

Outbreak of Measles in a Community with Low Vaccination Coverage – Johnson and Sedgwick Counties, June – July 2014



Background

On June 3, 2014, the Johnson County Health Department (JCHD) was notified of a child presumptively diagnosed with measles by a local children's hospital. It was reported that the child's parent had similar symptoms. This family had contact with a known measles case-patient who was associated with an ongoing measles outbreak in two Missouri counties in the Kansas City metropolitan area. The JCHD notified the Kansas Department of Health and Environment (KDHE), and an investigation was initiated immediately to prevent further transmission of the disease.

The Kansas City area outbreak investigation was ongoing when, on July 7, 2014, a Wichita hospital notified KDHE of an unvaccinated adult patient with symptoms consistent with measles. KDHE reported the case to the Sedgwick County Health Department (SCHD). The same day, SCHD received a report from a pediatrician's office that an infant less than one year of age had a rash, fever, cough, coryza, and conjunctivitis was being tested for measles. An investigation by SCHD, with assistance from KDHE, began immediately for both case-patients.

Methods

Epidemiologic Investigation

In accordance with the Centers for Disease Control and Prevention/Council of State and Territorial Epidemiologists (CDC/CSTE) measles case definition, a person was considered clinically compatible if they had a generalized, maculopapular rash lasting three days or longer, a temperature of 101°F or greater, and cough, coryza (runny nose), or conjunctivitis. A confirmed case was defined as contributory laboratory results (e.g., isolation of measles virus from a clinical specimen, detection of measles virus specific nucleic acid from a clinical specimen using polymerase chain reaction (PCR), immunoglobulin (Ig) G seroconversion, or a positive serologic test for measles IgM antibody) or an epidemiologic linkage to an individual with contributory laboratory results in a person with clinically compatible symptoms.

Interviews were conducted with all persons or their parents, to determine symptoms, onset date, and identify symptomatic and asymptomatic contacts. Contacts were notified of their exposure and given recommendations if they became symptomatic. As additional cases were identified, exposure histories were assessed to identify both epidemiologic linkage to known cases, and to identify additional susceptible contacts. This included assessing exposures at medical clinics, restaurants, a softball tournament, and a hotel.

Kansas Administrative Regulation (K.A.R) 28-1-6 dictates that each infected person shall remain in isolation for four days following rash onset, and that each susceptible person in a school, child care facility, or family daycare home shall be vaccinated within 24 hours of notification or they must be excluded for 21 days. Public health also recommended that all exposed, susceptible contacts avoid public settings and/or limit their exposure to susceptible individuals until 21 days after the last exposure.

Based on the documented vaccination status, if a person previously had two doses of a measles-containing vaccine they were considered protected. If they had one dose (typically 95% effective), a booster was recommended. If they had no documented vaccine history they were considered susceptible, and immunoglobulin (IG) or vaccine was offered, depending on length of time from exposure. Exposure was defined as being in an enclosed environment at the same time as a confirmed case, or being in an enclosed environment where a confirmed case had been less than two hours earlier.

Laboratory Testing

Serology testing was performed on blood specimens through a private laboratory. Nasopharyngeal and throat swabs were collected and sent to the Kansas Health and Environmental Laboratories (KHEL) for molecular testing using polymerase chain reaction (PCR). Genotyping was performed at the Centers for Disease Control and Prevention (CDC).

Results

Case Investigation

During this outbreak, 14 confirmed cases of measles were identified in Johnson and Sedgwick Counties, with the first cases developing symptoms on May 26, 2014 and June 21, 2014, respectively (Figure 1). The index cases from each county visited households in the Kansas City metropolitan area where a measles outbreak was occurring. The Johnson County cases reported visiting a house that was under quarantine due to measles approximately three times a week; the index case in Sedgwick County reported staying with relatives in the Kansas City metropolitan area 10 days prior to her rash onset. All of the Johnson County measles cases

resided in one household. In Sedgwick County, the index case spread measles to at least six individuals through social settings and a restaurant where she was employed.

Ill persons' ages ranged from two months to 43 years, with a median of 21 years; eight (57%) were female. All who were associated with this outbreak experienced both fever and rash (Table 1). The majority of ill persons (71%) also experienced cough, and half (50%) experienced conjunctivitis and coryza. Three reported diarrhea, and three reported otitis media, both complications commonly associated with measles infections. Two (14%) were hospitalized due to their illness; both were less than five years of age.

Figure 1. Number of cases by illness onset date and county of residence (n=14)

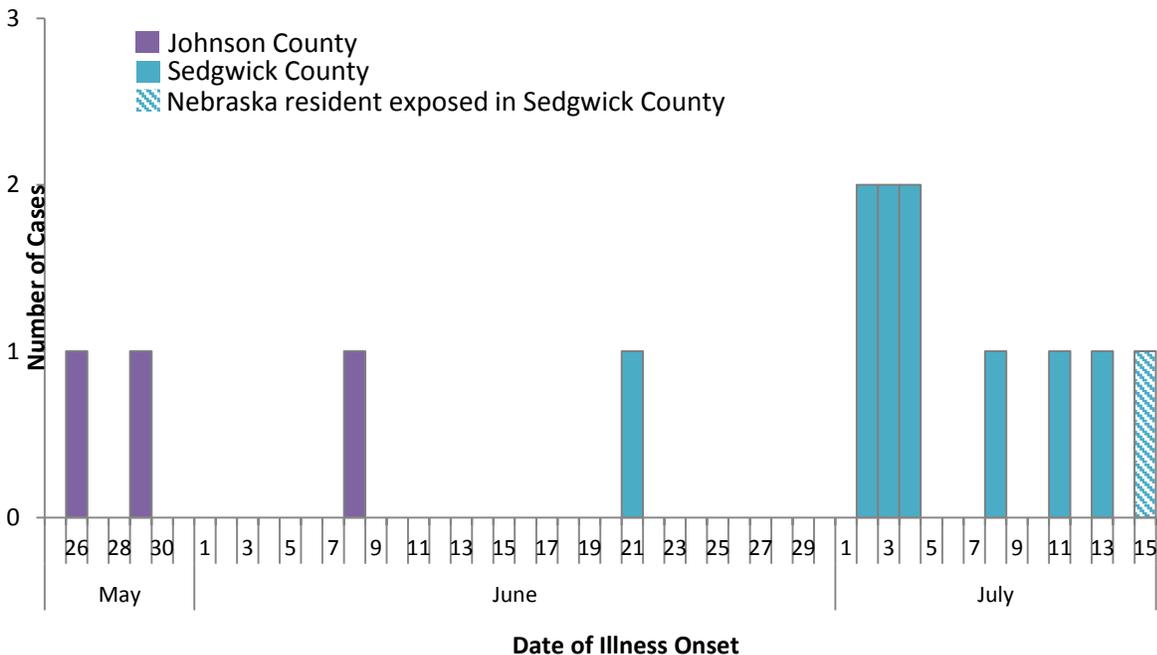


Table 1. Symptoms reported among cases (n=14)

Symptom	# of Cases with Symptom	% of Cases
Rash	14	100
Fever	14	100
Cough	10	71
Conjunctivitis	7	50
Coryza	7	50
Diarrhea	3*	21
Otitis media	3*	21

**Information for complications on one case-patient was not available*

The majority of ill persons (43%) were unaware of their vaccination status, and 21% were unvaccinated (Table 2). Four persons (29%) were unvaccinated because they were less than one year of age.

Table 2. Vaccination status of cases

Status	# of Cases (n=14)	% of Cases
Fully vaccinated	1	7
Unvaccinated	3	21
Unknown	6	43
Ineligible due to age	4	29

Laboratory testing was performed on the 12 (86%) of the case-patients associated with this outbreak; eight had PCR testing and four had serology testing performed. Four specimens were forwarded to the Centers for Disease Control and Prevention (CDC) for genotyping by PCR. Results showed an identical strain of measles, B3, consistent with the endemic strain circulating in the country where the Kansas City metropolitan area index case was born.

Contact Investigation

In both counties, there were numerous locations where infectious persons with measles may have exposed others, including hospitals, outpatient clinics, restaurants, a hotel, and a daycare (Table 3). SCHED determined 220 known individuals were exposed to a case of measles during the outbreak in Sedgwick County. When contact information was available, letters were sent or phone calls were made to inform individuals of their potential exposure.

In situations where specific individuals couldn't be identified, press releases were distributed. Several symptomatic individuals from Sedgwick County attended or participated in a softball tournament that was attended by non-Kansas residents; the organizer of the tournament reported that she posted information about the tournament on her Facebook page, and people showed up to participate. With no formal registration process, she was unable to provide a list of individuals who participated in the tournament. KDHE notified state health departments that had residents who participated in the softball tournament; Texas identified one person with measles who likely contracted the illness at the tournament.

Table 3. Case-patient exposure locations

<u>Exposure Location</u>	<u>Notification Method</u>
Johnson County Case-Patients	
Hospital	Letters sent to all exposed
Outpatient Clinic	Letters sent to all exposed
Sedgwick County Case-Patients	
2 Hospitals	Letters sent to all exposed
Hotel	Letters sent to all exposed
Daycare	Letters sent to all exposed
Outpatient Clinic	Phone calls to all exposed
Softball Tournament*	Press Release
2 Restaurants*	Press Releases

*Direct notification could not occur because individual contact information was not available.

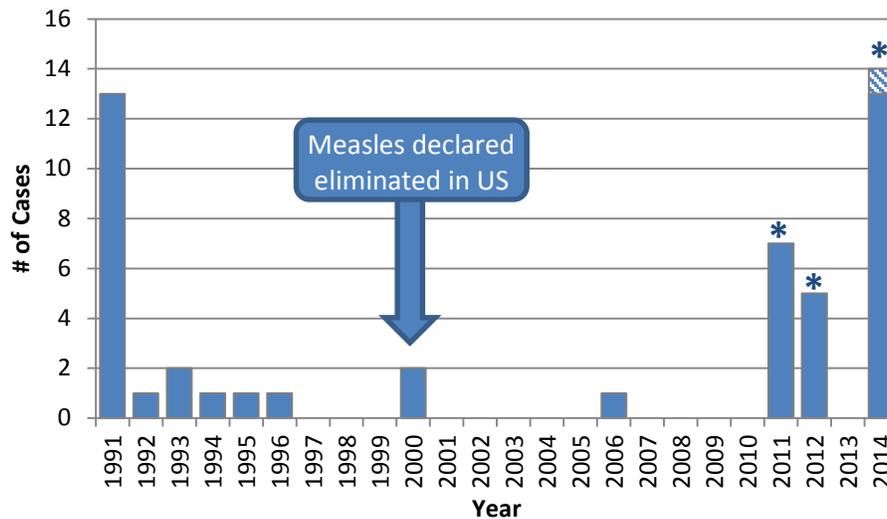
Susceptible household contacts of ill persons were quarantined for 21 days following their last exposure to an infectious person. To improve compliance with the quarantines, SCHED conducted daily checks on each of the houses where individuals were quarantined; this was also conducted to identify suspected cases and collect specimens in a timely manner. The Sedgwick County Health Officer served two written orders for quarantines during this outbreak: one for a family who was scheduled to fly to another state and the other for an individual who reportedly would be fired if she missed work. SCHED did not request law enforcement involvement for the enforcement of the quarantine orders.

To prevent additional individuals from contracting measles, post-exposure prophylaxis, in the form of IG, was provided to 11 individuals in Sedgwick County; seven infants exposed at a pediatrician's office, a household contact less than one year of age, a pregnant household contact with an unknown vaccination status, and two adult household contacts with unknown vaccination statuses who had extensive contact with an uninfected infant. One of the infants who received IG subsequently developed measles. Additionally, SCHED held two number of vaccination clinics where they vaccinated 452 persons with the MMR vaccine.

Conclusions

From May through July of 2014, 14 individuals were diagnosed with measles in Kansas, more than any year since 1991 (Figure 2). Of the 14 cases, three were Johnson County residents, and ten were Sedgwick County residents, and one was a Nebraska resident who contracted measles in Sedgwick County. The index cases in both counties were exposed to persons infected with measles in the Kansas City, Missouri metropolitan area.

Figure 2. Number of measles cases by year, Kansas, 1991-2014



* All cases associated with a measles outbreak

To control this outbreak, JCHD and SCHD implemented public health measures, including quarantines of susceptible, exposed individuals and daily checks of those quarantined individuals to ensure compliance as well as identify any newly ill persons. SCHD administered IG to 11 individuals and vaccinated over 400 persons with the MMR vaccine. Exposed individuals were notified of their exposure through multiple methods – when direct notification could occur, letters were sent or phone calls were made; when direct notification could not occur (e.g., there was no way to identify the specific individuals exposed), press releases were issued. Public health interventions during this outbreak were instrumental in preventing additional individuals from becoming ill.

In 2000, measles was declared eliminated from the United States, meaning there was no continuous disease transmission within its borders for 12 or more months. Since that time, cases reported throughout the country were usually associated with foreign travel. In 2011, the US reported 222 cases associated with 17 measles outbreaks, the largest number since elimination. A majority of individuals were either unvaccinated or had an unknown vaccination status.¹ As of September 29, 2014, the US reported 594 cases in 22 states, associated with 18 outbreaks, for 2014.²

Measles infection is caused by the measles virus, a paramyxovirus within the genus *Morbillivirus*.³ Measles virus normally grows in the cells that line the back of the throat and lungs.⁴ Measles is spread through direct contact with infectious droplets or by airborne spread of tiny droplets, which can remain suspended in the air and viable on surfaces for up to two hours after a person with measles has occupied the area. A person with measles is considered infectious from four days before the onset of the rash, or from one day before onset of the

prodromal symptoms of fever, cough, and coryza. The communicable period extends to four days after rash onset. A blue and white spotted rash (enanthem) on mucous membranes, called Koplik spots, is strong clinical indication of the presence of measles. It usually occurs 1-2 days before an external rash begins on the body, and lasts 1-2 days after the start of the external rash. The external rash associated with measles is a generalized maculopapular erythematous rash and can last 5-6 days. It begins on the face or forehead and progresses downward to the trunk and lower extremities. The palms of the hands and soles of the feet are generally spared from rash.³

There is no specific treatment for measles and most people recover within 2–3 weeks. However, particularly in children and immunocompromised persons, measles can cause serious complications, including blindness, encephalitis, severe diarrhea, ear infection and pneumonia.⁵ Unvaccinated young children are at highest risk of measles and its complications, including death. Children less than one year of age are particularly at risk, as they are not able to be vaccinated against measles until they are 12 months old. The CDC's Advisory Committee on Immunization Practices (ACIP) recommends two doses of Measles, Mumps, and Rubella (MMR) vaccine separated by at least 1 month (i.e., a minimum of 28 days) and administered on or after the first birthday for all children before entry into kindergarten and for certain high-risk groups of adolescents and adults.⁵ Unvaccinated pregnant women are also at risk with complications that can include miscarriage, premature birth, or an infant with low-birth-weight.⁶ Any non-immune person (who has not been vaccinated or was vaccinated but did not develop immunity) can become infected; this particularly includes persons who have suppressed immunological conditions.⁵

References:

- 1) CDC. Measles – United States, 2011. MMWR. April 20, 2012 / 61(15); 253-7.
- 2) CDC. Measles Cases and Outbreaks. Accessed online at: <http://www.cdc.gov/measles/cases-outbreaks.html>. Page last updated: October 9, 2014. Accessed on October 13, 2014.
- 3) Epidemiology and Prevention of Vaccine-Preventable Diseases, 12th ed. Pgs 173-192.
- 4) World Health Organization. Measles Factsheet. Accessed online at: <http://www.who.int/mediacentre/factsheets/fs286/en/index.html>. Page last updated: February 2014. Accessed on October 13, 2014.
- 5) Measles, Mumps, and Rubella Vaccine Use and Strategies for Elimination of Measles, Rubella, and Congenital Rubella Syndrome and Control of Mumps: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR. May 22, 1998 / 47(RR-8);1-57.

- 6) CDC. Complications of Measles. Accessed online at:
<http://www.cdc.gov/measles/about/complications.html>. Page last updated: August 30,
2013. Accessed on October 13, 2014.

Report by: Elizabeth Lawlor (Kansas Department of Health and Environment)
On: {Report Date}

Investigation by:

Johnson County Health Department

11875 S Sunset Dr

Olathe, KS 66061

<http://www.jocogov.org/dept/health-and-environment/home>

Sedgwick County Health Department

1900 E 9th Street

Wichita, KS 67214

<http://www.sedgwickcounty.org/healthdept/>

Kansas Department of Health & Environment

Bureau of Epidemiology and Public Health Informatics

1000 SW Jackson St., Suite 75

Topeka, Kansas 66612

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