

# Investigation of Mumps Outbreaks – Kansas, December 2016 – July 2017

---



# Table of Contents

Background .....	3
Methods.....	3
Epidemiologic Investigation.....	3
Laboratory Analysis.....	3
Results.....	4
Epidemiologic Investigation.....	4
Laboratory Analysis.....	6
Results by Outbreak.....	7
Douglas County, University of Kansas Mumps Outbreak, December 2016 .....	8
Riley County, Kansas State University Mumps Outbreak, February 2017 .....	10
Crawford County Mumps Outbreak, February 2017 .....	12
Finney County Mumps Outbreak, February 2017 .....	14
Thomas County Mumps Outbreak, February 2017 .....	16
Marshall County Mumps Outbreak, March 2017 .....	18
Johnson County Mumps Outbreak #1, March 2017.....	20
Johnson County Mumps Outbreak #2, March 2017.....	21
Trego County Mumps Outbreak, March 2017.....	24
Johnson County Mumps Outbreak #3, May 2017 .....	26
Wyandotte County Mumps Outbreak, June 2017.....	28
Discussion .....	30
Mumps Disease.....	30
Mumps Vaccine .....	30
Outbreak Communication .....	31

# Background

From December 2016 to July 2017, the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response Section (KDHE) along with local health departments across the state investigated eleven outbreaks of mumps. Outbreak investigations were immediately initiated upon report of each outbreak, as rapid detection and investigation of cases and contacts as well as prompt implementation of control measures can reduce the magnitude of mumps outbreaks<sup>1</sup>.

## Methods

### *Epidemiologic Investigation*

A confirmed case of mumps was defined as a positive mumps laboratory confirmation for mumps virus with polymerase chain reaction (PCR) or culture in a patient with an acute illness characterized by any of the following: acute parotitis or other salivary gland swelling lasting at least two days, aseptic meningitis, encephalitis, hearing loss, orchitis, oophoritis, mastitis, or pancreatitis<sup>2</sup>.

A probable case of mumps is defined as acute parotitis or other salivary gland swelling lasting at least two days, or orchitis or oophoritis unexplained by another more likely diagnosis, in either a person with a positive test for serum anti-mumps immunoglobulin (IgM) antibody, or a person with epidemiologic linkage to another probable or confirmed case or linkage to a group/community defined by public health during an outbreak of mumps<sup>2</sup>.

Case and contact investigations were performed for each reported case in accordance with the KDHE Mumps Disease Investigation Guidelines<sup>3</sup>. A mumps outbreak is defined as three or more cases, from two or more households, linked by time and place<sup>1</sup>. Outbreak investigations were finalized when two mumps incubation periods, or fifty days, had passed from the illness onset date of the most recent case associated with the outbreak.

Outbreak data was sent bimonthly to the Centers for Disease Control and Prevention (CDC) to enhance national mumps surveillance data. This was done in tandem with routine case reporting in order aid in evaluation of current data for the epidemiology of the two-dose MMR vaccine series and provide insight on future public health recommendations in response to mumps outbreaks.

### *Laboratory Analysis*

The preferred specimen for mumps is a buccal swab, which can be tested for mumps by polymerase chain reaction (PCR) and should be collected within five days of onset of parotitis; this testing can be performed at KHEL and other clinical labs. Serum anti-mumps immunoglobulin (IgM) antibody testing is recommended only for unvaccinated persons on specimens collected at least five days after onset

of parotitis. IgM testing can only be performed at private laboratories, and results should be interpreted with caution<sup>4</sup>.

Guidance on laboratory testing was provided for each suspected case of mumps reported to KDHE, and procedures were established to approve specimens for testing at the Kansas Health and Environmental Laboratories (KHEL). To be approved for mumps PCR testing at KHEL, the following criteria are required:

- the specimen must be collected within five days of onset of parotitis, **and**
- the patient reports specific mumps symptoms and exposures, including:
  - parotitis, *or*
  - oophoritis, *or*
  - orchitis, *or*
  - pancreatitis **and** documented exposure to mumps, *or*
  - encephalitis **and** documented exposure to mumps, *or*
  - meningitis **and** documented exposure to mumps.

For patients approved for mumps PCR testing at KHEL, healthcare providers were also encouraged to submit a nasopharyngeal swab for testing on a multiplex-PCR respiratory viral panel (RVP), which tests for twenty respiratory diseases including influenza, parainfluenza, human rhinovirus/enterovirus, and *Bordetella pertussis*. This testing was recommended as parotitis can also be caused by other illnesses including influenza<sup>5</sup>.

At least one PCR-positive specimen from each mumps outbreak was sent to CDC for genotyping to determine whether the mumps viruses causing illness in Kansas were genetically related to mumps viruses circulating in outbreaks throughout the country. Any PCR-positive specimens from sporadic cases (those without a known epidemiologic link to current outbreaks) were also submitted for genotyping, as well as specimens from persons experiencing multiple distinct episodes of parotitis.

## Results

### *Epidemiologic Investigation*

From December 1, 2016 to July 31, 2017, 166 mumps cases were reported in 26 counties in Kansas [Figure 1]. Of these, 92 (55%) were confirmed and 74 were probable cases of mumps. Among the 166 cases, 133 cases were associated with an outbreak, either as part of a Kansas outbreak or epidemiologically linked to an outbreak in another state. Additionally, a number of sporadic and outbreak cases in Kansas during this time were in members of the high school wrestling community; although not all of these cases could be linked to one another, it seems that transmission of mumps was occurring in this community.

Between December 2016 and July 2017, eleven mumps outbreaks were reported in Kansas. Crawford, Douglas, Finney, Marshall, Riley, Thomas, Trego, and Wyandotte Counties each had one mumps outbreak; three mumps outbreaks occurred in Johnson County [Figure 2].

Figure 1. Mumps Cases and Outbreaks by Kansas County, December 2016 – July 2017

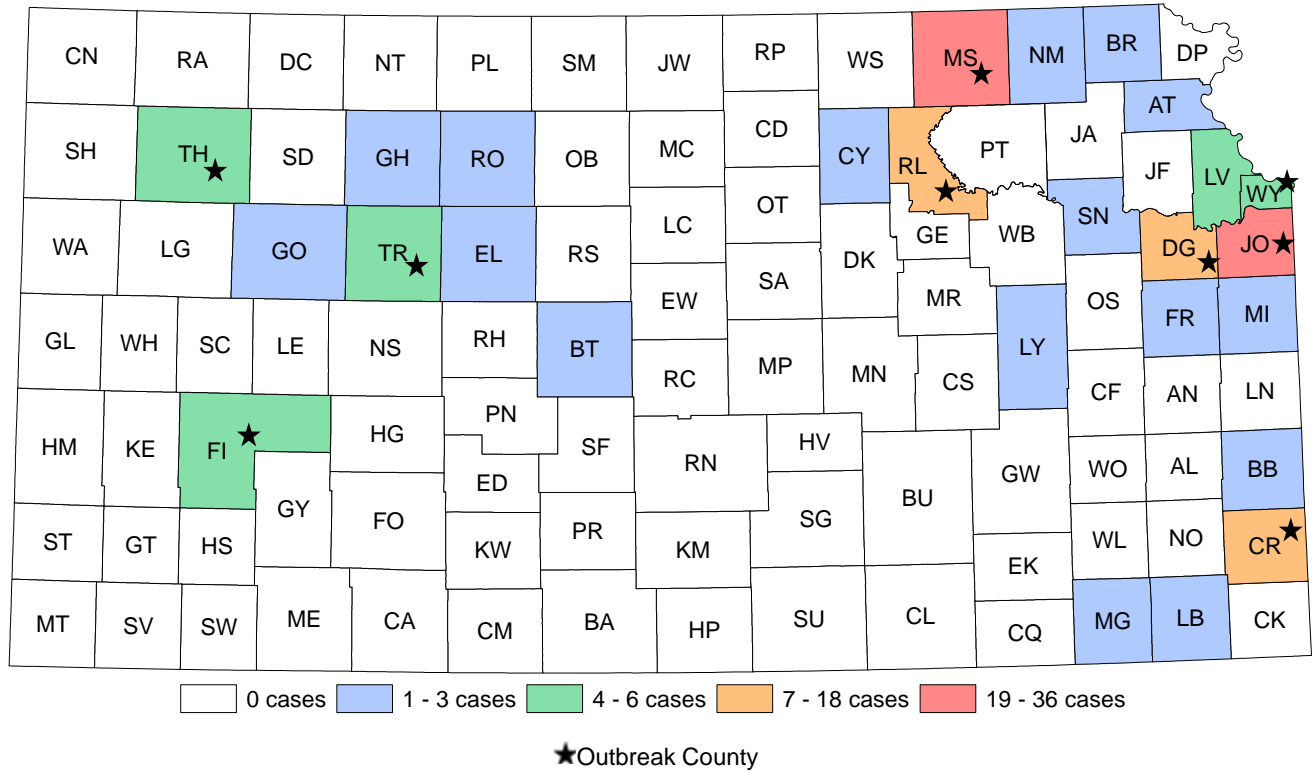
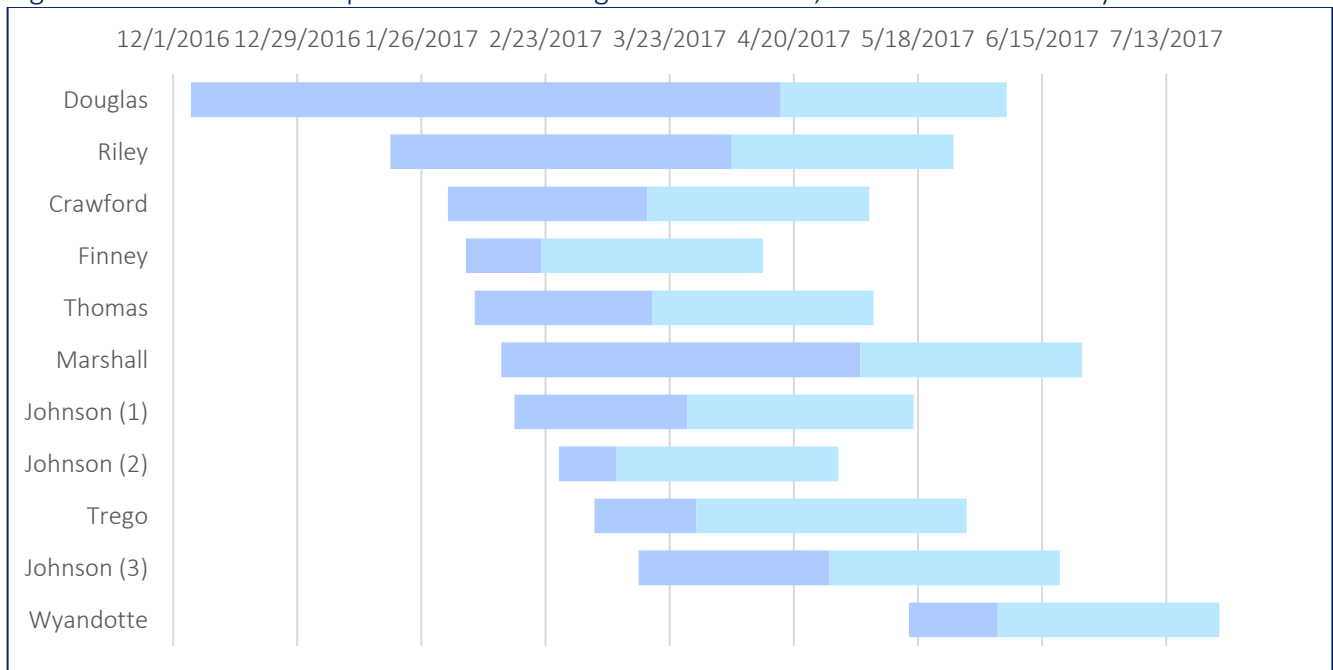


Figure 2. Timeline of Mumps Outbreak Investigations in Kansas, December 2016 – July 2017



### *Laboratory Analysis*

From December 2016 through July 2017, 430 specimens were tested for mumps via PCR at KHEL. Of these, 82 (19.1%) of these specimens tested PCR-positive for mumps. The average time between parotitis onset and collection of specimen for mumps testing was 1.8 days (range: 0 to 17 days; median: 1 day).

In addition, KHEL tested 155 specimens using the multiplex-PCR respiratory viral panel (RVP), of which 43 (27.7%) were positive for at least one of the organisms on the panel. Twenty-one (48.8%) were positive for Influenza A, 14 (9.0%) were positive for Rhinovirus/Enterovirus, and other specimens were positive for Coronaviruses and Influenza B, [Table 1]. Specimens from four persons were coinfecting with mumps and another organism on the RVP.

Of the twenty-five PCR-positive mumps specimens sent to CDC for genotyping, twenty-three (92%) the specimens were able to be genotyped, all of which were confirmed to be mumps genotype G.

Table 1. Positive RVP Results among Persons also tested for Mumps, December 2016 – July 2017

<b>Organism</b>	<b>Number of Positive Specimens</b>	<b>Number also Positive for Mumps</b>
Human Coronavirus 229E	5	1
Human Coronavirus OC43	2	
Influenza A (Seasonal H3)	21	1
Influenza B	1	
Rhinovirus/Enterovirus	14	2

## Results by Outbreak

## *Douglas County, University of Kansas Mumps Outbreak, December 2016*

An outbreak was identified among students of the University of Kansas in Douglas County on December 12, 2016. Lawrence-Douglas County Health Department (LDCHD) and KDHE immediately initiated an outbreak investigation, and the LDCHD Incident Command System was activated.

There were seven confirmed and thirteen probable cases associated with this outbreak. Ill persons ranged in age from 18 to 57 years of age (median age: 20 years), and ten (50%) were female. Eighteen (90%) ill persons experienced parotitis. Complications of mumps disease were reported in two (10%) persons, one of whom had orchitis and one of whom had meningitis. One person was hospitalized. Laboratory testing was conducted in eighteen cases; seven were confirmed by PCR. Eighteen (90%) ill persons had received two doses of the MMR vaccine; vaccine history was unknown for two (10%) persons [Table 2].

Onset dates ranged from December 5, 2016 to April 17, 2017 [Figure 3]. Among the ten cases for which recovery date was available, duration of illness ranged from 2 to 6 days (median duration: 4 days).

Sixteen (80%) cases occurred in University of Kansas students, three (15%) cases occurred in employees, and one (5%) was a close contact of a student [Table 2].

On December 13, 2016, a KDHE distributed a notice through the Kansas Health Alert Network (KS-HAN) regarding mumps cases in Kansas; LDCHD shared this information with Douglas County healthcare providers. On January 4, 2017, the University of Kansas was designated as an outbreak community, which allowed for more efficient case investigations and faster identification of contacts. Representatives from LDCHD, KDHE, and the University of Kansas met on January 6 and again on February 14, 2017 to discuss the outbreak and provide prevention and control recommendations. The university reported that 98% of the student body had documented history of MMR vaccine.

An after-action meeting was held on April 20, 2017 to determine investigation strengths and weaknesses. Investigation strengths included the communication between LDCHD, the university, and KDHE; the university's existing vaccination policy and ease of checking vaccination status of contacts to ill persons; and communication to students regarding illness prevention. Difficulties encountered during this outbreak investigation included educating healthcare providers on mumps recognition and reporting, and obtaining clinical specimens collected for laboratory testing. This outbreak was declared over on June 7, 2017.

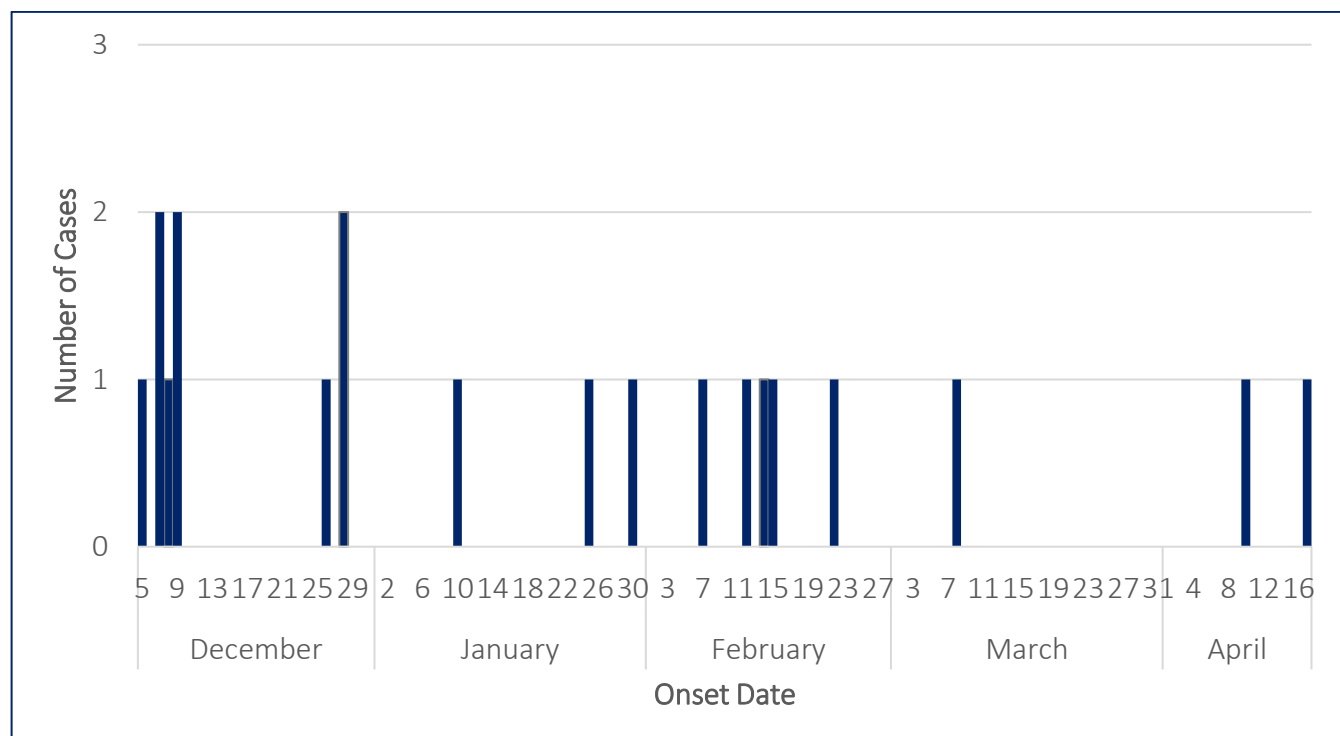


Table 2. Characteristics of Ill Persons (n=20), Douglas County Mumps Outbreak

		# of Cases	% of Cases
Symptoms Reported by Ill Persons	Parotitis	18	90%
	Fever	13	65%
	Meningitis	1	5%
	Orchitis	1	5%
Medical Care	Sought Healthcare	18	90%
	Hospitalized	1	5%
Positive Laboratory Results*	PCR	7	35%
Lifetime Number of MMR Vaccines Received	2	18	90%
	Unknown	2	10%
University of Kansas Affiliation	Student	16	80%
	Employee	3	15%
	Contact of Student	1	5%

\*Individuals may have been tested using more than one laboratory test. Some persons were not tested.

Figure 3. Number of Cases (n=20) by Onset Date, Douglas County Mumps Outbreak



### *Riley County, Kansas State University Mumps Outbreak, February 2017*

An outbreak of mumps was identified among students of Kansas State University in Riley County on February 20, 2017. The Riley County Health Department (RCHD) and KDHE conducted an outbreak investigation.

There were eight confirmed and nine probable cases of mumps associated with this outbreak. Ill persons ranged in age from 17 to 36 years (median age: 21 years), and eight (47%) were female. All ill persons experienced parotitis; no complications of mumps disease or hospitalizations were reported. Laboratory testing was conducted in thirteen cases; eight were confirmed by PCR. All ill persons had received two doses of the MMR vaccine [Table 3].

Onset dates ranged from January 19 to April 6, 2017 [Figure 4]. Duration of illness ranged from 3 to 7 days (median duration: 5 days).

Thirteen (76%) cases occurred in Kansas State University students, two (12%) cases occurred in employees, and two (12%) were in close contacts of a student [Table 3].

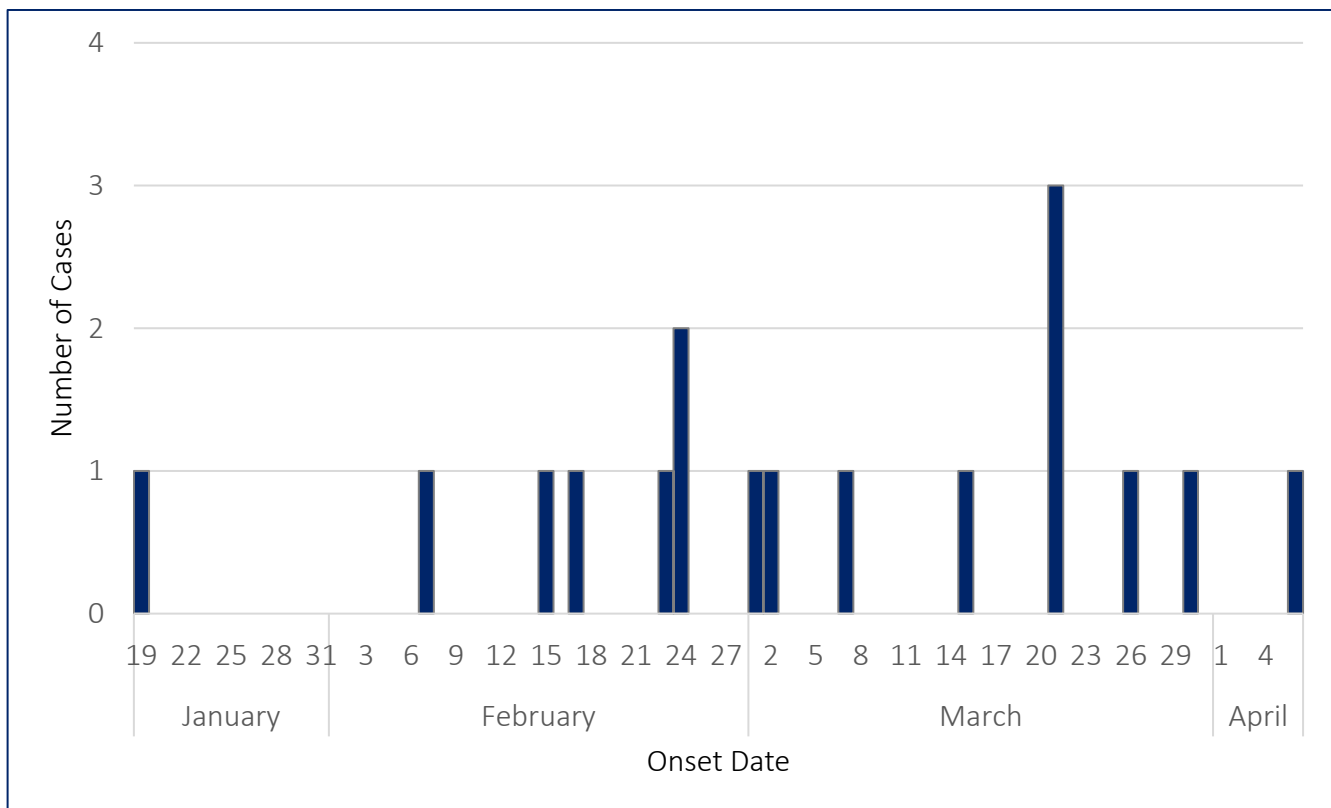
Representatives from RCHD, KDHE, and Kansas State University met on February 27, 2017 to discuss the outbreak and provide prevention and control recommendations. A third dose of MMR vaccine was recommended for persons at increased risk of illness, which was defined as persons with contact to the current cluster of mumps. A second meeting was held on April 5, 2017 to prepare for vaccination clinics, which were held on April 7, April 11, and April 12, 2017. During these vaccination clinics, 415 doses of MMR vaccine were administered in direct response to the outbreak. This outbreak was declared over on May 26, 2017.

Table 3. Characteristics of Ill Persons (n=17), Riley County Mumps Outbreak

		# of Cases	% of Cases
Symptoms Reported by Ill Persons	Parotitis	17	100%
	Fever	8	47%
Medical Care	Sought Healthcare	13	76%
	Hospitalized	0	0%
Positive Laboratory Results*	PCR	8	47%
Lifetime Number of MMR Vaccines	2	17	100%
Kansas State University Affiliation	Student	13	76%
	Employee	2	12%
	Contact of Student	2	12%

\*Individuals may have been tested using more than one laboratory test. Some persons were not tested.

Figure 4. Number of Cases (n=17) by Onset Date, Riley County Mumps Outbreak



## *Crawford County Mumps Outbreak, February 2017*

On February 6, 2017, two suspect mumps cases were reported in Crawford County, and an outbreak investigation was initiated by the Crawford County Health Department (CCHD) and KDHE. Both cases reported attending a family birthday party.

There were sixteen confirmed cases associated with this outbreak. Ill persons ranged in age from 15 to 54 years (median age: 21 years), and ten (63%) were female. All ill persons experienced parotitis, for which the median duration of illness was four days (range: two to six days). No complications from mumps were reported. All ill persons sought healthcare for their illness, and no ill person was hospitalized. Vaccination status was known for fifteen (94%) persons. Laboratory testing was conducted for all ill persons, and all were positive for mumps by PCR. Six persons (40%) were completely unvaccinated, one (6%) had received one dose of the MMR vaccine, and eight (50%) had received two doses. [Table 4].

Onset dates ranged from February 1 to March 18, 2017 [Figure 5].

Eight (50%) ill persons reported exposure at the birthday party attended by the first two suspect cases, also present were persons from an out-of-state that was experiencing a mumps outbreak at that time.

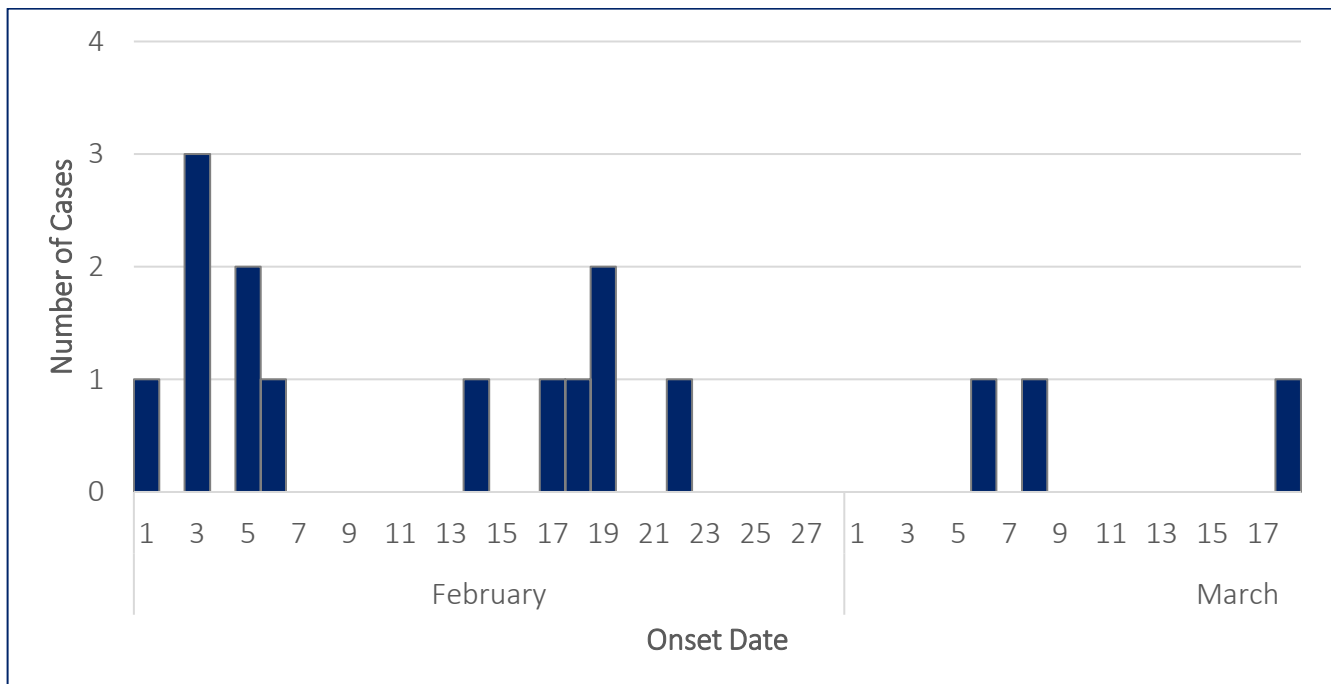
On February 9, 2017, CCHD in coordination with the local school district and major area hospitals issued a press release concerning mumps in the community, describing symptoms of mumps and urging all symptomatic persons to seek medical care. This outbreak was declared over on May 7, 2017.

Table 4 Characteristics of Ill Persons (n=16), Crawford County Mumps Outbreak

		# of Cases	% of Cases
Symptoms Reported by Ill Persons	Parotitis	16	100%
	Fever	6	38%
Medical Care	Sought Healthcare	16	100%
	Hospitalized	0	0%
Positive Laboratory Results*	PCR	16	100%
	IgM	1	6%
Lifetime Number of MMR Vaccines Received	2	8	50%
	1	1	6%
	0	6	38%
	Unknown	1	6%

\*Individuals may have been tested using more than one laboratory test. Some persons were not tested.

Figure 5. Number of Cases (n=16) by Onset Date, Crawford County Mumps Outbreak



### *Finney County Mumps Outbreak, February 2017*

A mumps outbreak was identified among residents of Finney County on February 22, 2017, and an outbreak investigation was conducted by the Finney County Health Department (FCHD) and KDHE.

There were one probable and two confirmed cases of mumps associated with this outbreak. Ill persons ranged in age from 44 to 47 years of age (median age: 46 years) and two (67%) ill persons were male. All ill persons reported parotitis, and one (33%) person had orchitis as a complication of mumps. One (33%) person sought healthcare, and no hospitalizations were reported. Laboratory testing was conducted for all ill persons; two (67%) were positive for mumps by PCR, and one (33%) was positive by IgM. Two (67%) ill persons had received one MMR vaccine, and vaccination status was unknown for one person [Table 5].

Onset dates ranged from February 5 to 22, 2017 [Figure 6]. Duration of illness was 6 days for two ill persons (duration was unknown for one person).

All cases occurred in persons associated with high school wrestling or their contacts.

A press release was issued by FCHD on February 28, 2017 regarding mumps cases in the county. This outbreak was declared over on April 13, 2017.

Table 5. Characteristics of Ill Persons (n=3), Finney County Mumps Outbreak

		# of Cases	% of Cases
Symptoms Reported by Ill Persons	Parotitis	3	100%
	Fever	1	33%
	Orchitis	1	33%
Medical Care	Sought Healthcare	1	33%
	Hospitalized	0	0%
Positive Laboratory Results*	PCR	2	67%
	IgM	1	33%
Lifetime Number of MMR Vaccines Received	2	0	0%
	1	2	67%
	Unknown	1	33%

\*Individuals may have been tested using more than one laboratory test. Some persons were not tested.

Figure 6. Number of Cases (n=3) by Onset Date, Finney County Mumps Outbreak



### *Thomas County Mumps Outbreak, February 2017*

A mumps outbreak was identified among high school students in Thomas County on February 20, 2017, and an outbreak investigation was conducted by the Thomas County Health Department (THCHD) and KDHE.

There were three confirmed and three probable cases of mumps associated with this outbreak. Ill persons ranged in age from 14 to 23 years of age (median age: 18 years), and five (83%) ill persons were male. Five (83%) ill persons reported parotitis, and one (17%) person had orchitis as a complication of mumps. Three (50%) persons sought healthcare, and no hospitalizations were reported. Laboratory testing was conducted for five ill persons; three were positive for mumps by PCR. All ill persons had received two doses of the MMR vaccine [Table 6].

Onset dates ranged from February 7 to March 19, 2017 [Figure 7]. Duration of illness ranged from 4 to 7 days (median duration: 5.5 days; duration unknown for four persons).

All cases occurred in high school wrestlers or persons with contact to high school wrestlers.

Messaging was distributed to parents with information on mumps and a press release was issued by THCHD on February 21, 2017 regarding the outbreak. This outbreak was declared over on May 8, 2017.

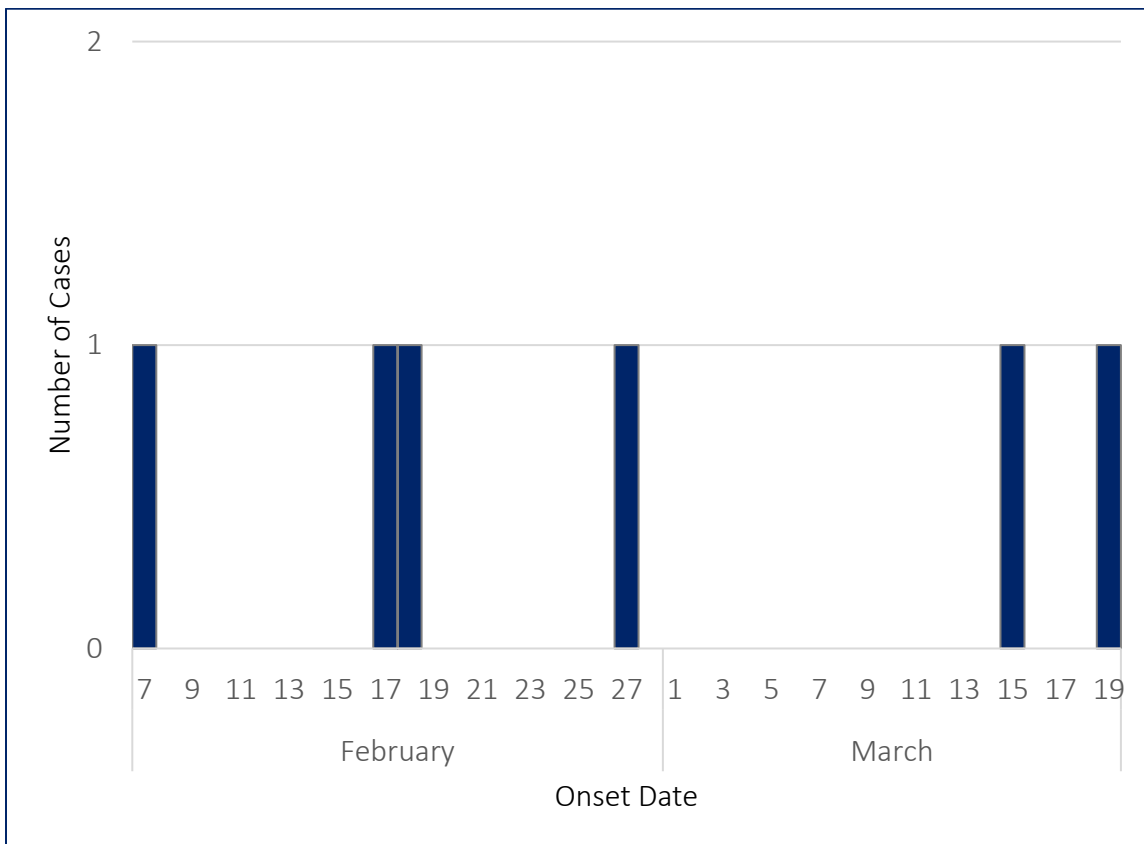


Table 6. Characteristics of Ill Persons (n=6), Thomas County Mumps Outbreak

		# of Cases	% of Cases
Symptoms Reported by Ill Persons	Parotitis	5	83%
	Fever	4	67%
	Orchitis	1	17%
Medical Care	Sought Healthcare	3	50%
	Hospitalized	0	0%
Positive Laboratory Results*	PCR	3	50%
Lifetime Number of MMR Vaccines	2	6	100%

\*Individuals may have been tested using more than one laboratory test. Some persons were not tested.

Figure 7. Number of Cases (n=6) by Onset Date, Thomas County Mumps Outbreak



### *Marshall County Mumps Outbreak, March 2017*

An outbreak of mumps was reported among high school students in Marshall County on February 28, 2017. The Marshall County Health Department (MCHD) and KDHE conducted an outbreak investigation.

There were twenty-one confirmed and fourteen probable cases of mumps associated with this outbreak. Ill persons ranged in age from 5 to 63 years (median age: 18 years), and twenty (57%) ill persons were male. All ill persons reported parotitis, and two (6%) persons experienced orchitis as a complication of mumps. Twenty-one (60%) persons sought healthcare, and no hospitalizations were reported. Laboratory testing was conducted for 22 cases; 21 were positive for mumps by PCR. Twenty-five (71%) ill persons had received two doses of the MMR vaccine, six (17%) persons had received 1 dose, two (6%) were unvaccinated, and vaccination status was unknown for two persons [Table 7].

Onset dates ranged from February 13 to May 5, 2017 [Figure 8]. Duration of illness was 2 to 8 days (median duration: 5 days).

Twenty (57%) ill persons were students, three (9%) were employees of the school, and twelve (34%) were contacts of ill persons affiliated with the school [Table 7].

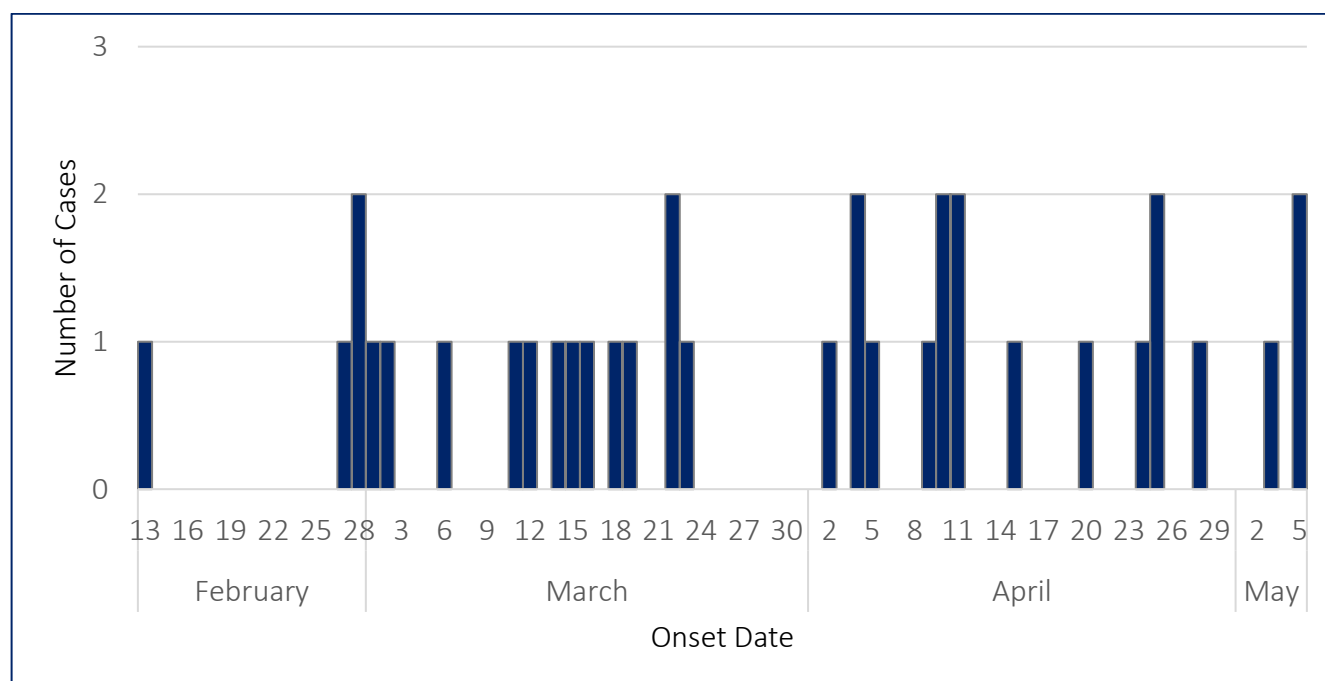
One May 1, 2017, the recommendation was made that anybody with a connection to the high school should receive a third dose of the MMR vaccine. Vaccination clinics were held at the school on May 1 and May 8, 2017, during which 91 doses of MMR vaccine were given. An evening clinic was held at MCHD on May 10, 2017, during which 25 doses of MMR vaccine were given, and an additional 81 doses of MMR vaccine were given during normal clinic hours at MCHD. A total of 197 doses of MMR vaccine were given by MCHD during this outbreak. This outbreak was declared over on June 24, 2017.

Table 7. Characteristics of Ill Persons (n=35), Marshall County Mumps Outbreak

		# of Cases	% of Cases
Symptoms Reported by Ill Persons	Parotitis	35	100%
	Fever	16	46%
	Orchitis	2	6%
Medical Care	Sought Healthcare	21	60%
	Hospitalized	0	0%
Positive Laboratory Results*	PCR	21	60%
	IgM	2	6%
	IgG	6	17%
Lifetime Number of Mumps Vaccines Received	2	25	71%
	1	6	17%
	0	2	6%
	Unknown	2	6%
High School Affiliation	Student	20	57%
	Employee	3	9%
	Contact of Student	12	34%

\*Individuals may have been tested using more than one laboratory test. Some persons were not tested.

Figure 8. Number of Cases (n=35) by Onset Date, Marshall County Mumps Outbreak



### *Johnson County Mumps Outbreak #1, March 2017*

On March 27, 2017, an outbreak of mumps was reported among employees of a workplace in Johnson County, and an outbreak investigation was initiated by the Johnson County Department of Health and Environment (JCDHE) and KDHE. Representatives from JCDHE met in person with management and employees of the workplace to assess for additional ill persons, gather exposure and illness information, and provide prevention and control recommendations.

There were two confirmed and thirteen probable mumps cases associated with this outbreak. Ill persons ranged from 22 to 46 years of age (median age: 30 years; age unknown for one person), and fourteen (93%) ill persons were male. Fourteen (93%) ill persons reported parotitis, and one (7%) person had orchitis as a complication of mumps. Seven (47%) persons sought healthcare, and one person was hospitalized. Laboratory testing was conducted for seven ill persons; two (13%) were positive for mumps by PCR, two (13%) were positive by IgM, and four (27%) were positive by IgG. Fourteen (93%) ill persons had received two doses of the MMR vaccine, and one had received one dose of MMR vaccine. [Table 8].

Onset dates ranged from February 16 to March 27, 2017 [Figure 9]. Duration of illness ranged from 2 to 15 days (median duration: 5.5 days; duration unknown for five persons).

Two (13%) ill persons were residents of Missouri, while the remainder were residents of Kansas. Thirteen (87%) cases occurred in employees of the workplace, one was in a household contact of an employee, and one was in a customer.

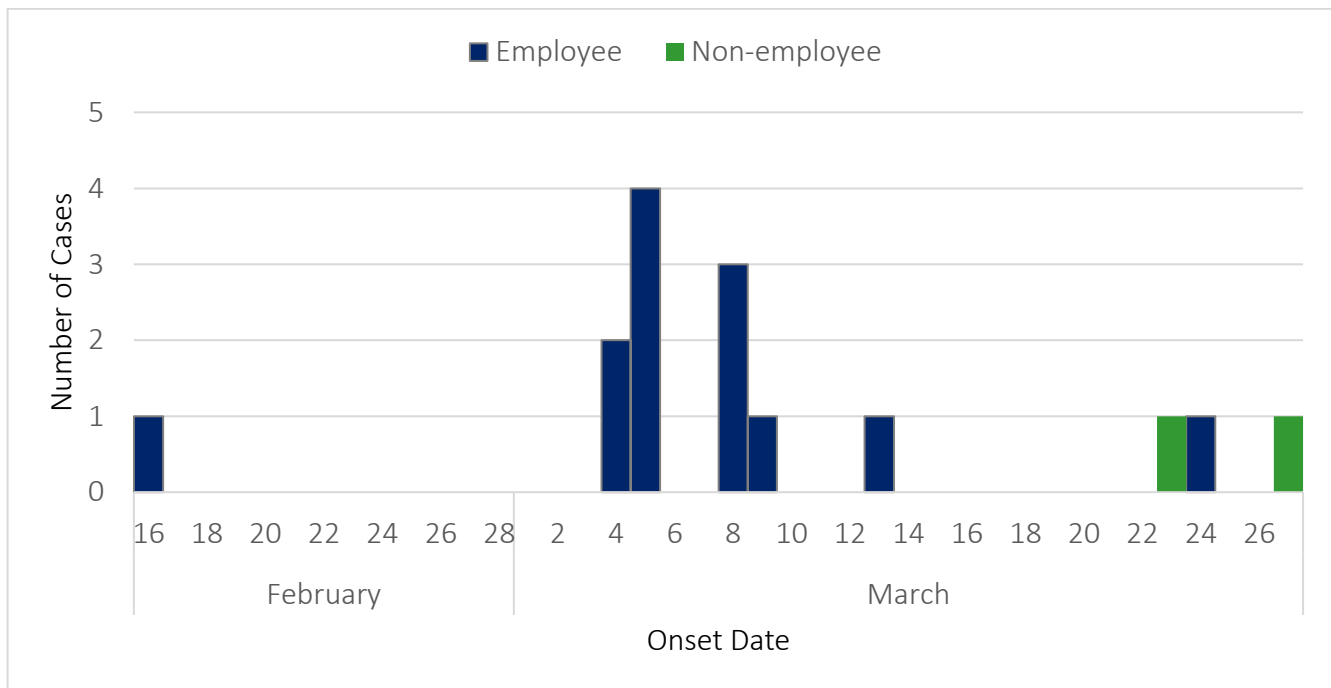
This outbreak was declared over on May 17, 2017.

Table 8. Characteristics of Ill Persons (n=15), Johnson County Mumps Outbreak #1

		# of Cases	% of Cases
Symptoms Reported by Ill Persons	Parotitis	14	93%
	Fever	6	40%
	Orchitis	1	7%
Medical Care	Sought Healthcare	7	14%
	Hospitalized	0	0%
Positive Laboratory Results*	PCR	2	13%
	IgM	2	13%
	IgG	4	27%
Lifetime Number of Mumps Vaccines Received	2	14	93%
	1	1	7%

\*Individuals may have been tested using more than one laboratory test. Some persons were not tested.

Figure 9. Number of Cases (n=15) by Onset Date, Johnson County Mumps Outbreak #1



### *Johnson County Mumps Outbreak #2, March 2017*

On March 23, 2017, an outbreak of mumps was reported among students at a post-secondary school in Johnson County, and an outbreak investigation was initiated by the Johnson County Department of Health and Environment (JCDHE) and KDHE. The school distributed a letter informing students about mumps when the first case was identified.

There were two probable Kansas cases associated with this outbreak, as well as one confirmed case in a Missouri resident. Ill persons ranged in age from 18 to 23 years (median age: 20.5 years; age was unknown for one person), and all ill persons were female. All ill persons reported parotitis, and no complications were reported. No hospitalizations were reported among ill persons in this outbreak. Laboratory testing was conducted for two (67%) ill persons; one (33%) was positive for mumps by PCR. Two (67%) ill persons had received two doses of the MMR vaccine, and vaccination status was unknown for one person [Table 9].

Onset dates ranged from February 26 to March 11, 2017 [Figure 10]. Duration of illness was 6 days for two ill persons (duration of illness was unknown for one person).

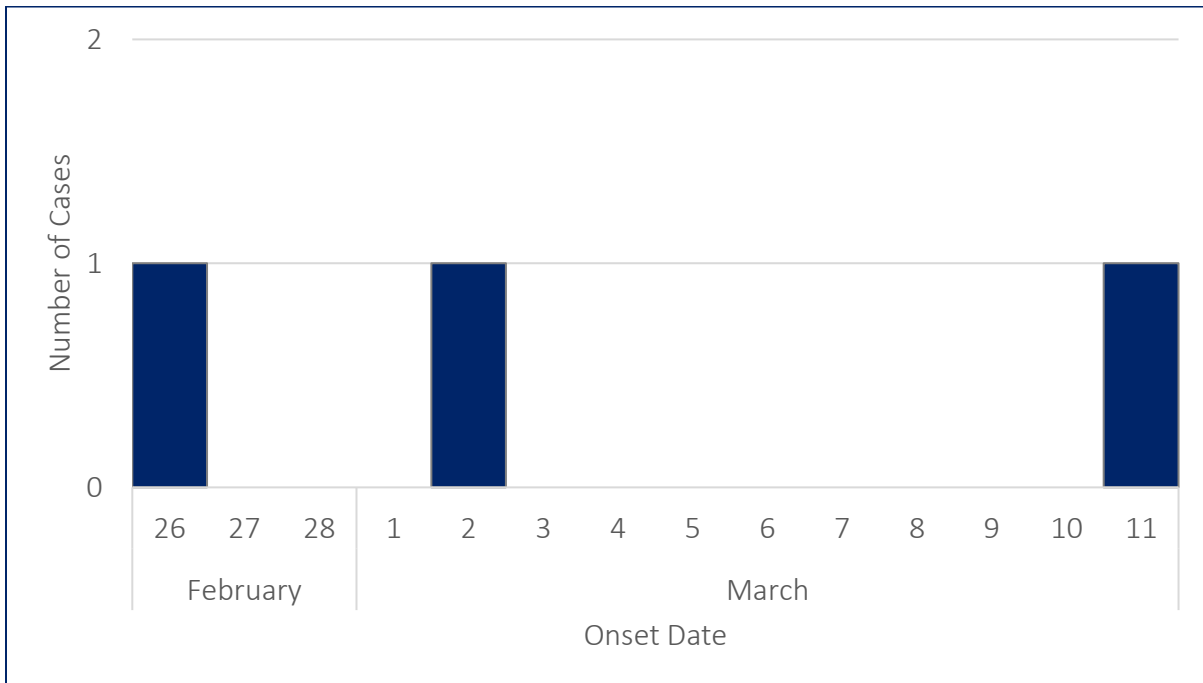
This outbreak was declared over on April 30, 2017.

Table 9. Characteristics of Ill Persons (n=3), Johnson County Mumps Outbreak #2

		# of Cases	% of Cases
Symptoms Reported by Ill Persons	Parotitis	3	100%
	Fever	2	67%
Medical Care	Sought Healthcare	1	33%
	Hospitalized	0	0%
Positive Laboratory Results*	PCR	1	33%
Lifetime Number of MMR Vaccines Received	2	2	37%
	Unknown	1	33%

\*Individuals may have been tested using more than one laboratory test. Some persons were not tested.

Figure 10. Number of Cases (n=3) by Onset Date, Johnson County Mumps Outbreak #2



### *Trego County Mumps Outbreak, March 2017*

An outbreak of mumps among high school students in Trego County was reported on March 14, 2017, and an outbreak investigation was conducted by Trego County Health Department (TR CHD) and KDHE.

There were five confirmed and one probable cases of mumps associated with this outbreak. Ill persons ranged in age from 15 to 18 years (median age: 17 years), and four (67%) ill persons were male. All ill persons reported parotitis, and one (33%) ill person experienced orchitis as a complication of mumps. All ill persons sought healthcare, and no hospitalizations were reported. Laboratory testing was conducted for five ill persons; all five (83%) were positive for mumps by PCR. All ill persons had received two doses of the MMR vaccine [Table 10].

Onset dates ranged from March 6 to March 29, 2017 [Figure 11]. Duration of illness ranged from 5 to 10 days (median duration: 8 days; duration unknown for two persons).

This outbreak was declared over on May 29, 2017.

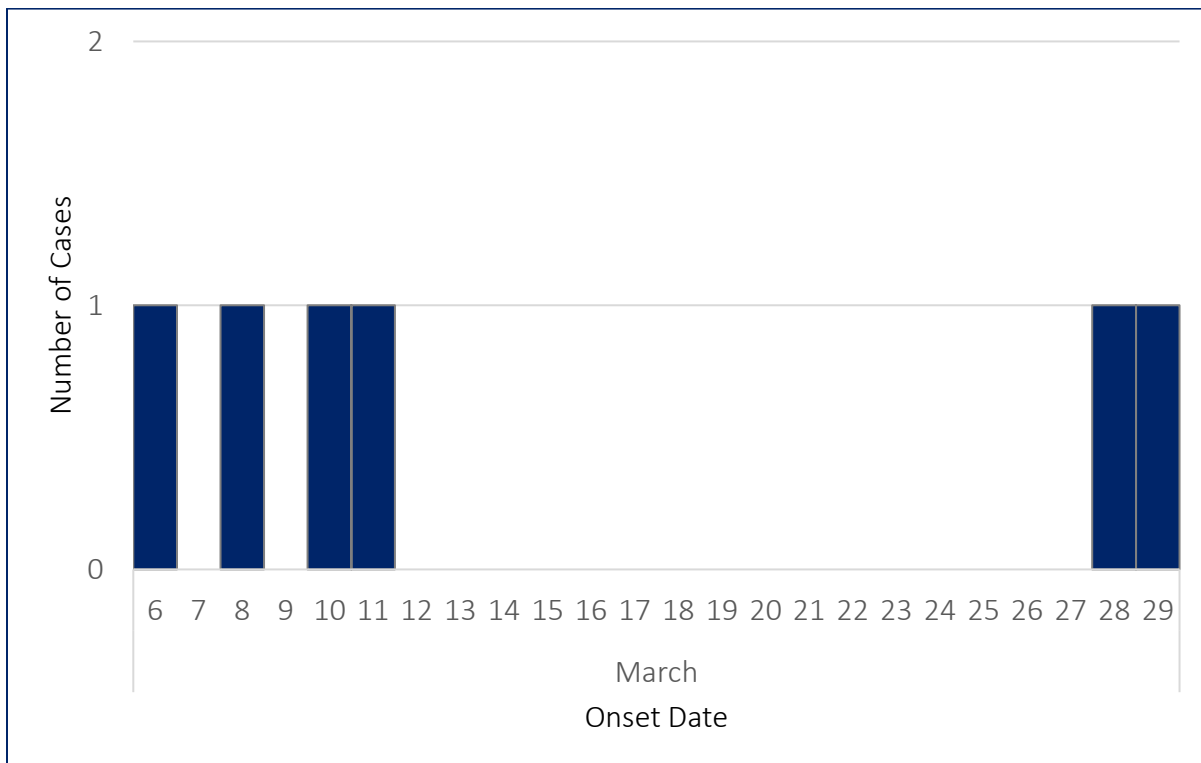


Table 10. Characteristics of Ill Persons (n=6), Trego County Mumps Outbreak

		# of Cases	% of Cases
Symptoms Reported by Ill Persons	Parotitis	6	100%
	Fever	3	50%
	Orchitis	1	17%
Medical Care	Sought Healthcare	6	100%
	Hospitalized	0	0%
Positive Laboratory Results*	PCR	5	83%
	IgM	1	17%
Lifetime Number of MMR Vaccines	2	6	100%

\*Individuals may have been tested using more than one laboratory test. Some persons were not tested.

Figure 11. Number of Cases (n=6) by Onset Date, Trego County Mumps Outbreak



### *Johnson County Mumps Outbreak #3, May 2017*

On May 3, 2017, a mumps outbreak was identified among persons associated with a healthcare facility in Johnson County where several patients with mumps had sought medical care. An outbreak investigation was conducted by the Johnson County Department of Health and Environment (JCDHE) and KDHE.

There were two confirmed and three probable cases of mumps associated with this outbreak. Ill persons ranged in age from 32 to 53 years (median age: 44 years), and four (80%) ill persons were female. All ill persons reported parotitis, and no complications were documented. All ill persons sought healthcare, and no hospitalizations were reported. Laboratory testing was performed for two (40%) ill persons; one was positive by PCR only and one was positive by both PCR and culture. Four (80%) ill persons had received two doses of the MMR vaccine and vaccination status was unknown for one person [Table 11].

Onset dates ranged from March 16 to April 28, 2017 [Figure 12]. Duration of illness ranged from 4 to 10 days (median duration: 5 days).

All cases in this outbreak were patients or employees of the healthcare facility.

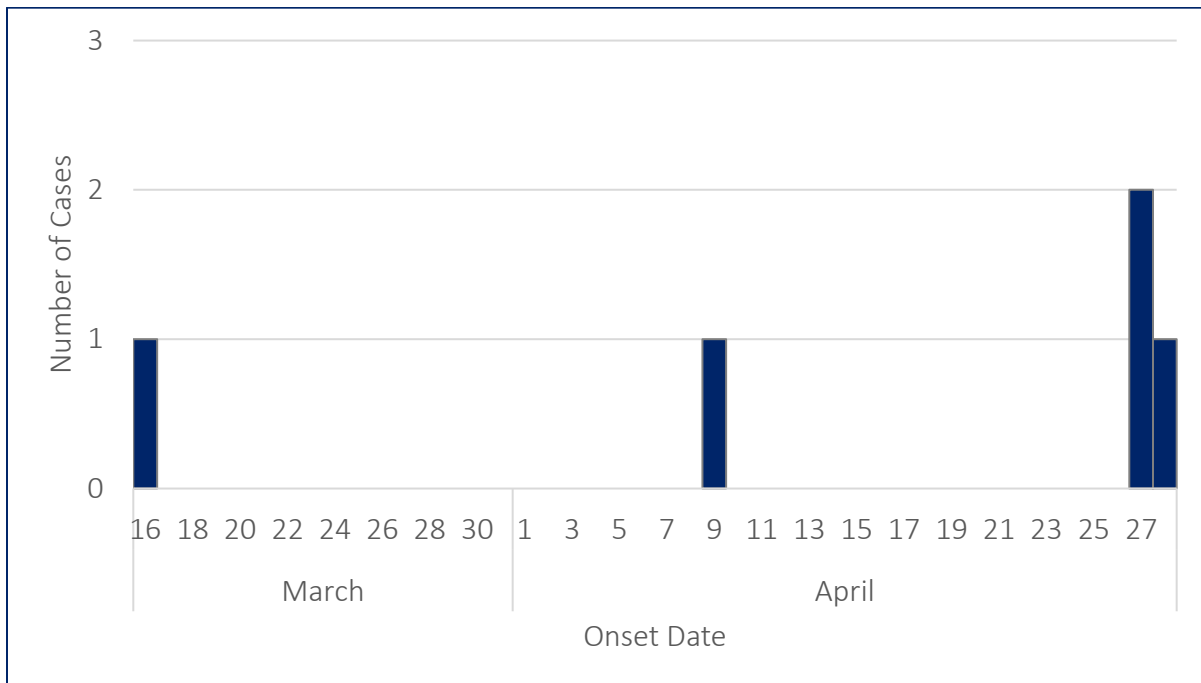
This outbreak was declared over on June 19, 2017.

Table 11. Characteristics of Ill Persons (n=5), Johnson County Mumps Outbreak #3

		# of Cases	% of Cases
Symptoms Reported by Ill Persons	Parotitis	5	100%
	Fever	1	20%
Medical Care	Sought Healthcare	5	100%
	Hospitalized	0	0%
Positive Laboratory Results*	PCR	1	20%
	Culture	2	40%
Lifetime Number of MMR Vaccines Received	2	4	80%
	Unknown	1	20%

\*Individuals may have been tested using more than one laboratory test. Some persons were not tested.

Figure 12. Number of Cases (n=5) by Onset Date, Johnson County Mumps Outbreak #3



### *Wyandotte County Mumps Outbreak, June 2017*

An outbreak of mumps was reported among employees of a workplace in Wyandotte County on June 9, 2017, and an investigation was conducted by the Wyandotte County Health Department (WCHD) and KDHE.

There were two confirmed and one probable cases of mumps associated with this outbreak. Ill persons ranged in age from 29 to 46 years of age (median age: 32 years); two (67%) ill persons were male. All ill persons reported parotitis, and one (33%) person experienced orchitis as a complication of mumps. Two (67%) persons sought healthcare, and no hospitalizations were reported. Laboratory testing was conducted for two persons; both were positive for mumps by PCR. One (33%) ill person had received two doses of the MMR vaccine and two ill persons reported being vaccinated but did not know how many doses of the MMR vaccine they had received [Table 12].

Onset dates ranged from May 16 to June 5, 2017 [Figure 13]. Duration of illness ranged from 3 to 10 days (median duration: 7.5 days).

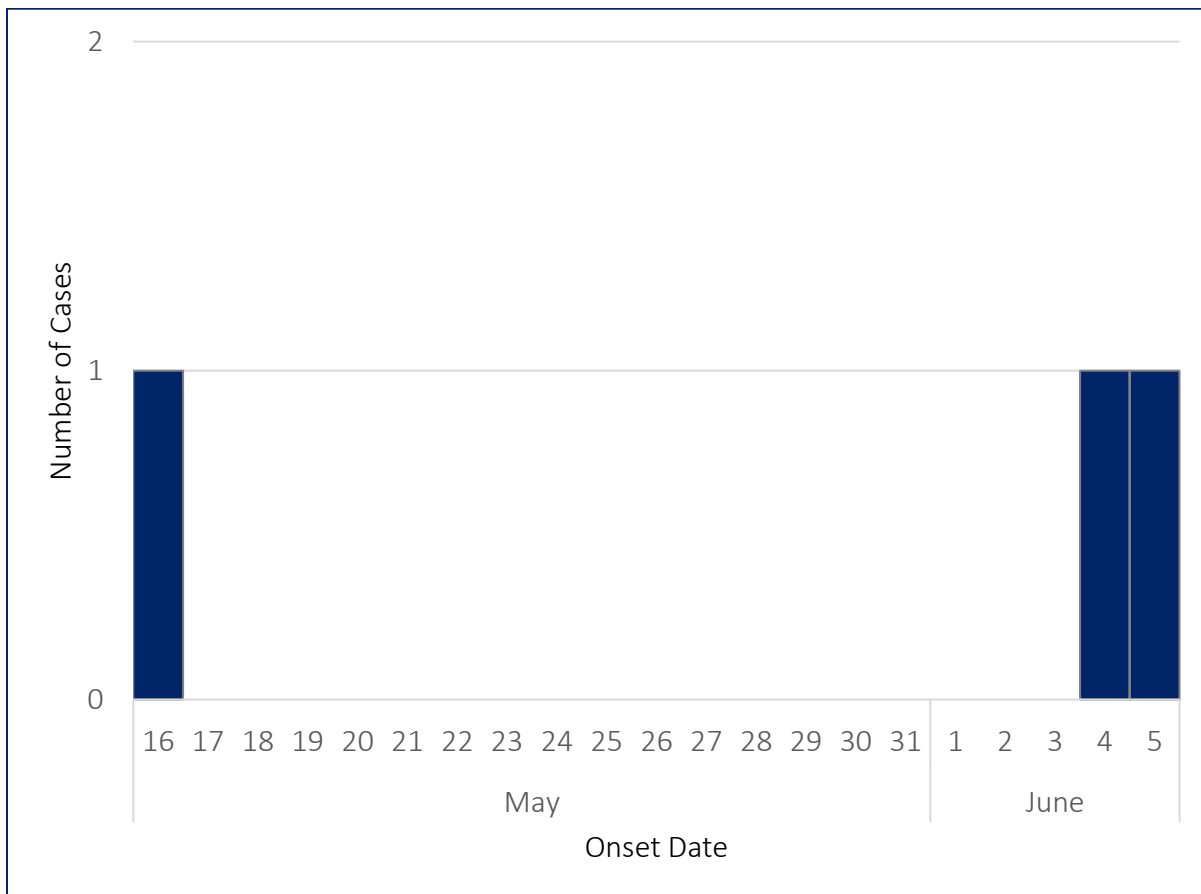
On June 7, 2017, WCHD met with staff and upper management to provide mumps education and prevention information. This outbreak was declared over on July 25, 2017.

Table 12. Characteristics of Ill Persons (n=3), Wyandotte County Mumps Outbreak

		# of Cases	% of Cases
Symptoms Reported by Ill Persons	Parotitis	3	100%
	Orchitis	1	33%
Medical Care	Sought Healthcare	2	37%
	Hospitalized	0	0%
Positive Laboratory Results*	PCR	2	67%
Lifetime Number of Mumps Vaccines Received	2	1	33%
	Unknown	2	67%

\*Individuals may have been tested using more than one laboratory test. Some persons were not tested.

Figure 13. Number of Cases (n=3) by Onset Date, Wyandotte County Mumps Outbreak



# Discussion

## *Mumps Disease*

Mumps is an acute viral infection transmitted from person to person through coughing, sneezing, or talking; by sharing items such as cups or utensils with others; or by touching objects or surfaces freshly soiled by infected respiratory secretions. Symptoms typically begin with body aches, loss of appetite, fatigue, headache, and low-grade fever. Symptoms then progress to parotitis (swollen parotid or salivary gland) which can be one-sided or occur on both sides. Earache on the side of parotitis and discomfort with eating acidic foods are common. Fever usually resolves within three to five days, and parotitis resolves within seven to ten days. Some people with mumps will experience very mild symptoms or no symptoms. Adolescents and adults often have more severe illness than young children<sup>1</sup>.

Most persons with mumps will recover completely, though serious complications can occur. Complications can include orchitis (testicular inflammation) in males, oophoritis (ovarian inflammation) in females, aseptic meningitis (inflammation of the lining of the brain), encephalitis (inflammation of the brain), pancreatitis, deafness, and death. Complications can occur in people who do not experience parotitis. Among vaccinated persons, severe complications of mumps are uncommon but occur more often in adults than in children<sup>1</sup>.

Symptoms usually appear 16 to 18 days after a person is infected with the mumps virus, but the incubation period can range from 12 to 25 days after infection. A person with mumps is contagious two days before onset of parotitis through five days after onset of parotitis<sup>1</sup>.

Although mumps is no longer very common in the United States, cases and outbreaks do still occur. In recent years, mumps outbreaks have occurred in highly vaccinated populations in high transmission settings, including elementary, middle, and high schools, colleges, and camps. Mumps remains a very common disease in many parts of the world as only 61% of countries routinely vaccinate against mumps. Cases and outbreaks of mumps will continue to occur in the United States as long as the disease is endemic globally<sup>1</sup>.

The mumps virus has 12 distinct genotypes. Genotyping is used to track transmission pathways and suggest epidemiological links between outbreaks. Since CDC first initiated genotype surveillance, genotype G has been the most prevalent in the United States; other genotypes have been associated with international travel and have not been associated with large scale outbreaks in the US<sup>4</sup>.

## *Mumps Vaccine*

There is a vaccine available to help prevent mumps and is given as a combination vaccine with measles and rubella (MMR vaccine). This vaccine is safe and effective. Two doses of the MMR vaccine

are recommended: a first dose at 12-15 months of age, and a second dose at 4-6 years of age. Two doses of MMR vaccine are 88% effective at preventing mumps<sup>1</sup>.

Vaccinated persons who contract mumps often experience a more mild illness with fewer complications than unvaccinated persons<sup>1</sup>. The current mumps vaccine does protect against genotype G, the mumps genotype causing illness throughout Kansas in 2016 and 2017<sup>5</sup>.

Insufficient data exists for the usefulness of recommending a third MMR dose to control mumps outbreaks. During mumps outbreaks, CDC recommends the following criteria be used when considering a third dose recommendation for an identified population at increased risk of mumps disease:

- there is high (e.g. >90%) two-dose vaccination coverage in the population;
- the population is in an intense exposure setting likely to facilitate disease transmission (e.g. schools, colleges, correctional facilities, congregate living facilities, or healthcare facilities);
- high attack rates (e.g. >5 cases for 1,000 population) are occurring among the population at risk; and
- there is evidence of ongoing transmission for at least two weeks in the target population<sup>1</sup>.

### *Outbreak Communication*

Throughout the outbreaks, KDHE provided relevant information to local health departments and healthcare providers across Kansas through the Kansas Health Alert Network (KS-HAN). Webinars were held with local health departments to discuss mumps investigations and recommendations for testing on January 16 and February 14, 2017.

KDHE issued media releases notifying the public of mumps cases in Kansas on December 16, 2016 and January 6 and March 9, 2017. These media releases provided information on mumps symptoms and prevention. On March 8, 2017, a mumps web page was posted on the KDHE website which provided information about mumps disease and vaccine, laboratory testing information, and a quick reference guide for providers. The website also provided a mumps summary update with case counts by county which was updated weekly throughout the outbreaks.

# Report by:

Lindsey Martin Webb, MPH, Kelly Gillespie, MPH, M. Ella Vajnar, Mychal Davis, MPH, Chelsea Raybern, MPH, Amie Worthington, Justin Blanding, MPH, and Robert Geist, MPH  
Kansas Department of Health and Environment

# Investigation by:

## **Kansas Department of Health and Environment**

1000 SW Jackson Street, Suite 075  
Topeka, Kansas 66612  
[www.kdheks.gov/epi](http://www.kdheks.gov/epi)

## **Crawford County Health Department**

410 E Atkinson Avenue #B  
Pittsburg, Kansas 66762  
[www.crawfordcountykansas.org/health-department](http://www.crawfordcountykansas.org/health-department)

## **Douglas County Health Department**

200 Maine Street  
Lawrence, Kansas 66044  
[www.ldchealth.org](http://www.ldchealth.org)

## **Finney County Health Department**

919 Zerr Road  
Garden City, Kansas 67846  
[www.finneycounty.org/index.aspx?NID=139](http://www.finneycounty.org/index.aspx?NID=139)

## **Johnson County Department of Health and Environment**

11875 S Sunset Drive #300  
Olathe, Kansas 66061  
[www.jocogov.org/dept/health-and-environment](http://www.jocogov.org/dept/health-and-environment)

## **Marshall County Health Department**

600 Broadway Street  
Marysville, Kansas 66508  
[www.marshallcohealth.org](http://www.marshallcohealth.org)

## **Riley County Health Department**

2030 Tecumseh Road  
Manhattan, Kansas 66502  
[www.rileycountyks.gov/286/Health-Department](http://www.rileycountyks.gov/286/Health-Department)

## **Thomas County Health Department**

350 S Range Avenue  
Colby, Kansas 67701  
[www.thomascohealth.com](http://www.thomascohealth.com)

## **Trego County Health Department**

201 N Main Street  
WaKeeney Kansas 67672  
[www.tregocountyks.com/2202/Health-Department](http://www.tregocountyks.com/2202/Health-Department)

## **Wyandotte County Health Department**

619 Ann Avenue  
Kansas City, Kansas 66101  
[www.wycokck.org/health](http://www.wycokck.org/health)

- 
1. <https://www.cdc.gov/vaccines/pubs/surv-manual/chpt09-mumps.html>
  2. <https://wwwn.cdc.gov/nndss/conditions/mumps/case-definition/2012/>
  3. [http://www.kdheks.gov/epi/Investigation\\_Guidelines/Mumps\\_Disease\\_Investigation\\_Guideline.pdf](http://www.kdheks.gov/epi/Investigation_Guidelines/Mumps_Disease_Investigation_Guideline.pdf)
  4. <https://www.cdc.gov/mumps/lab/qa-lab-test-infect.html#v5>
  5. <https://www.cdc.gov/flu/about/season/questions-answers-parotitis.htm>