. The school was very diligent in reporting pertussis cases to PCHD and excluded completely unvaccinated students for 21 days following their last exposure. The local health department provided letters on prevention and control measures that the school distributed to parents. The school also advertised the vaccination clinic held by PCHD to parents and the community. This collaborative environment facilitated in controlling the spread of disease.

The Pottawatomie County Health Department was presented with a very difficult task of controlling an outbreak and preventing further spread of disease in a highly unvaccinated community. This outbreak presented many challenges, which contributed to it being the longest individual pertussis disease outbreak Kansas has experienced to date. However, PCHD made efforts that were successful in stopping transmission.

Report by:

Chelsea Raybern, Kansas Department of Health and Environment
Sarah Fornshell, Pottawatomie County Health Department
Lisa DeWeese, Pottawatomie County Health Department

Publication Date: August 17, 2016

Investigation by:

Pottawatomie County Health Department

320 E Main

Westmoreland, KS 66549

<http://www.pottcounty.org/HealthDept/HealthServ.html>

Kansas Department of Health & Environment

Bureau of Epidemiology and Public Health Informatics

1000 SW Jackson St., Suite 075

Topeka, Kansas 66612

<http://www.kdheks.gov/>

¹ Centers 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>

² Centers for Disease Control and Prevention. Pertussis (Whooping Cough): Postexposure Antimicrobial Prophylaxis. Accessed January 5, 2016. <http://www.cdc.gov/pertussis/outbreaks/pep.html>