

# Got Mumps?

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## Overview of Mumps Epidemiology and Surveillance in Colorado and the U.S.

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# Overview

- Epidemiology and clinical features
- US and Colorado trends
- Current outbreaks
- Diagnostics
- Vaccination and prevention
- Why are vaccinated communities getting mumps?



# Background

- Paramyxovirus
- Pre-Vaccine Era
  - ~186,000 cases reported/year (mostly school-aged)
- 99% decrease in mumps cases in the US since vaccine
- Increases over the past year, including outbreaks

# Epidemiology

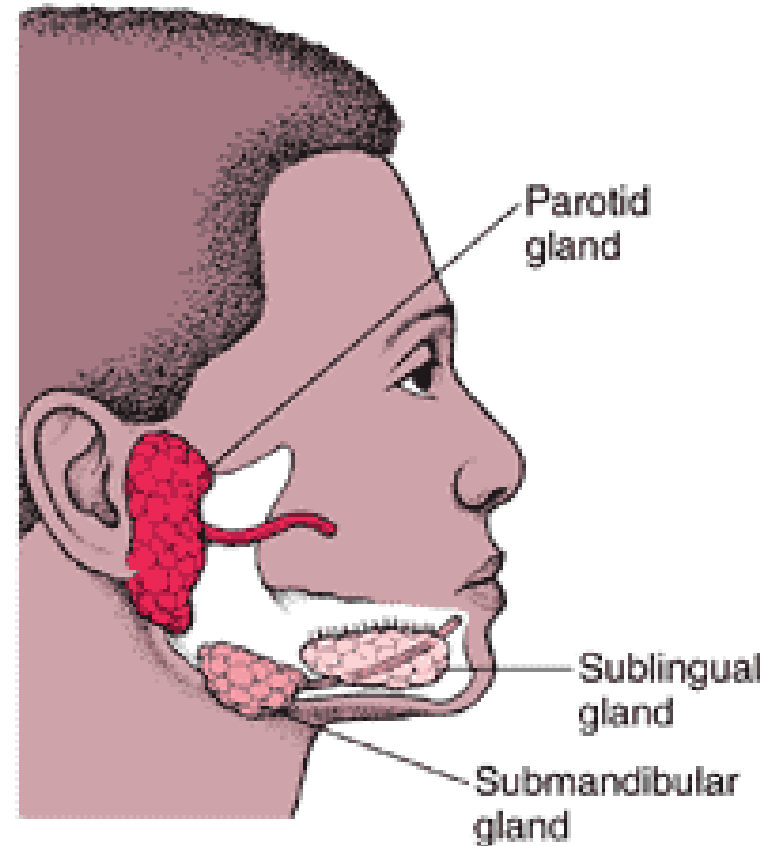
<b>Reservoir</b>	Humans are the only known natural hosts
<b>Transmission</b>	Direct contact with respiratory droplets or saliva from infected person Spreads rapidly among individuals in close settings
<b>Incubation Period</b>	Average: 16-18 days (Range: 12-25 days)
<b>Infectious Period</b>	2 days before onset of parotitis to 5 days after onset
<b>Treatment</b>	None; symptom relief

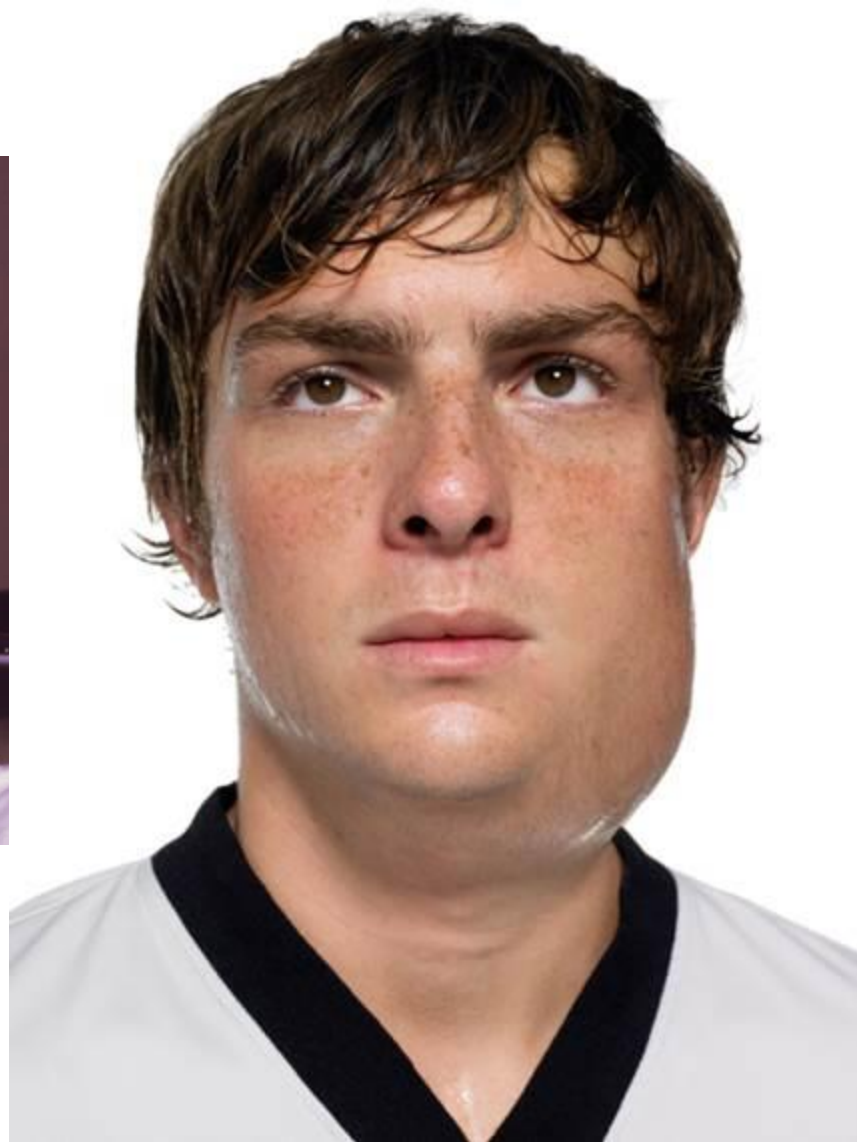
# Clinical Features

- Parotitis
  - Swelling and tenderness of one or more of the salivary glands  $\geq$  2 days
  - Unilateral or bilateral
- Prodrome symptoms
  - Myalgia, malaise, lack of appetite, headache, low grade fever
- Can be asymptomatic
- Complications
  - Orchitis
  - Oophoritis
  - Aseptic meningitis
  - Encephalitis
  - Hearing loss
  - Mastitis
  - Pancreatitis

# Parotitis

- Sometimes confused with lymph swelling
- Parotitis - other viruses
  - Influenza A
  - Parainfluenza
  - Coxsackie A virus
  - Epstein Barr virus
- Parotitis in 30-40% of infected persons

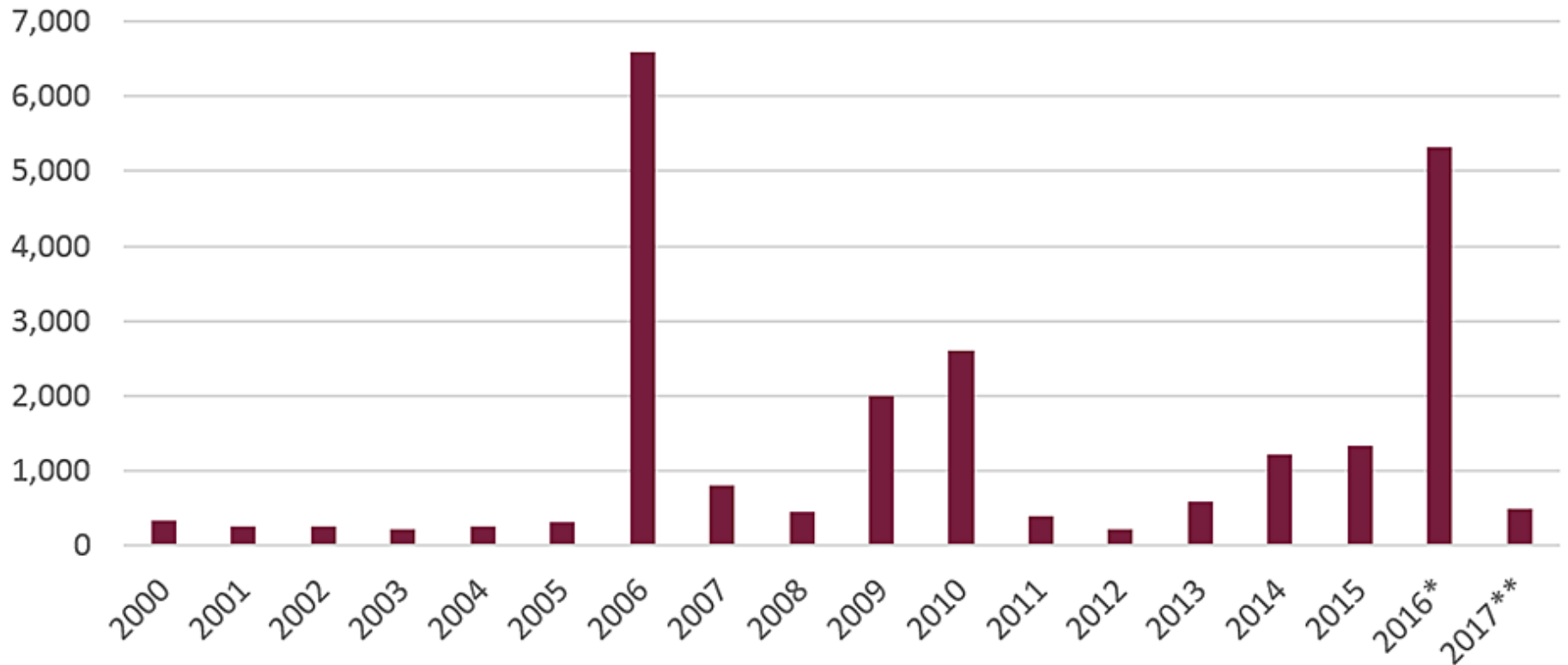




# U.S. Mumps Trends



## Mumps Cases in U.S., by Year

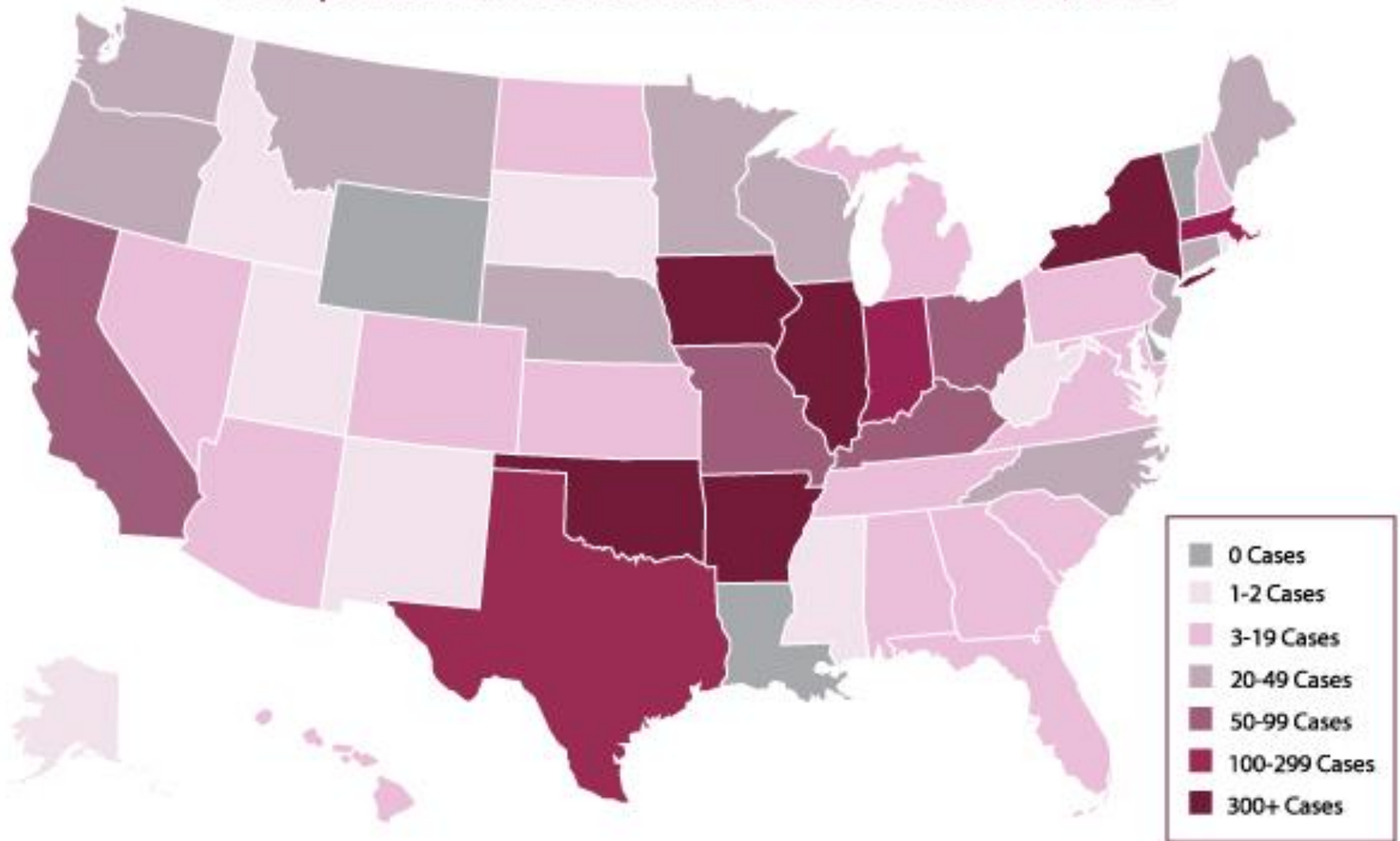


\*Cases as of December 31, 2016. Case count is preliminary and subject to change.

\*\*Cases as of January 28, 2017. Case count is preliminary and subject to change.

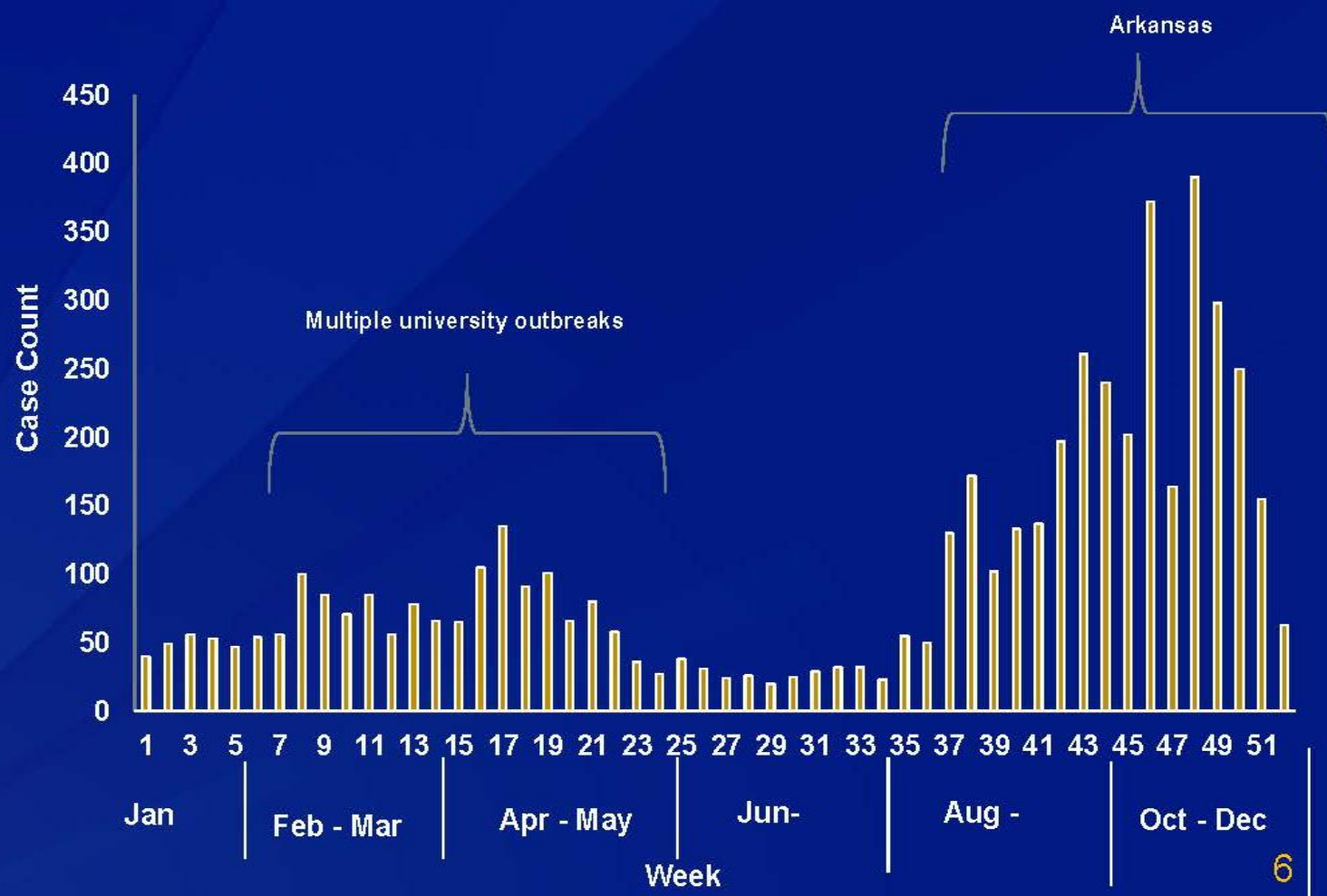
Source: [Morbidity and Mortality Weekly Report \(MMWR\), Notifiable Diseases and Mortality Tables](#)

## Mumps Cases and Outbreaks as of December 31, 2016



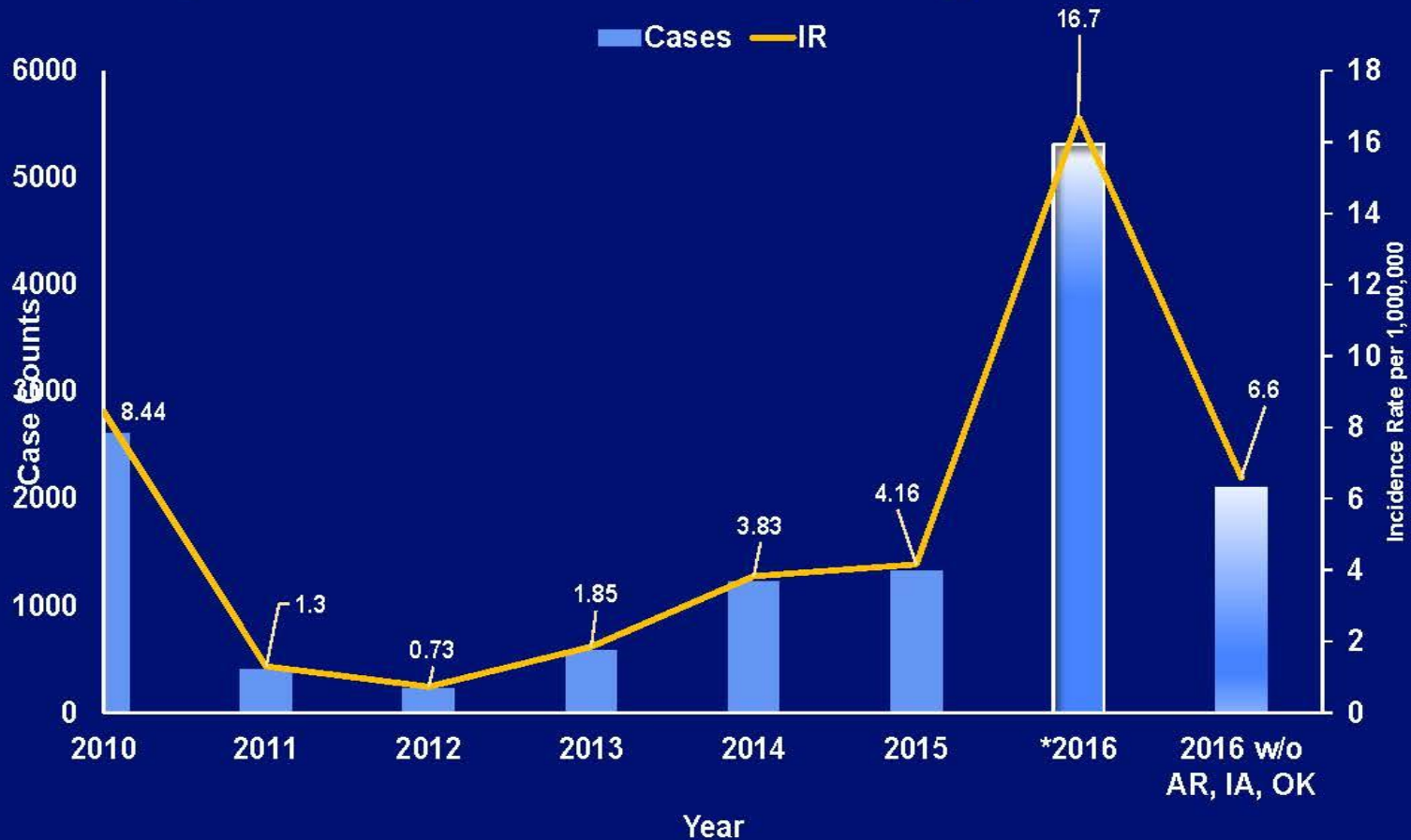
CDC, 2016

# U.S. Mumps Cases by Epi Week, 1-52, 2016\* (n=5,311)



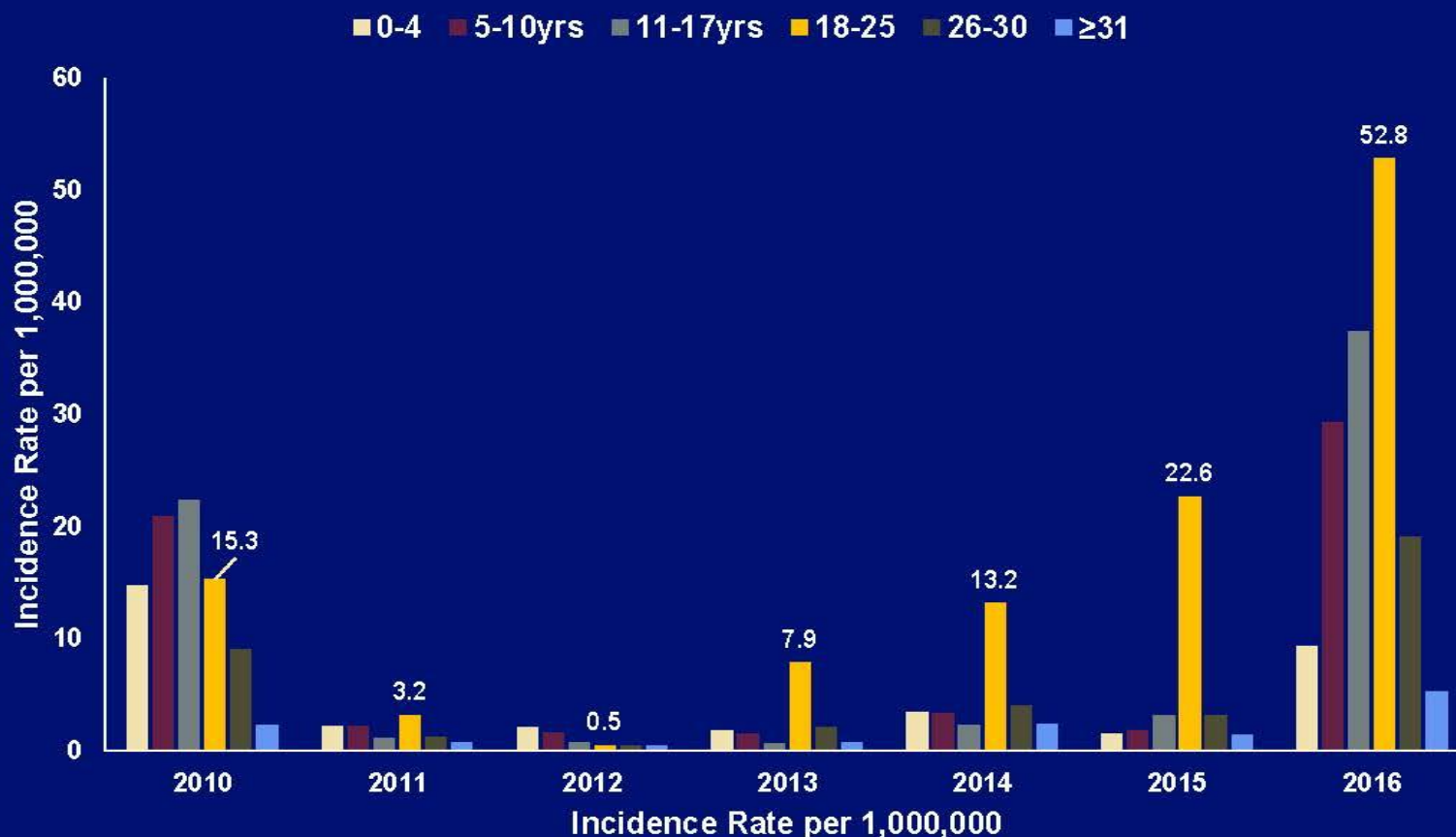
\*NNDSS data, last accessed Jan 6<sup>th</sup>, 2016, data is preliminary and subject to change

## Mumps Cases and Incidence Rates by Year, 2010-2016\*



\*NNDSS and NCIRD data, last accessed Dec 6<sup>th</sup>, 2016. 2016 data is preliminary and subject to change

## Reported U.S. Mumps Incidence Rate by Year and Age Group, 2010-2016\*



\*NNDSS and NCIRD data, last accessed Jan 6<sup>th</sup>, 2016. 2016 data is preliminary and subject to change

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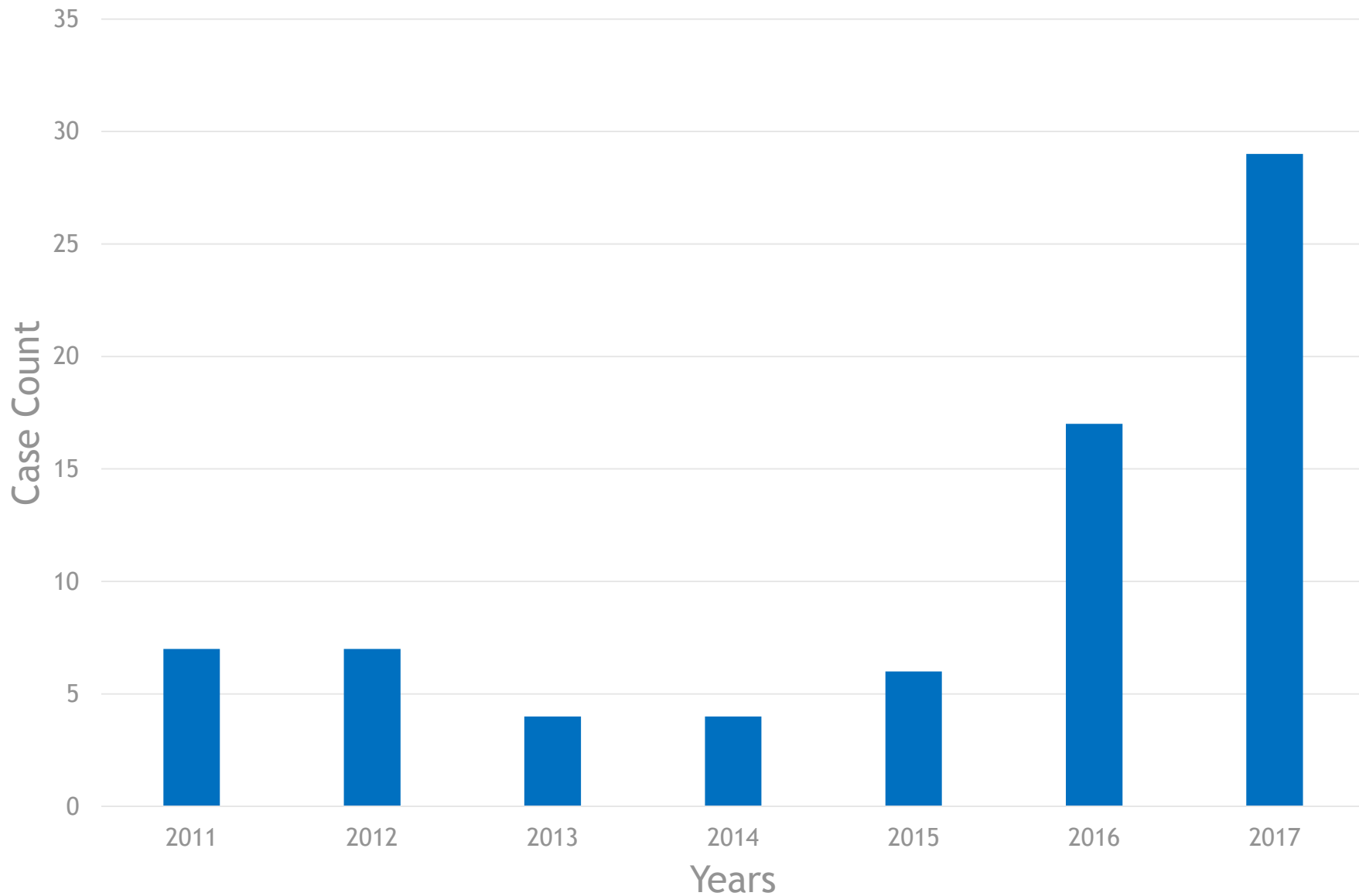
# Current US Outbreaks

- Arkansas
  - 2,783 cases (as of 2/10/2017; began in August)
  - 58% between 5-17 years of age
  - 40 schools in 12 school districts, 24 workplaces, and 3 colleges/vocational schools, and 4 private schools impacted
- Washington
  - 404 cases (as of 2/8/2017; began in October)
  - Most cases in King County (43%) and Spokane County (41%)
- University of Missouri
  - 334 cases (as of 2/9/2017; began in November)



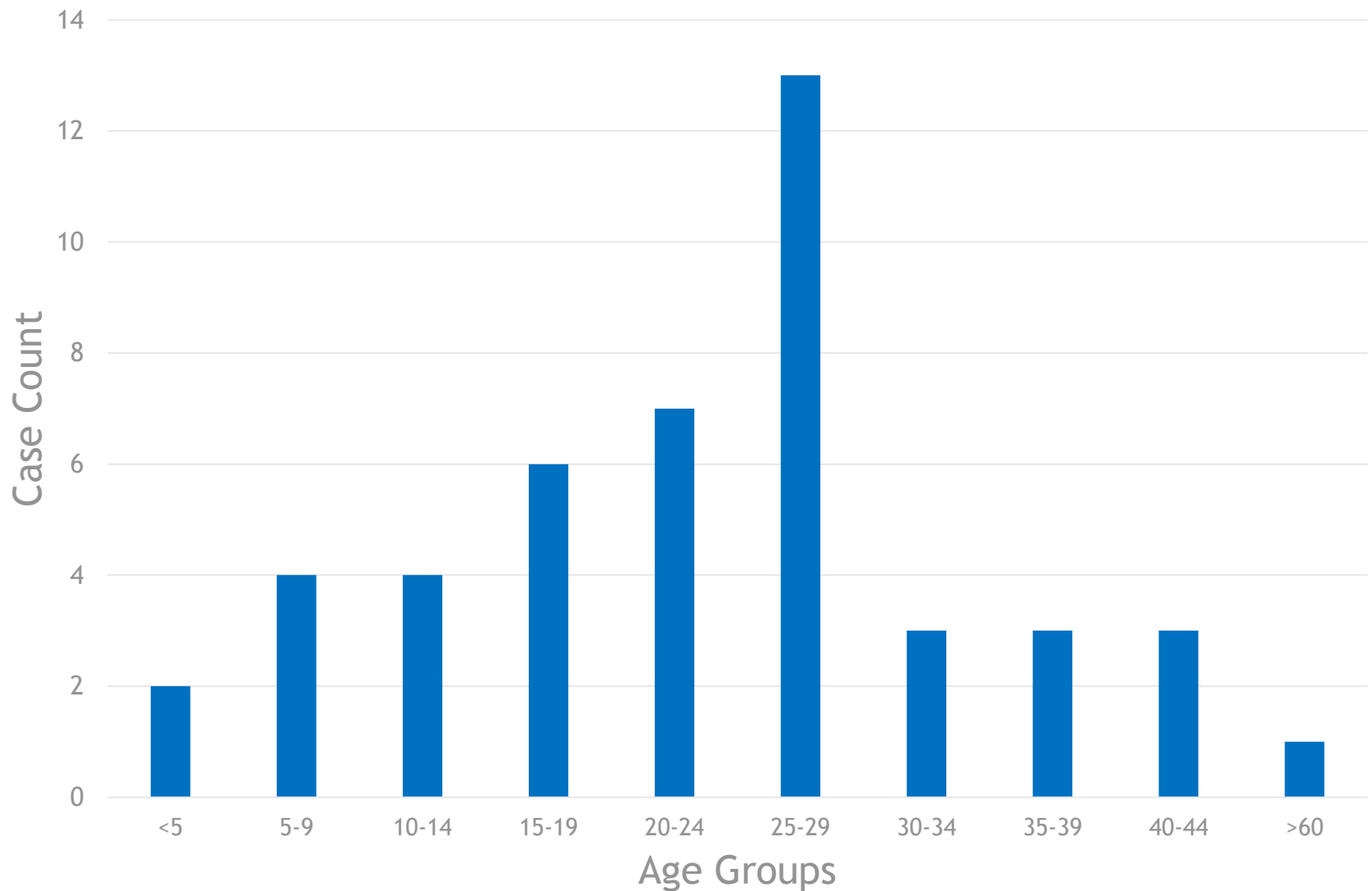
# Colorado Mumps Trends

# Mumps Cases in Colorado, 2011-2017





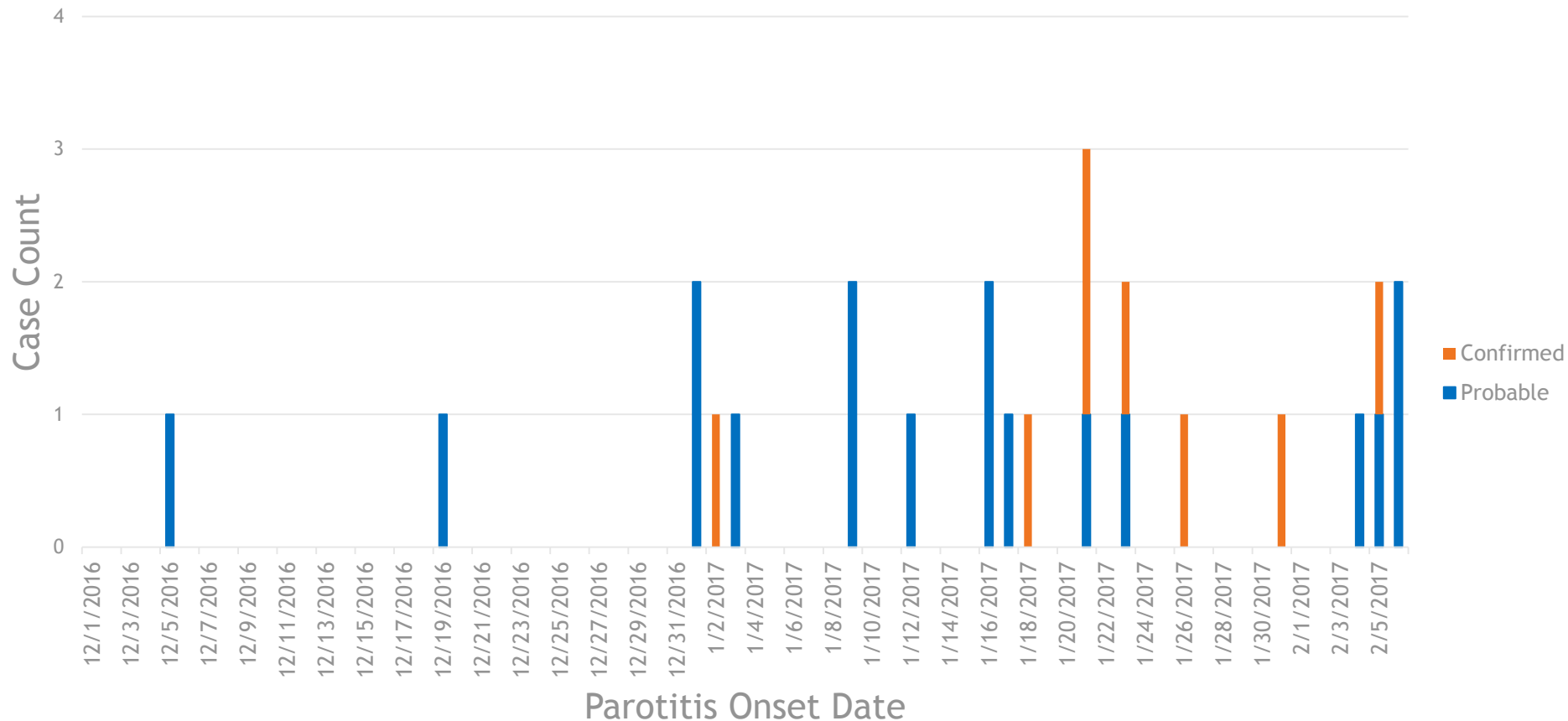
# Colorado Mumps Cases By Age Group, 2016-2017



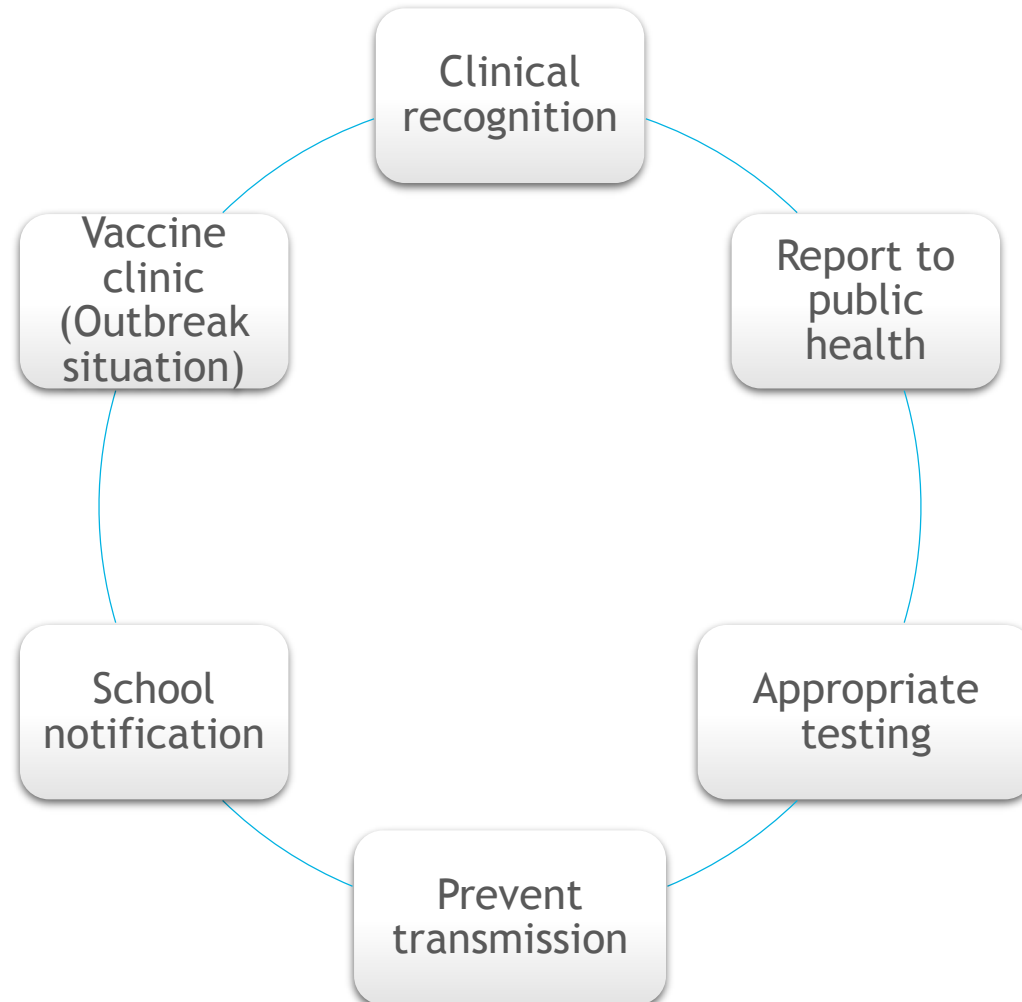
# Current Colorado Outbreak

- Occurring in a small community in Denver Metro
  - CDPHE, Tri County Health Department, and Denver Public Health are investigating
- Under vaccinated community
  - Not against vaccines
- Likely linked to outbreaks from other states
- Local health department hosting vaccine clinics for affected community
- No spread beyond community at this point

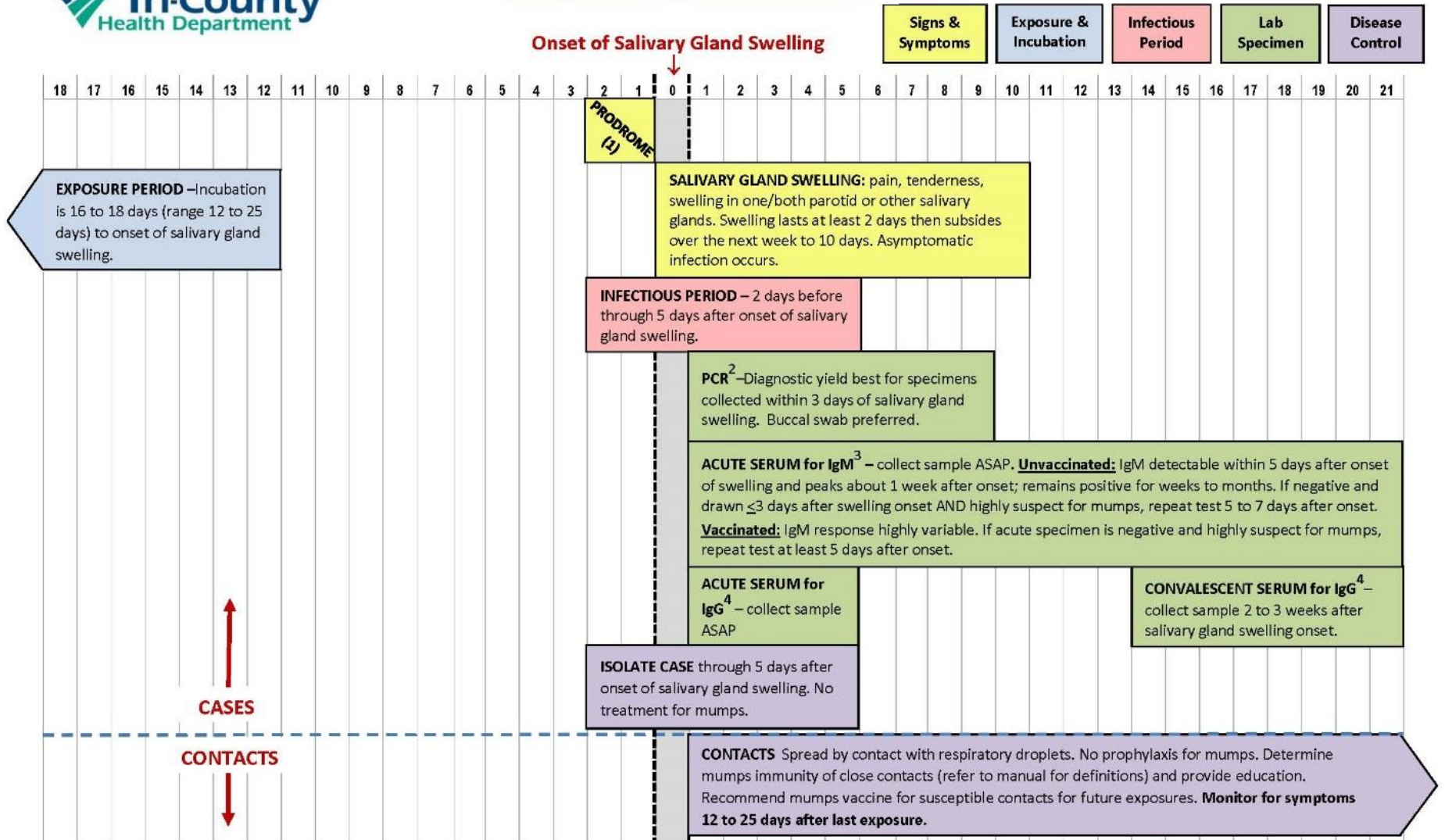
# Colorado Mumps Outbreak Epi Curve (n=25)



# Public Health Response



# Mumps Management Timeline



<sup>1</sup> Nonspecific prodrome symptoms including myalgia, malaise, headache and low grade fever may occur several days prior to salivary gland swelling.

<sup>2</sup> Swab of the buccal mucosa/parotid duct (massage gland prior to collecting specimen). Diagnostic yield is lower for specimens collected 9 or more days after salivary gland swelling. PCR testing is available through CDPHE (contact CDPHE first). In addition to PCR, collect serology ASAP.

<sup>3</sup> False positive and negative serology results are not uncommon. Vaccinated persons may not have detectable mumps IgM antibody regardless of timing of specimen collection.

<sup>4</sup> Mumps may be confirmed by demonstrating a 4-fold increase in mumps IgG titer using paired acute and convalescent serum samples. Paired sera from vaccinated persons may not show a rise in IgG titer.

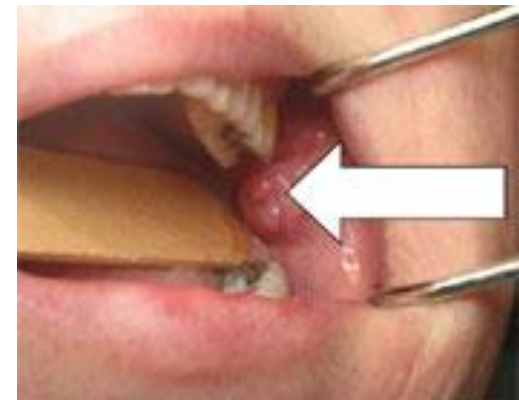
# Testing for Mumps

- RT-PCR
- Serology
- Viral Culture

# Testing – RT-PCR

- **Buccal Swab**

- Virus detected from fluid collected from the parotid duct or other affected salivary gland ducts
- Follow specimen collection guidelines:
  - Use PPE for droplet precautions
  - Massage the salivary gland area for ~30 seconds prior to swabbing
  - Synthetic swabs preferred!
  - Swabs should be stored in standard viral transport medium and kept cold
- Obtain sample ASAP after parotitis onset
  - Within 3 days and not more than 8 days after onset
- Available at CDPHE Lab



# Testing – RT-PCR

- Results

- Unvaccinated:

- Virus may be isolated until 11-14 days after parotitis
    - Most successful results are within 3 days of onset

- Vaccinated:

- Collect within 1-3 days after onset
  - Negative PCR results *DO NOT RULE OUT MUMPS*
    - Timing and quality of specimen can prevent successful detection



# Testing – Serology

- **Immunoglobulin G (IgG)**
  - Tests for immunity
  - Seroconversion from negative to positive by EIA or a four-fold rise in titer
    - Paired serology rarely done!
  - Difficult to interpret results
  - Available at commercial labs
  - **Unvaccinated:**
    - IgG antibody increases rapidly after onset of symptoms and is long lasting
  - **Vaccinated:**
    - IgG may already be elevated in the acute phase blood sample which may prevent detection of a four-fold rise in IgG titer in the convalescent serum specimen

# Testing – Serology

- Immunoglobulin M (IgM)
  - Available at commercial labs
  - **Unvaccinated:**
    - IgM detectable within 5 days after onset, max about a week after onset
    - Remains elevated for weeks to months
  - **Vaccinated:**
    - May not have a detectable IgM response → false-negative results occur
    - Some evidence indicate that the ability to detect IgM increases >10 days after parotitis onset
    - Negative IgM results *DO NOT RULE OUT MUMPS!*

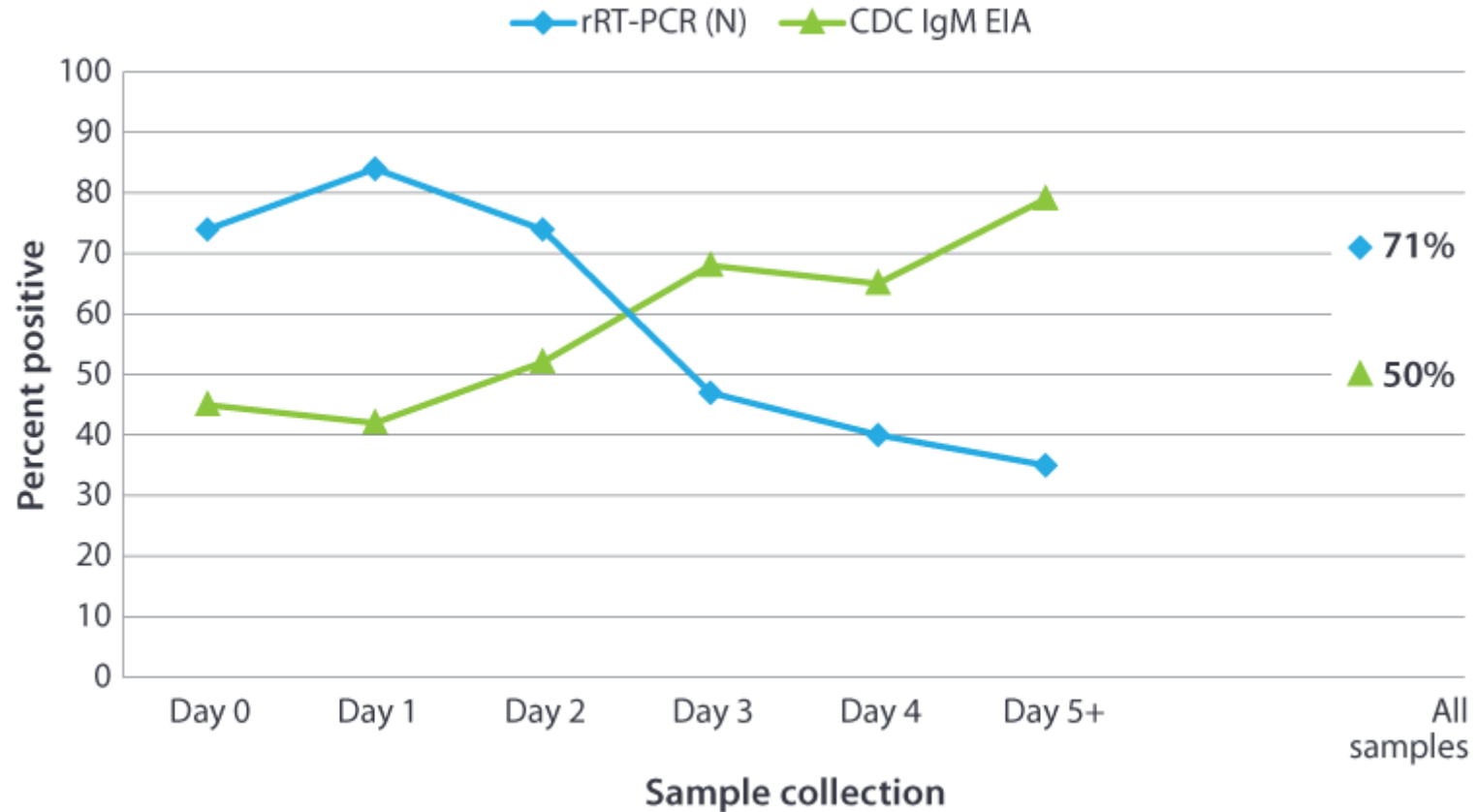
# Testing – Interpreting Serology Results

Mumps Exposure History	IgM	IgG	Comments
Unvaccinated or no history of mumps	+	+ or -	<ul style="list-style-type: none"> <li>- IgM may be detected for weeks to months</li> <li>- IgM positive results in <u>80 - 100%</u> of serum samples</li> <li>- Low levels of IgG may be present at symptom onset</li> </ul>
1-dose vaccine history	+ or -	Likely +	<ul style="list-style-type: none"> <li>- IgM positive results in <u>50%</u> of samples that were collected 1-10 days after symptom onset</li> <li>- IgM positive results in <u>50-80%</u> of samples collected &gt;10 days after symptom onset</li> <li>- IgG will be positive because of vaccine</li> </ul>
2-dose vaccine history	+ or -	Likely +	<ul style="list-style-type: none"> <li>- IgM positive results in <u>13-46%</u> of samples collected &lt;3 days after symptoms onset</li> <li>- IgM positive results in <u>71%</u> of samples collected &gt;3 days after symptom onset</li> <li>- IgG will be positive because of vaccine</li> </ul>

# Testing – Viral Culture

- Mumps virus isolated from buccal or oral swab
- Virus can be isolated even when IgM and IgG are negative
- Turn around time can take several days to several weeks
- *This method is not widely used or recommended*

# PERCENTAGE OF MUMPS SPECIMENS DETERMINED POSITIVE BY CDC IGM CAPTURE EIA OR RRT-PCR (N TARGET GENE) AS A FUNCTION OF TIME POST PAROTITIS ONSET\*



The percentage of positive results obtained from testing 296 confirmed mumps cases from New York City by day of sample collection after onset of symptoms. The serum samples were tested for presence of IgM using the CDC capture IgMEIA. The buccal swab samples were tested by rRT-PCR using the mumps nucleoprotein (N) gene as the target.

\*Done in collaboration with New York City Department of Health and Mental Hygiene Public Health Laboratory, New York, NY

Mumps virus was isolated from 209 (71%) of the 296 buccal swabs tested.

# Mumps Vaccine

- Mumps virus isolated in 1945
- The first mumps vaccine was developed in 1948 and included an inactivated vaccine (discontinued in the 1970s) and a live attenuated vaccine
- Mumps vaccine combined with measles and rubella (MMR) or measles, rubella, and varicella (MMRV)
  - MMR licensed in 1971
  - MMRV licensed in 2005
- Single-antigen vaccine not available in the US



# Vaccination

- Vaccine Schedule

- MMR for 18 years or younger

- 1<sup>st</sup> dose - 12-15 months

- 2<sup>nd</sup> dose - 4-6 years

- 2<sup>nd</sup> dose may be given sooner (at least 28 days after first) in certain outbreak situations

- MMR for adults born after 1956 (if no record of immunization)

- Should get at least 1 dose

- In outbreak settings, a 2<sup>nd</sup> or 3<sup>rd</sup> dose may be recommended

- MMR or MMRV Effectiveness

- 2 doses: 88% effective (range: 66-95%)

- 1 dose: 78% effective (range: 49-92%)



# DON'T LET MUMPS SPOIL YOUR FUN



**MMR VACCINATION IS THE BEST  
PROTECTION AGAINST MUMPS!**

## KEEP FROM SPREADING MUMPS



Don't share drinks  
or eating utensils



Cover your coughs  
and sneezes



Stay home when  
you are sick



Wash your hands  
often with soap  
and water



Clean and disinfect  
surfaces

## SIGNS AND SYMPTOMS OF MUMPS



Mumps is best known for the  
puffy cheeks and swollen  
jaw that it causes.



Fever



Headache



Loss of appetite



Muscle aches



Tiredness

## THERE IS NO TREATMENT FOR MUMPS



If you have symptoms, stay home and away from others and  
contact Student Health Services or your doctor.

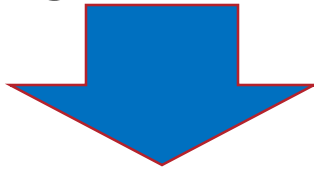
**ASK YOUR STUDENT HEALTH SERVICES ABOUT  
WHERE YOU CAN GET VACCINATED.**





# Why are vaccinated people getting mumps?

- ✓ Vaccines can fail
  - Person may not develop an immune response (either vaccine or host related)
- ✓ There is evidence of waning vaccine-induced immunity over the years
- ✓ Mumps component in MMR has relatively lower effectiveness
- ✓ Congregating in close settings intensifies exposure



- Proportion of cases among people who are vaccinated may appear high; however, *should not be interpreted that the vaccine is not effective!*
- Vaccine effectiveness is assessed by comparing attack rates in vaccinated individuals to attack rates in unvaccinated individuals.
- If attack rates are compared between vaccinated individuals and unvaccinated individuals, the unvaccinated individuals have a much higher attack rate.

# Conclusion

- Mumps has been on the rise
- Outbreaks are occurring in highly vaccinated communities
- Can be difficult to diagnose due to clinical symptoms and low sensitivity in diagnostic testing
- Important to quickly identify suspect cases to allow for appropriate public health intervention
- MMR vaccine is still highly effective

# References and Resources

- Mumps information for health care and public health professionals (CDPHE)
  - <https://www.colorado.gov/pacific/cdphe/mumps-information-health-care-and-public-health-professionals>
- Mumps (CDC)
  - <https://www.cdc.gov/mumps/>
- Mumps Lab Testing (CDC)
  - <https://www.cdc.gov/mumps/lab/qa-lab-test-infect.html#v3>

# Questions?

## MUMPS OUTBREAK



**Some things are best not shared.**

**Get the MMR vaccine now to help protect yourself and your family from mumps.**

# Fun Reading

- Patel, L. N., Arciuolo, R., Fu, J., Giancotti, F. R., Zucker, J. R., Rakeman, J., & Rosen, J. B. (2016). Mumps Outbreak among a Highly Vaccinated University Community-New York City, NY, January-April 2014. *Clinical Infectious Diseases*, ciw762.
- Kutty, P. K., Kyaw, M. H., Dayan, G. H., Brady, M. T., Bocchini, J. A., Reef, S. E., ... & Seward, J. F. (2010). Guidance for isolation precautions for mumps in the United States: a review of the scientific basis for policy change. *Clinical Infectious Diseases*, 50(12), 1619-1628.
- Krause, C. H., Molyneaux, P. J., Ho-Yen, D. O., McIntyre, P., Carman, W. F., & Templeton, K. E. (2007). Comparison of mumps-IgM ELISAs in acute infection. *Journal of clinical virology*, 38(2), 153-156.