The Epidemiology of Select High Consequence Communicable Diseases

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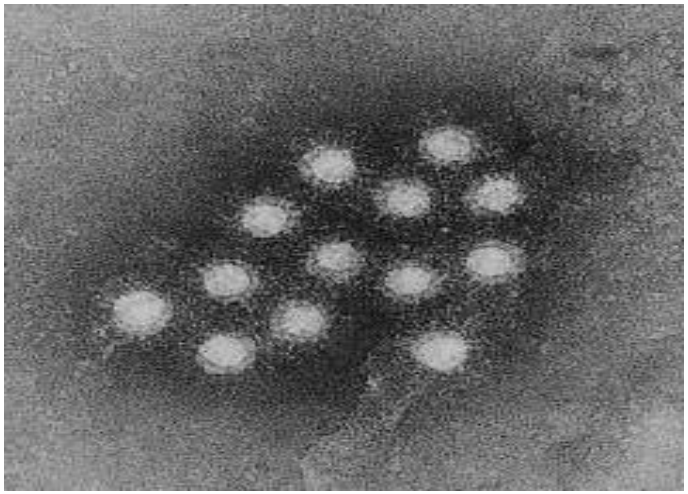
Objectives

- Describe the epidemiology of high consequence communicable diseases including:
  - Hepatitis A
  - Measles
- Review the current status of the Ebola outbreak in Democratic Republic of the Congo.
- Briefly discuss updates to surveillance activities for select enteric diseases and legionellosis.

Hepatitis A – Disease

- A discrete onset of symptoms
  - Dark “tea colored” urine
  - Clay-colored stools
  - Jaundice
- Illness typically lasts less than 2 months
- Hospitalizations are common
- Rarely causes liver failure and death



Images courtesy the CDC Image Library

Hepatitis A – Transmission

- Person to person
  - Fecal–oral
  - Food and water
  - Bloodborne and percutaneous
- United States
  - International travel
  - Close personal contact with infected person
  - Sex among men who have sex with men
  - Behaviors associated with injection drug use

Hepatitis A – Transmission

- Communicable: 2 weeks before through 2 weeks after onset of symptoms (1 week after onset of jaundice)
- Incubation Period: 15 – 50 days following exposure
- Children less than 6 will often not have symptoms, but are still infectious

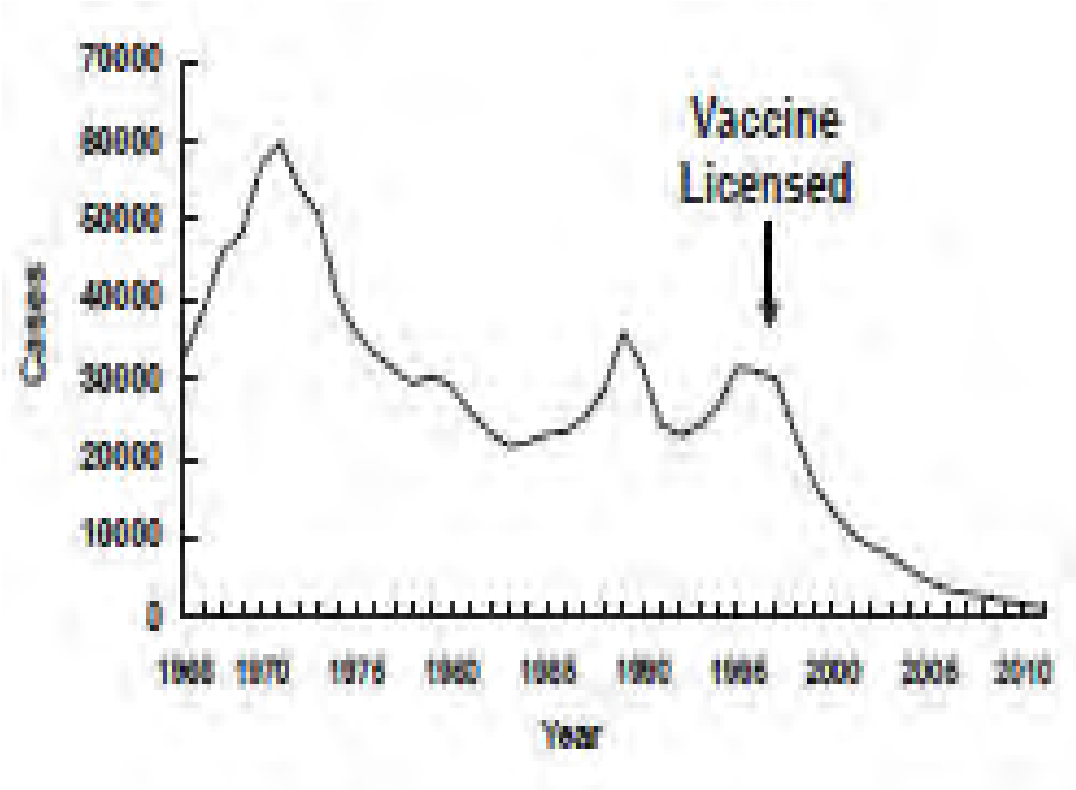
Hepatitis A – Diagnostics

- Hepatitis A Total Antibody Test (IgM and IgG)
- Hepatitis A IgM
- Liver function test
  - Liver enzymes (ALT and AST)
  - Bilirubin
- Hepatitis B and Hepatitis C tests

Hepatitis A – Vaccine

- Hepatitis A vaccination available in 1996
- Over 95% effective for up to 11 years with a single dose
- Approximately 100% effective with a second dose

Hepatitis A Cases in U.S. 1966 – 2010*



*CDC Pink book
https://www.cdc.gov/vaccines/pubs/pinkbook/hepa.html

Hepatitis A – Vaccine

Routinely Recommended for:

- All children at age one year
- Persons who are at increased risk for infection
- Persons who are at increased risk for complications
- Any person wishing to obtain immunity (protection)
- Persons who are homeless

Persons at Increased Risk:

- Travelers to countries with high rates of hepatitis A
- Family members and caregivers of recent adoptees from countries where hepatitis A is common
- Men who have sex with men
- People who use injection and non-injection drugs
- People with chronic liver diseases
- People who are treated with clotting-factor concentrates
- People who work with hepatitis A infected animals or in a hepatitis A research laboratory

Hepatitis A – Postexposure Prophylaxis

- Must be given within 2 weeks after exposure
- Single-antigen Hepatitis A Vaccine
  - Healthy persons aged $\geq$12 months
- Immune globulin (IG)
  - Children aged <12 months,
  - Persons for vaccine is contraindicated
- Vaccine and IG
  - Immunocompromised
  - Chronic liver disease
  - Others at increased risk for severe disease

Hepatitis A – Postexposure Prophylaxis

- Nelson NP. Updated Dosing Instructions for Immune Globulin (Human) GamaSTAN S/D for Hepatitis A Virus Prophylaxis. MMWR Morb Mortal Wkly Rep 2017;66:959–960.

- Nelson NP, Link-Gelles R, Hofmeister MG, et al. Update: Recommendations of the Advisory Committee on Immunization Practices for Use of Hepatitis A Vaccine for Postexposure Prophylaxis and for Preexposure Prophylaxis for International Travel. MMWR Morb Mortal Wkly Rep 2018;67:1216–1220.

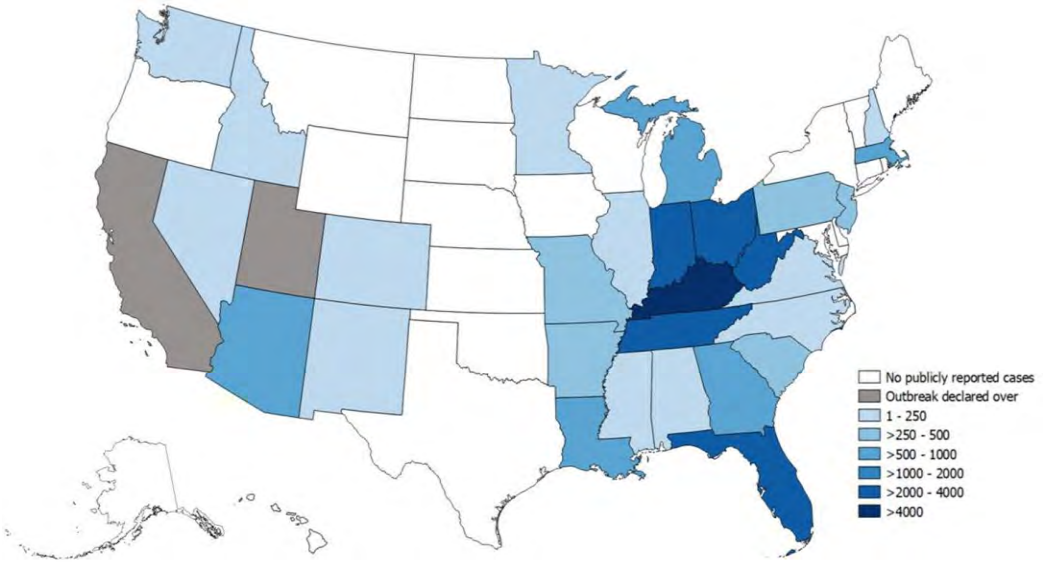
  - Supplementary Text 1: Provider Guidance on Risk Assessment and Clinical Decision-making for Hepatitis A Postexposure Prophylaxis.

  - Supplementary Text 2: Provider Guidance for Pre-Exposure Protectionphylaxis for Travelers aged ≥12 months.

Multistate Hepatitis A Outbreak – U.S.

- 2016 through September 13, 2019
- 25,783 – Cases
- 30 States
- 15,517 (60%) – Hospitalized
- 259 – Deaths

State-Reported Hepatitis A Outbreak Cases as of September 13, 2019



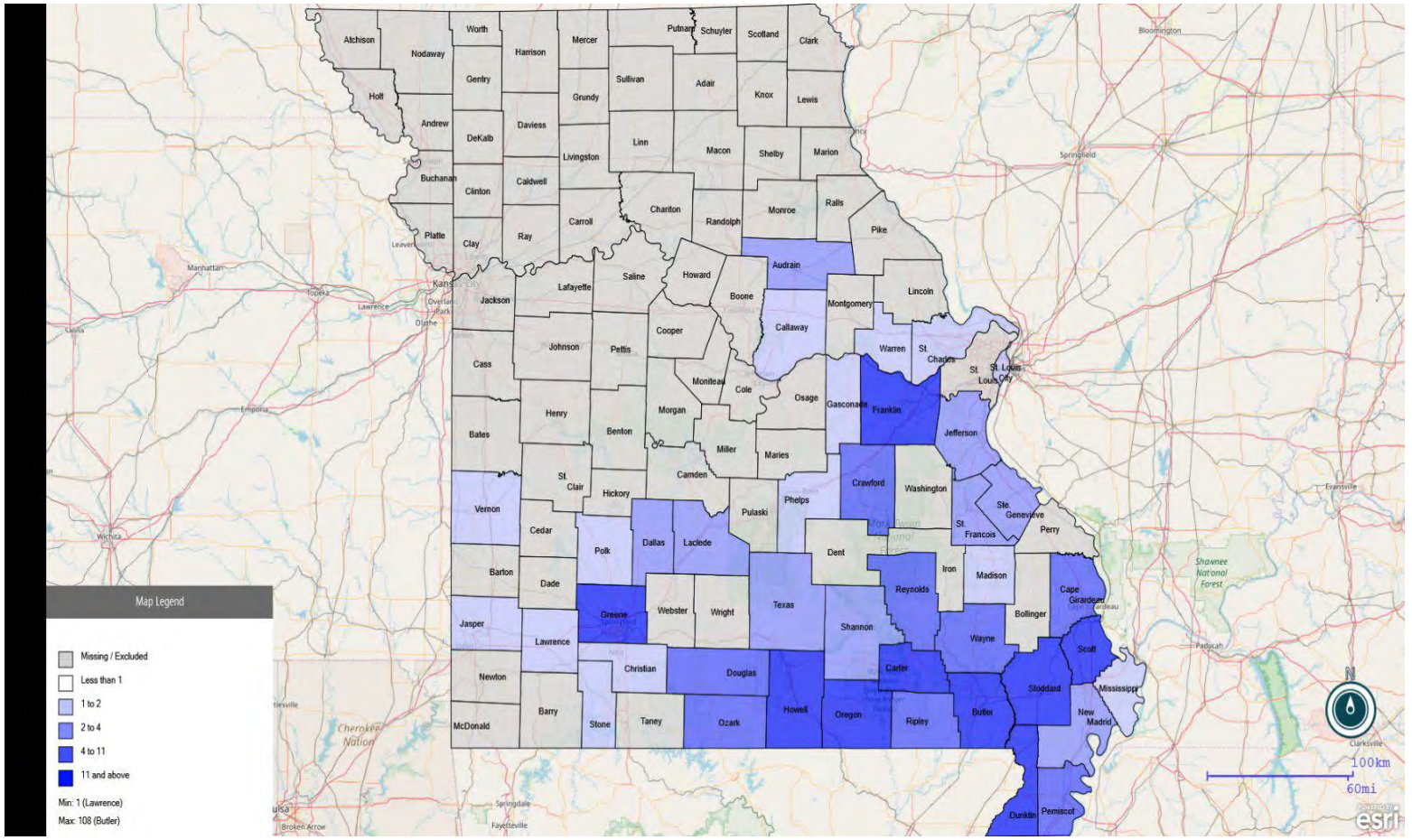
Courtesy CDC:
https://www.cdc.gov/hepatitis/outbreaks/2017March-HepatitisA.htm

Hepatitis A Outbreak – Missouri*

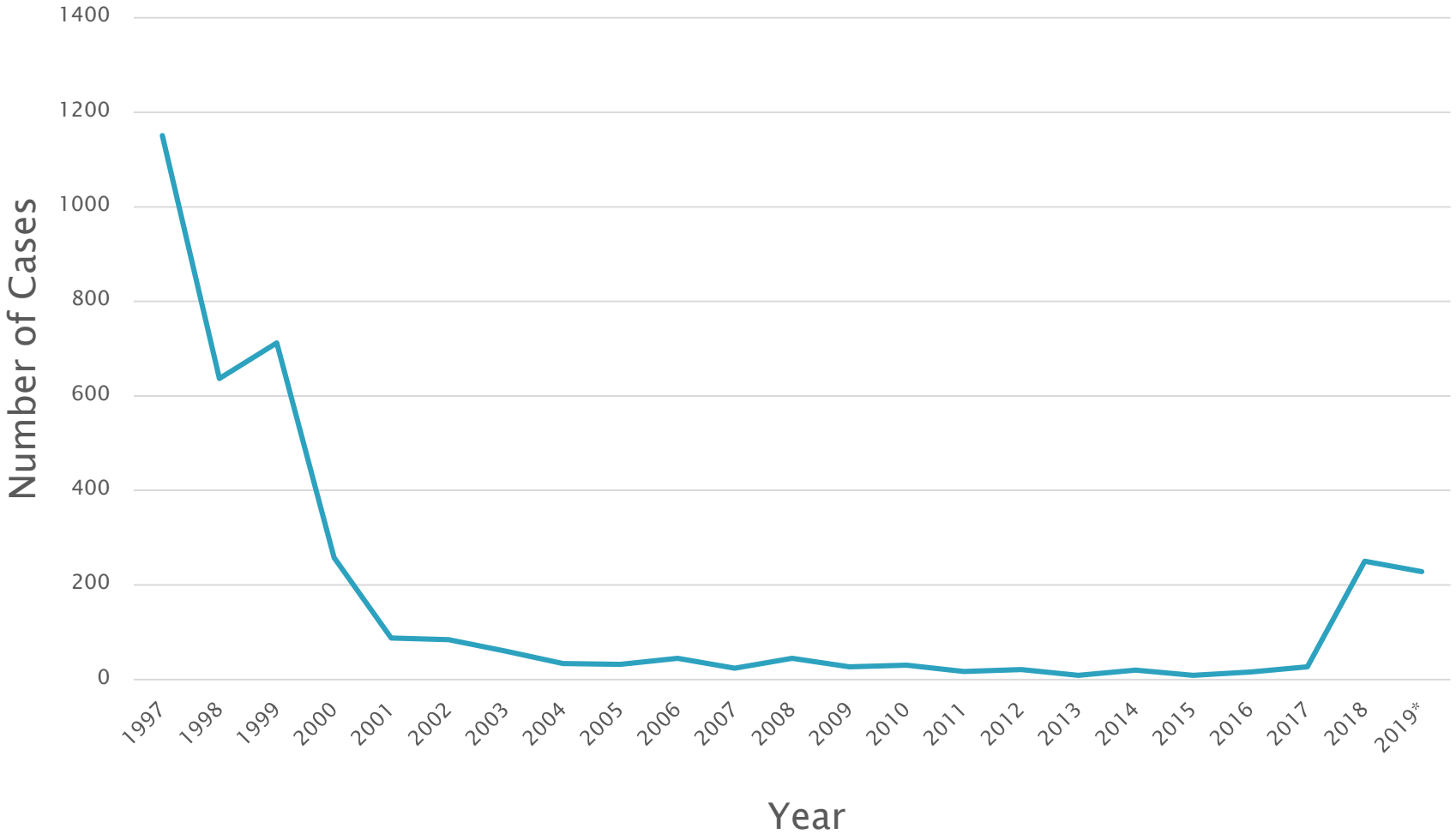
- 453 outbreak-associated cases reported since September 2017
- 41 (36 %) of counties in Missouri have reported one or more cases
- 60% of cases are male
- Median age 37 years, range (13 – 77 years)
- 255 (56%) of cases hospitalized
- 2 deaths

* Data as of September 17, 2019.

Outbreak-Associated Cases of Hepatitis A, Missouri – September 2017 through September 17, 2019:



Reported Number of Hepatitis A Cases - Missouri, 1997-2019*



* Cases reported as of September 20, 2019. 2019 data is preliminary.

Pop Quiz: How is this hepatitis A outbreak spreading?

Hepatitis A Outbreak – Increased Risk

- People who use drugs (injection or non-injection)
  - Missouri – 67% of cases report using or tested positive for illicit drugs
- People experiencing unstable housing or homelessness
- Men who have sex with men (MSM)
- People who are, or were recently, incarcerated
- People with chronic liver disease, including cirrhosis, hepatitis B, or hepatitis C

Hepatitis A Outbreak – Food Handlers

- The virus is being spread from person-to-person primarily among people who use injection and non-injection drugs, people who are experiencing homelessness, and their close direct contacts.
- Although cases in food handlers occur, common sources of food or drinks have not been identified as potential sources of infection in the jurisdictions experiencing hepatitis A outbreaks.
- Food handlers are not at increased risk for hepatitis A because of their occupation.
- Transmission from food handlers to restaurant patrons has been extremely rare because standard sanitation practices of food handlers help prevent the spread of the virus.

Courtesy CDC:
https://www.cdc.gov/hepatitis/outbreaks/FAQs-HepAOutbreaks.htm

Hepatitis A Outbreak – Healthcare Setting

- Healthcare personnel do not have increased prevalence of infection and healthcare-associated outbreaks are rare.
- Hepatitis A vaccination is not routinely recommended for health care personnel in the U.S.
- If a healthcare provider receives a diagnosis of hepatitis A infection, postexposure prophylaxis should be administered to other healthcare personnel at the same facility.
- In a setting containing multiple enclosed units or sections, postexposure prophylaxis administration can be limited only to health care personnel in the area where there is exposure risk.
- Postexposure prophylaxis administration to patients can be considered if during the time of patient care the infected healthcare provider was likely to be infectious, did not use gloves when appropriate and had diarrhea or poor hygienic practices.

Courtesy CDC:
https://www.cdc.gov/hepatitis/outbreaks/FAQs-HepAOutbreaks.htm

Hepatitis A Outbreak – Public Health Challenges

- Confirming the case
  - Symptoms and symptom onset dates
  - Laboratory results
- Prompt interview of case
  - Identify close contacts
  - Identify high risk settings
- Public Messaging
- Vaccinating persons at greatest risk

Hepatitis A Outbreak – Increased Risk

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- People experiencing unstable housing or homelessness
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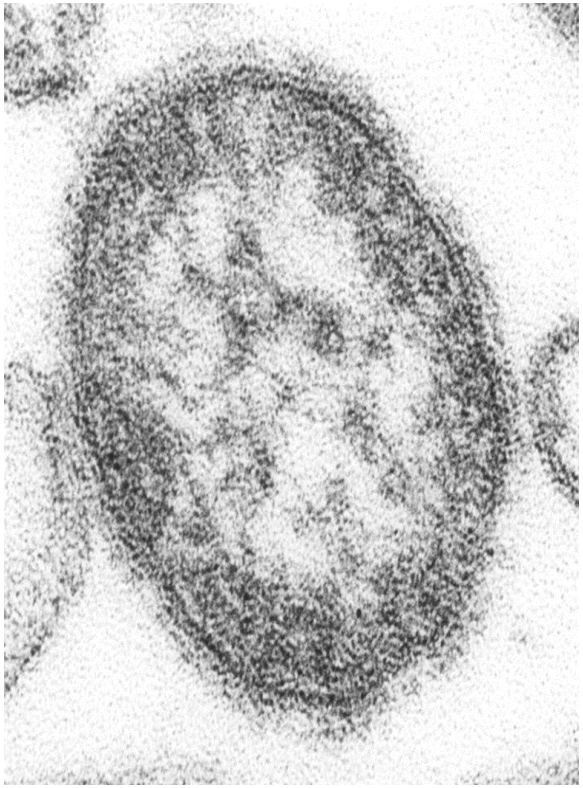
Measles (Rubeola)



Images courtesy the CDC/Public Health Image Library

Measles: Background

- Agent: Measles virus
- Symptoms:
  - High fever
  - 3 C's – cough, coryza, and conjunctivitis
  - Koplik spots
  - Maculopapular rash – spreads from head to trunk to extremities
- Incubation period: 7 – 21 days (14 days to rash onset)
- Communicable: 4 days before to 4 days after rash appears
- Transmission: Infectious droplets or airborne spread

Measles: Complications

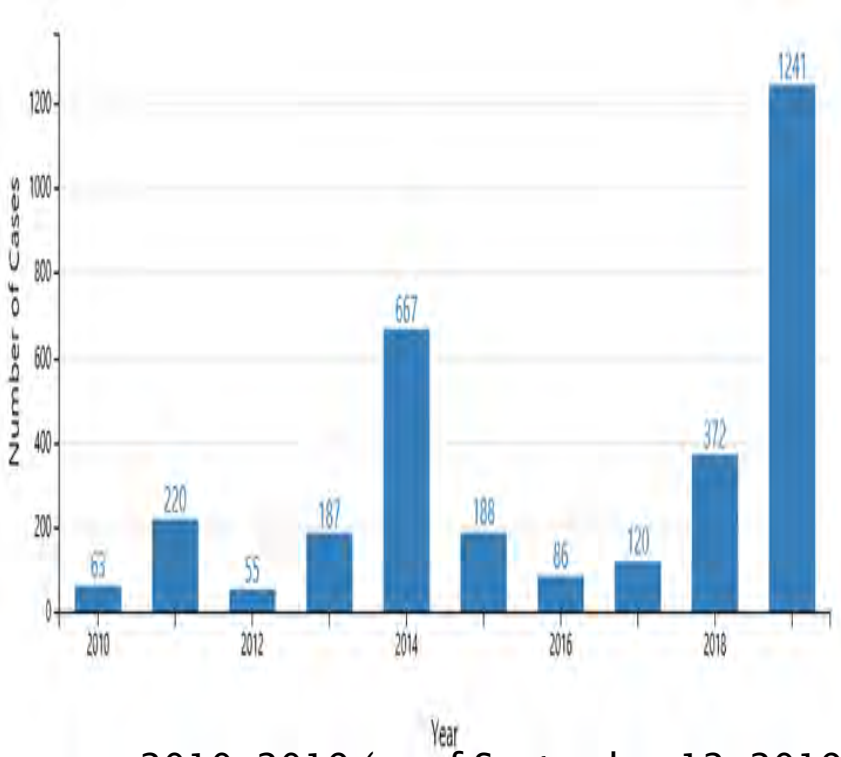
- About one in five unvaccinated persons in U.S. is hospitalized.
- One out of 20 children develop pneumonia.
- One out of every 1,000 cases will develop acute encephalitis, which often results in permanent brain damage.
- One to three out of every 1,000 children infected will die from respiratory and neurologic complications, even with the best care.
- Subacute sclerosing panencephalitis (SSPE) is a rare, but fatal degenerative disease of central nervous system
  - Behavioral and intellectual deterioration and seizures that develop 7 to 10 years after infection.

Measles Cases and Outbreaks, United States

Measles – 2019*

- 31 states reported one or more cases of measles
- Outbreaks
  - New York State, Rockland County
  - New York State, Wyoming County
  - New York City
  - El Paso, TX
- All cases caused by measles wild-type D8 or B3

Measles Cases by Year, U.S.*

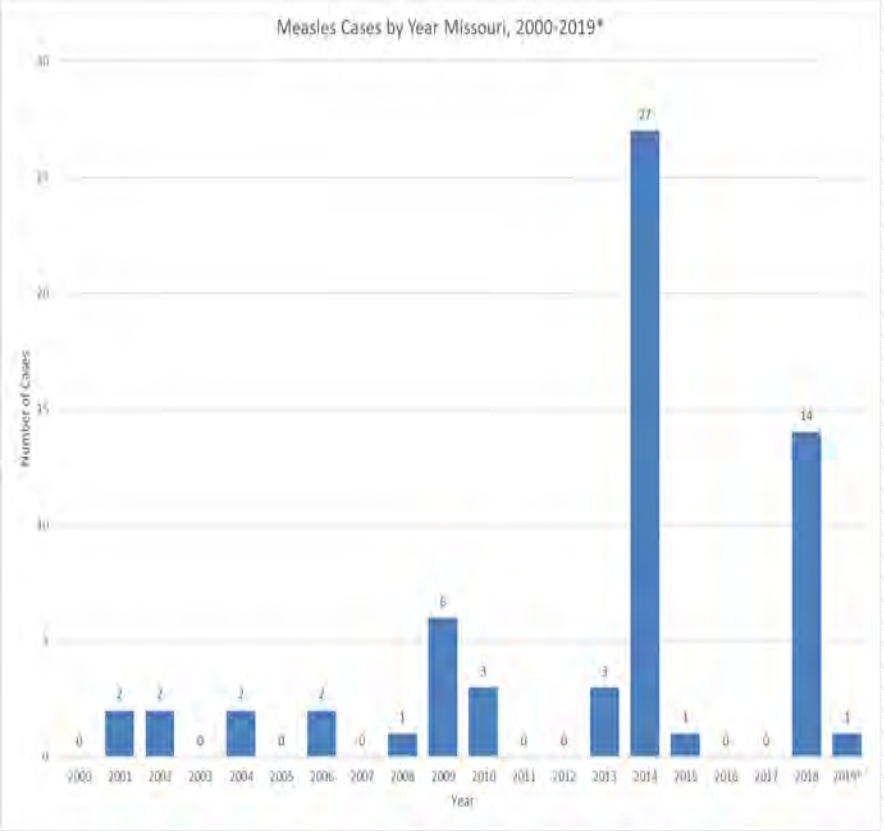


*Cases as 2010-2019 (as of September 12, 2019)

Data Courtesy CDC: https://www.cdc.gov/measles/cases-outbreaks.html

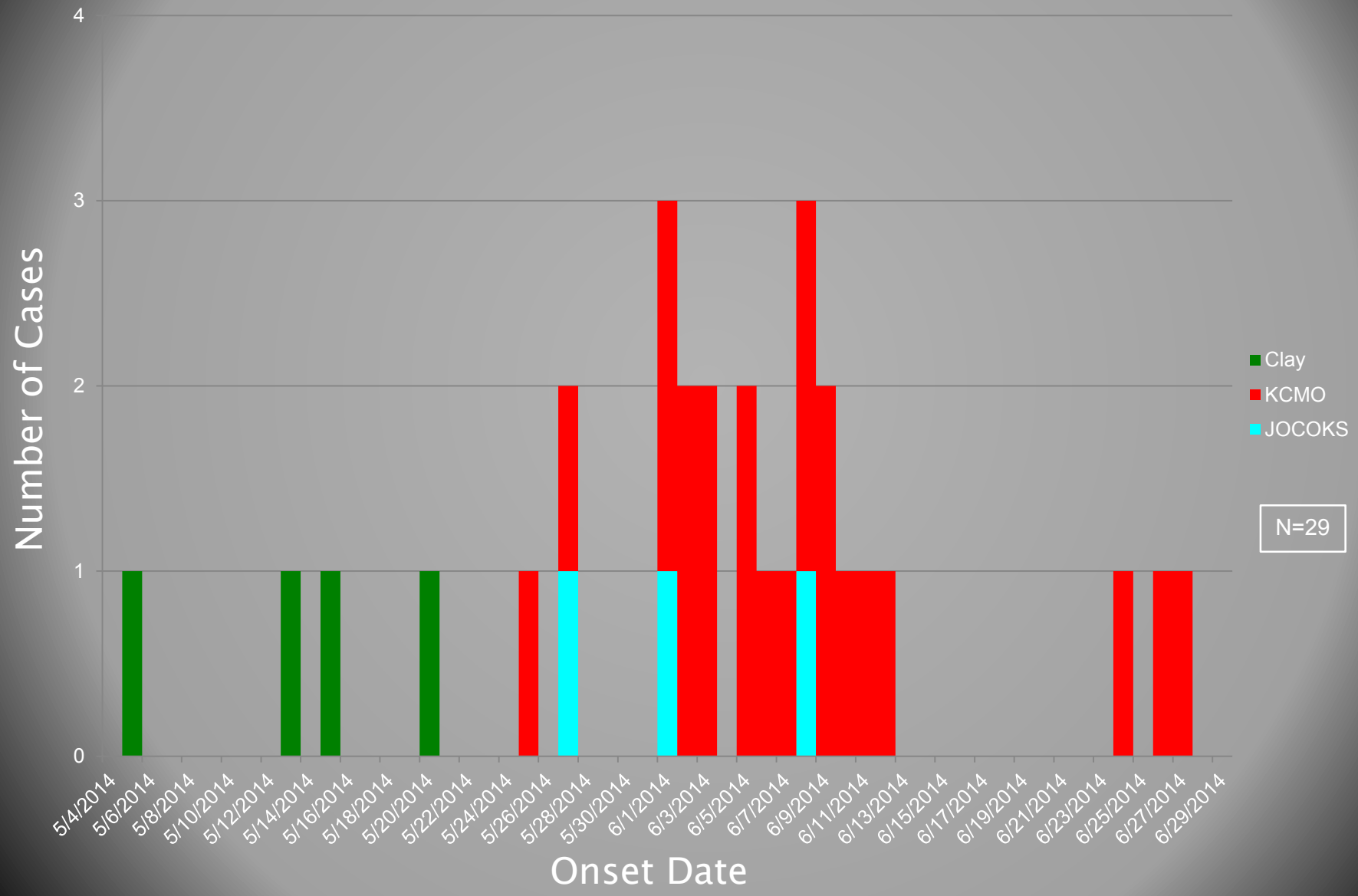
Measles Cases and Outbreaks, Missouri

- 2019 – 1 case
- 2018 – Outbreak in KC Metropolitan Area
- 2014 – Outbreak in KC Metropolitan Area
- 14 years before 2014 – Only 21 cases



*Cases as of September 18, 2019. 2019 data are preliminary and subject to change.

Outbreak Associated Measles Cases by Local Jurisdiction and Date of Onset, May–June, 2014



Slide courtesy C. Jon Hinkle, DHSS

Measles: Public Health Investigation and Control Measures

- Confirm the diagnosis
- Identify contacts (4 days before to 4 days after onset of rash)
- Determine immunity of close contacts
- Post-exposure prophylaxis of susceptible contacts
  - MMR vaccine within 72 hours of exposure
  - Immunoglobulin within 6 days of exposure
- Active surveillance of contacts for symptoms of measles

Measles: Confirming the Diagnosis

- Testing can be challenging

- Specimens: Serum AND Throat/NP swab
  - Serology – IgM: Detection of measles antibodies
  - Swab – reverse transcription polymerase chain reaction (RT-PCR): Detection of measles RNA

- Why Serology and RT-PCR?
  - False positives
  - False negatives
  - Virus identification

Measles: Testing Through Public Health

- Both IgM and RT-PCR tests are available
  - IgM – State Public Health Laboratory
  - RT-PCR – Sent out to Laboratory Response Network Laboratory

- Prior approval is required by DHSS
  - Symptoms, onset dates of symptoms, description and progression of the rash, vaccination dates
  - Travel or other opportunity for exposures to measles
  - Vaccination history

It's Measles!

- Calls from the school nurse
- The "rule out" serology
- The recently vaccinated
- Cross reaction – false positive

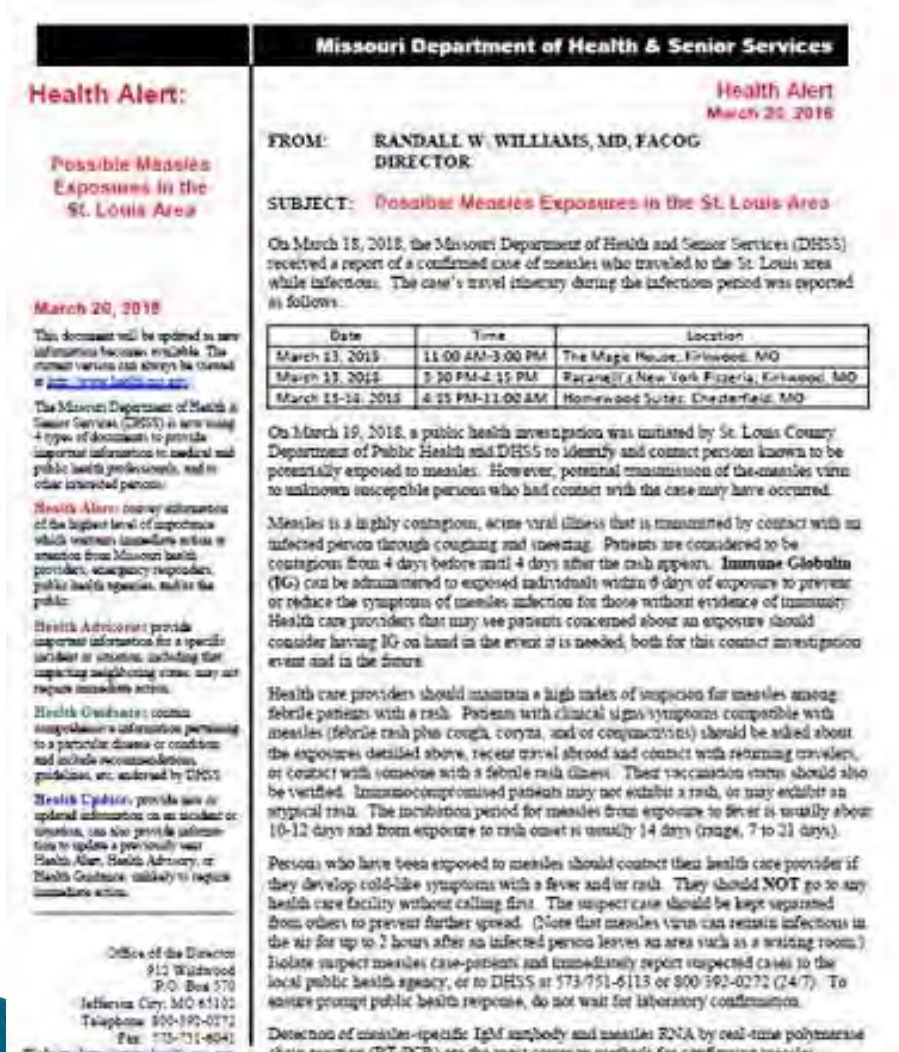
Measles Investigations – Costs

- Colorado estimated the costs of investigating two individual cases that were not related to be in excess of $68,000.
- Other published cost estimates for public health to respond to a single measles case range from $5,655 to $181,679.
- Arizona (2008) – Estimated $800,000. for two hospitals to respond to seven cases in their facilities.

Marx GE, Chase J, Jasperse J, et al. Public Health Economic Burden Associated with Two Single Measles Case Investigations — Colorado, 2016–2017. MMWR Morb Mortal Wkly Rep 2017;66:1272–1275.

Measles data and statistics 2019: https://www.cdc.gov/measles/downloads/MeaslesDataAndStatsSlideSet.pdf

Health Alerts, Advisories, and Updates



Missouri Department of Health & Senior Services

Health Alert:

Possible Measles Exposures in the St. Louis Area

March 20, 2018

This document will be updated as new information becomes available. The current version can always be viewed at www.health.mo.gov.

The Missouri Department of Health & Senior Services (DHSS) is now using 4 types of documents to provide important information to medical and public health professionals, and to other interested persons:

Health Alert: convey information of the highest level of importance which warrants immediate action or attention from Missouri health providers, emergency responders, public health agencies, and/or the public.

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Fax: 573-751-6041
Website: http://www.health.mo.gov

Health Alert
March 20, 2018

FROM: RANDALL W. WILLIAMS, MD, FACOG
DIRECTOR

SUBJECT: Possible Measles Exposures in the St. Louis Area

On March 18, 2018, the Missouri Department of Health and Senior Services (DHSS) received a report of a confirmed case of measles who traveled to the St. Louis area while infectious. The case's travel itinerary during the infectious period was reported as follows:

Date	Time	Location
March 13, 2018	11:00 AM-3:00 PM	The Magic House; Kirkwood, MO
March 13, 2018	5:30 PM-8:15 PM	Pacanelli's New York Pizzeria; Kirkwood, MO
March 15-16, 2018	8:15 PM-11:00 AM	Homewood Suites; Chesterfield, MO

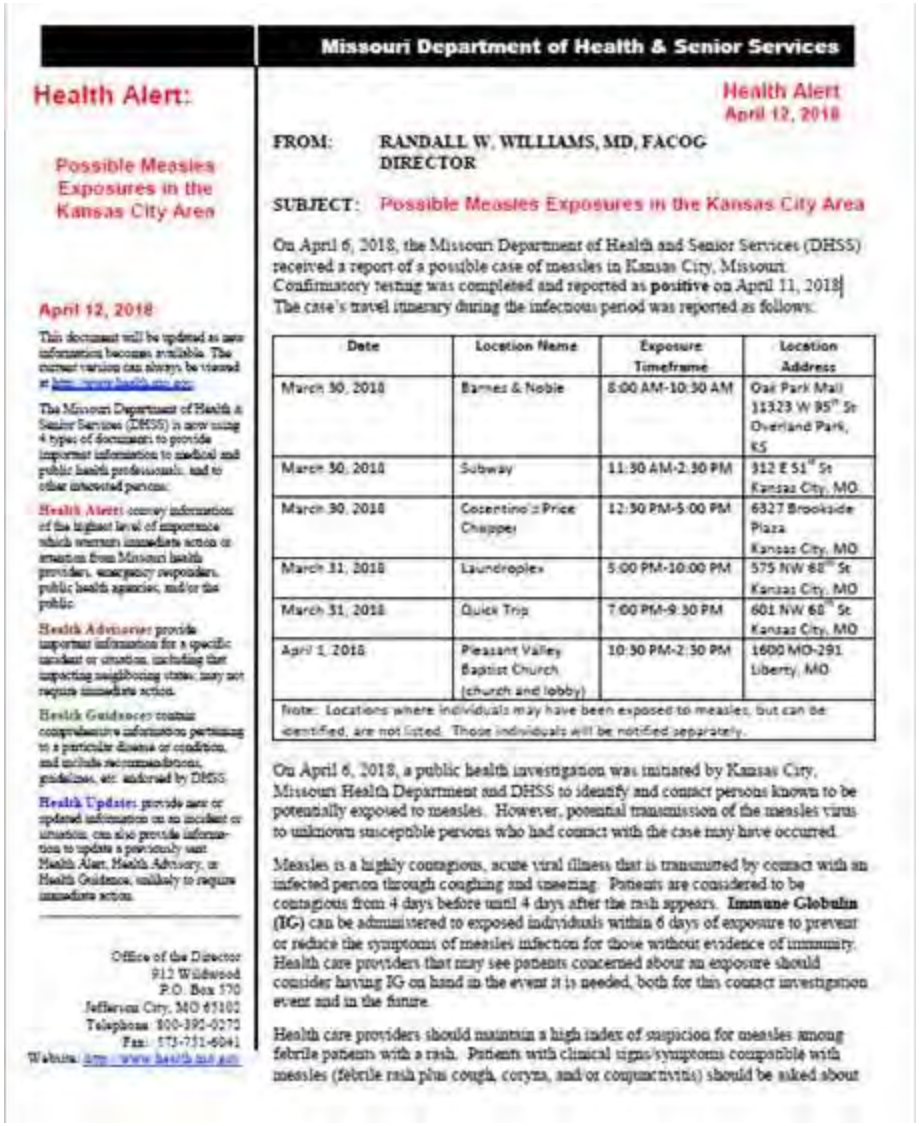
On March 19, 2018, a public health investigation was initiated by St. Louis County Department of Public Health and DHSS to identify and contact persons known to be potentially exposed to measles. However, potential transmission of the measles virus to unknown susceptible persons who had contact with the case may have occurred.

Measles is a highly contagious, acute viral illness that is transmitted by contact with an infected person through coughing and sneezing. Patients are considered to be contagious from 4 days before until 4 days after the rash appears. **Immune Globulin (IG)** can be administered to exposed individuals within 6 days of exposure to prevent or reduce the symptoms of measles infection for those without evidence of immunity. Health care providers that may see patients concerned about an exposure should consider having IG on hand in the event it is needed, both for this contact investigation event and in the future.

Health care providers should maintain a high index of suspicion for measles among febrile patients with a rash. Patients with clinical signs/symptoms compatible with measles (febrile rash plus cough, coryza, and/or conjunctivitis) should be asked about the exposures detailed above, recent travel abroad and contact with returning travelers, or contact with someone with a febrile rash illness. Their vaccination status should also be verified. Immunocompromised patients may not exhibit a rash, or may exhibit an atypical rash. The incubation period for measles from exposure to fever is usually about 10-12 days and from exposure to rash onset is usually 14 days (range, 7 to 21 days).

Persons who have been exposed to measles should contact their health care provider if they develop cold-like symptoms with a fever and/or rash. They should **NOT** go to any health care facility without calling first. The suspect case should be kept separated from others to prevent further spread. (Note that measles virus can remain infectious in the air for up to 2 hours after an infected person leaves an area such as a waiting room.) Isolate suspect measles case-patients and immediately report suspected cases to the local public health agency, or to DHSS at 573/751-6113 or 800/392-0272 (24/7). To ensure prompt public health response, do not wait for laboratory confirmation.

Detection of measles-specific IgM antibody and measles RNA by real-time polymerase chain reaction (RT-PCR) are the most common methods for confirming measles.



Missouri Department of Health & Senior Services

Health Alert:

Possible Measles Exposures in the Kansas City Area

April 12, 2018

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Health Alert
April 12, 2018

FROM: RANDALL W. WILLIAMS, MD, FACOG
DIRECTOR

SUBJECT: Possible Measles Exposures in the Kansas City Area

On April 6, 2018, the Missouri Department of Health and Senior Services (DHSS) received a report of a possible case of measles in Kansas City, Missouri. Confirmatory testing was completed and reported as **positive** on April 11, 2018. The case's travel itinerary during the infectious period was reported as follows:

Date	Location Name	Exposure Timeframe	Location Address
March 30, 2018	Barnes & Noble	8:00 AM-10:30 AM	Oak Park Mall 11323 W 95th St Overland Park, KS
March 30, 2018	Subway	11:30 AM-2:30 PM	312 E 51st St Kansas City, MO
March 30, 2018	Cocentino's Price Chopper	12:30 PM-5:00 PM	6327 Brookside Plaza Kansas City, MO
March 31, 2018	Laundroplex	5:00 PM-10:00 PM	575 NW 68th St Kansas City, MO
March 31, 2018	Quick Trip	7:00 PM-9:30 PM	601 NW 68th St Kansas City, MO
April 1, 2018	Pleasant Valley Baptist Church (church and lobby)	10:30 PM-2:30 PM	1600 MO-291 Liberty, MO

Note: Locations where individuals may have been exposed to measles, but can be identified, are not listed. Those individuals will be notified separately.

On April 6, 2018, a public health investigation was initiated by Kansas City, Missouri Health Department and DHSS to identify and contact persons known to be potentially exposed to measles. However, potential transmission of the measles virus to unknown susceptible persons who had contact with the case may have occurred.

Measles is a highly contagious, acute viral illness that is transmitted by contact with an infected person through coughing and sneezing. Patients are considered to be contagious from 4 days before until 4 days after the rash appears. **Immune Globulin (IG)** can be administered to exposed individuals within 6 days of exposure to prevent or reduce the symptoms of measles infection for those without evidence of immunity. Health care providers that may see patients concerned about an exposure should consider having IG on hand in the event it is needed, both for this contact investigation event and in the future.

Health care providers should maintain a high index of suspicion for measles among febrile patients with a rash. Patients with clinical signs/symptoms compatible with measles (febrile rash plus cough, coryza, and/or conjunctivitis) should be asked about

http://health.mo.gov/emergencies/ert/alertsadvisories/index.php

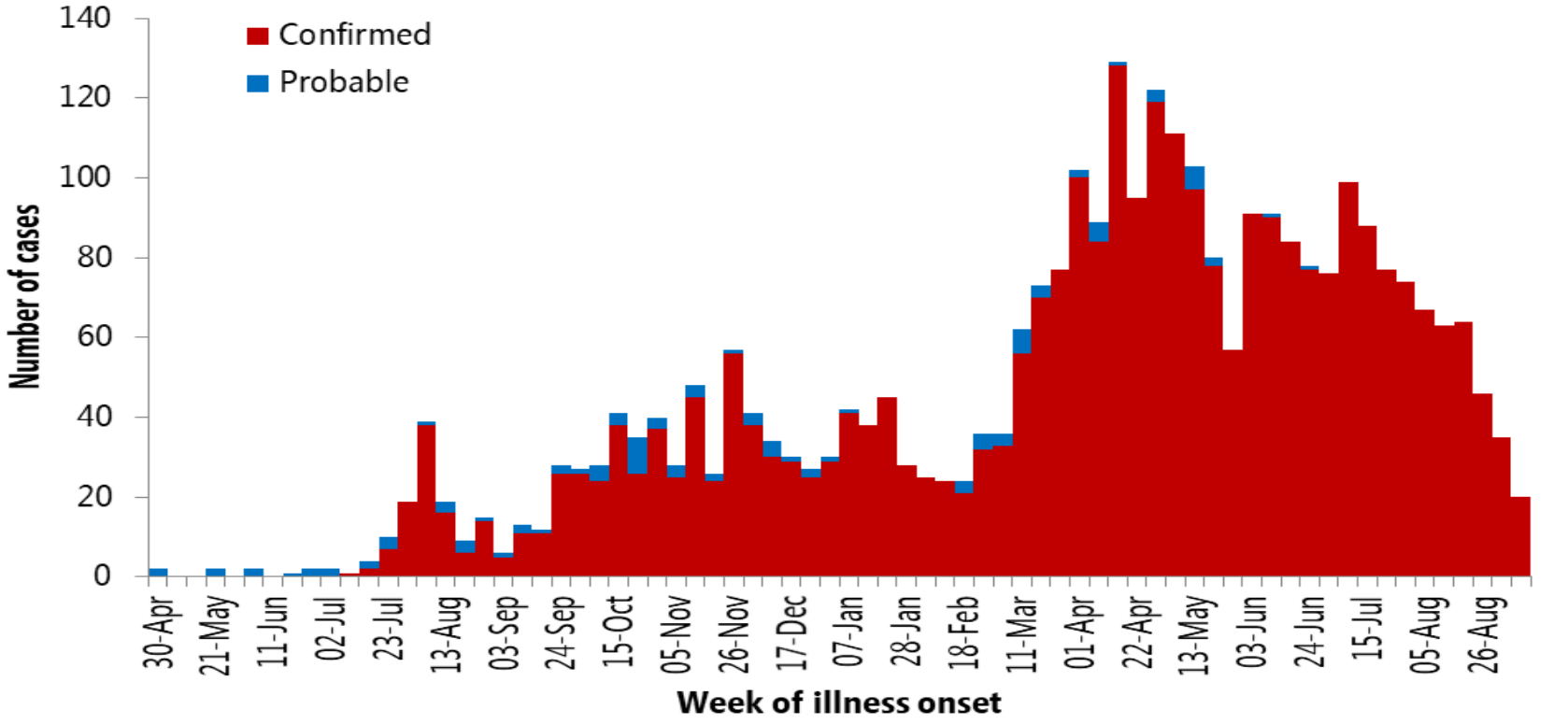
Ebola Update

- Ebola Virus
- Symptoms
  - Fever, severe headache, muscle pain, weakness, fatigue, diarrhea, vomiting, abdominal pain, unexplained hemorrhage (bleeding or bruising)
- Incubation Period: 2 – 21 days (avg. 8-10 days)
- Transmission:
  - Likely zoonotic: fruit bat or nonhuman primate
  - Person-to-person through direct contact
  - Cannot spread to others until a person develops signs or symptoms

Ebola Outbreak – Eastern Democratic Republic of the Congo (DRC)

- August 1, 2018 – Outbreak in DRC first reported
- July 17, 2019 – Declared a "public health emergency of international concern"
- September 19, 2019
  - 3,157 Cases
  - 2,108 Deaths
  - 966 Survivors

Confirmed and probable Ebola virus disease cases by week of illness onset, as of September 15, 2019



Courtesy WHO Ebola Situation Report – September 17, 2019

Ebola – Response

- Security Concerns
- Active Screening
  - Strategic location in the region
  - No entry screening in US
- Ring Vaccination: 222,415 persons have consented and received vaccine
- No country has implemented travel measures that significantly interfere with international traffic to and from the DRC

Ebola – Response in the U.S.

- Travelers to DRC:
  - Alert Level 2, Practice Enhanced Precautions
- Aid workers returning to U.S.
  - Complete an exposure and health assessment
  - Notify local and state health departments
  - Missouri – active monitoring
- Hospital Preparedness
  - Ask and document international travel histories
  - Identify patients with fever and other signs or symptoms

Ebola – Person Under Investigation (PUI)

- Ebola PUI – Both consistent signs or symptoms and risk factors for Ebola

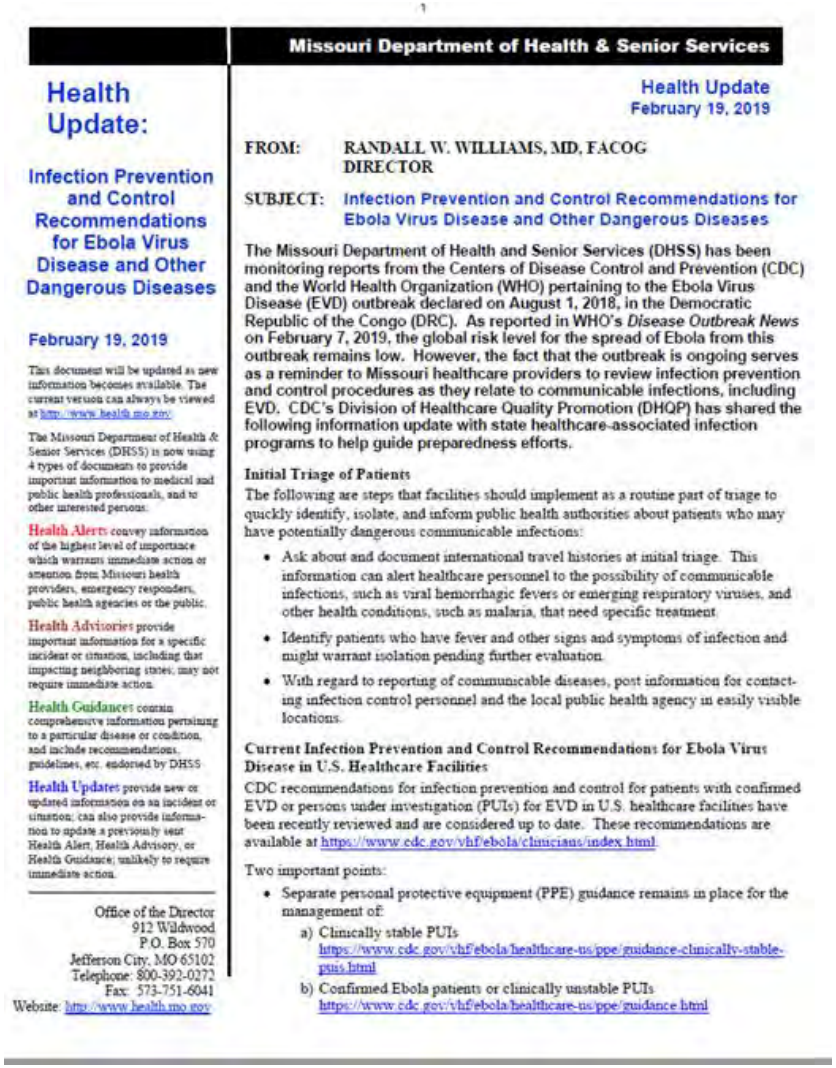
  1. Elevated body temperature or subjective fever or symptoms, including severe headache, fatigue, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage; AND

  2. An epidemiologic risk factor within the 21 days before the onset of symptoms.

- Immediately report any PUI for Ebola to DHSS and/or Local Public Health Agency

Ebola – Resources

- DHSS – Health Advisories, Alerts, and Updates
- CDC – Ebola Website
- World Health Organization – Situation Reports



Missouri Department of Health & Senior Services

Health Update:

Infection Prevention and Control Recommendations for Ebola Virus Disease and Other Dangerous Diseases

February 19, 2019

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Health Update
February 19, 2019

FROM: RANDALL W. WILLIAMS, MD, FACOG
DIRECTOR

SUBJECT: Infection Prevention and Control Recommendations for Ebola Virus Disease and Other Dangerous Diseases

The Missouri Department of Health and Senior Services (DHSS) has been monitoring reports from the Centers of Disease Control and Prevention (CDC) and the World Health Organization (WHO) pertaining to the Ebola Virus Disease (EVD) outbreak declared on August 1, 2018, in the Democratic Republic of the Congo (DRC). As reported in WHO's *Disease Outbreak News* on February 7, 2019, the global risk level for the spread of Ebola from this outbreak remains low. However, the fact that the outbreak is ongoing serves as a reminder to Missouri healthcare providers to review infection prevention and control procedures as they relate to communicable infections, including EVD. CDC's Division of Healthcare Quality Promotion (DHQP) has shared the following information update with state healthcare-associated infection programs to help guide preparedness efforts.

Initial Triage of Patients

The following are steps that facilities should implement as a routine part of triage to quickly identify, isolate, and inform public health authorities about patients who may have potentially dangerous communicable infections:

- Ask about and document international travel histories at initial triage. This information can alert healthcare personnel to the possibility of communicable infections, such as viral hemorrhagic fevers or emerging respiratory viruses, and other health conditions, such as malaria, that need specific treatment.
- Identify patients who have fever and other signs and symptoms of infection and might warrant isolation pending further evaluation.
- With regard to reporting of communicable diseases, post information for contacting infection control personnel and the local public health agency in easily visible locations.

Current Infection Prevention and Control Recommendations for Ebola Virus Disease in U.S. Healthcare Facilities

CDC recommendations for infection prevention and control for patients with confirmed EVD or persons under investigation (PUIs) for EVD in U.S. healthcare facilities have been recently reviewed and are considered up to date. These recommendations are available at https://www.cdc.gov/vhf/ebola/clinicians/index.html.

Two important points:

- Separate personal protective equipment (PPE) guidance remains in place for the management of:
  a) Clinically stable PUIs
  https://www.cdc.gov/vhf/ebola/healthcare-us/ppe/guidance-clinically-stable-puis.html
  b) Confirmed Ebola patients or clinically unstable PUIs
  https://www.cdc.gov/vhf/ebola/healthcare-us/ppe/guidance.html

Brief Update – Whole Genome Sequencing

- Whole genome sequencing (WGS) replaced pulsed-field gel electrophoresis (PFGE) for select enteric diseases
  - WGS – Procedure that determines the order of bases in genome of an organism in one process
  - More detailed and precise than PFGE
  - Compare millions of bases instead of 15-30 bands

Brief Update –Legionellosis

- Legionellosis added to the list of conditions to be reported in 1 day (previously 3 days)
- PCR added to the national case definition as confirmatory (January 1, 2020)
- Definition for healthcare and travel exposures extended from 10 to 14 days (January 1, 2020)

In Conclusion

- High consequence communicable diseases continue to emerge and reemerge
  - Acute Flaccid Myelitis (AFM)
  - Antibiotic Resistance
  - Healthcare-associated Infections

- Highlights the importance of the healthcare/public health partnership

CDC – Biggest Antibiotic Resistant Threats

- Clostridioides difficile
- Carbapenem-resistant Enterobacteriaceae (CRE)
- Neisseria gonorrhoeae
- Acinetobacter
- Campylobacter
- Candida
- Pseudomonas aeruginosa
- Salmonella Typhi (typhoid fever)
- Non-typhoidal Salmonella
- Shigella
- Staphylococcus aureus
- Streptococcus pneumonia
- Tuberculosis
- Group A Streptococcus
- Group B Streptococcus

DHSS Healthcare-Associated Infections Program

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Thank You!

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