Surveillance of Vaccine-Preventable Diseases (VPDs): Update 2017

Viral VPDs

November 28, 2017

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Objectives

- Identify 3 main levels of the national surveillance system for VPDs
- Describe the concept of surveillance indicators
- Discuss the importance of surveillance and case identification
- Describe appropriate mechanisms for surveillance
- Describe the appropriate application of case definitions, clinical descriptions, and case classifications
- List the most appropriate laboratory tests for surveillance, and
- List epidemiologically important data to collect for surveillance.

Outline

- Mumps
- Polio and Acute Flaccid Myelitis (AFM)
- Varicella
- Measles
- Rotavirus
- Surveillance needs at various levels of public health

Mumps

Mumps

- Acute viral illness
- Typically causes unilateral or bilateral parotitis
- Possible to present only with non-specific respiratory symptoms or be asymptomatic with a subclinical infection
- Complications include:
  - Orchitis
  - Oophoritis
  - Meningitis

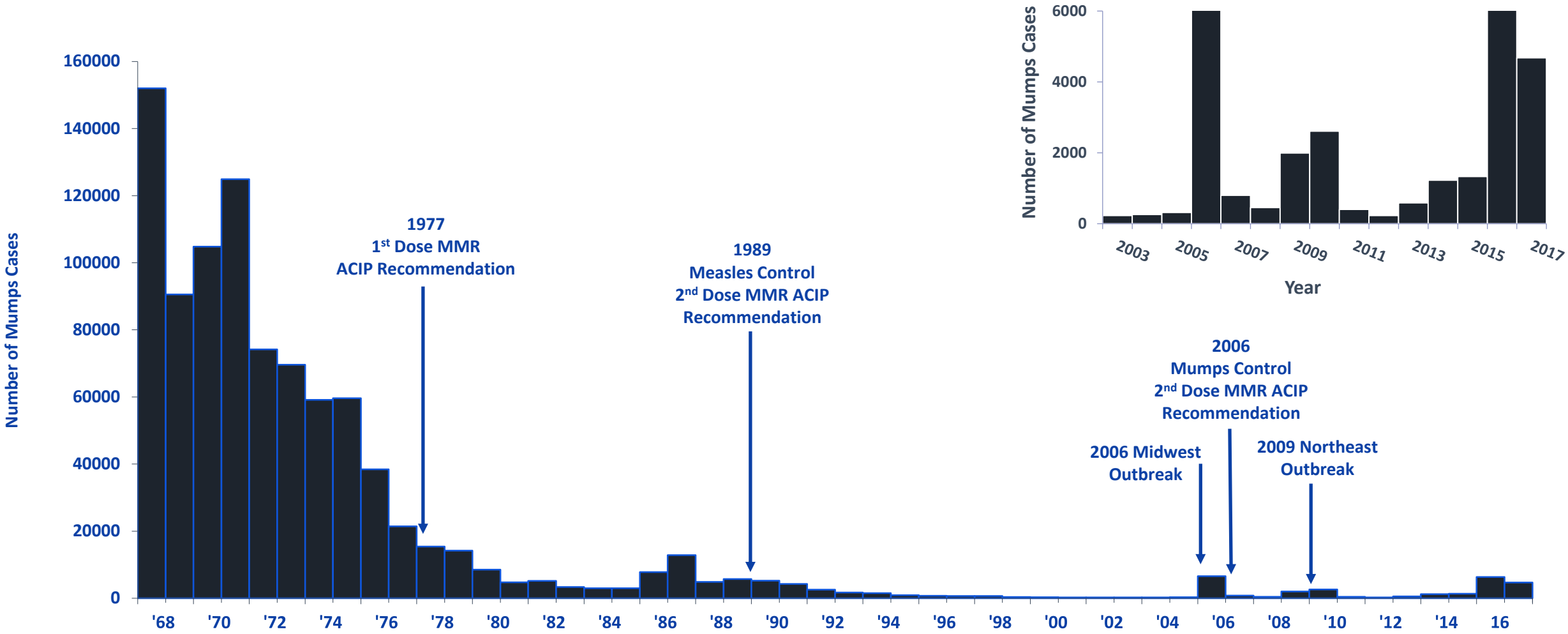
Mumps Transmission

- Transmitted by droplet secretions
- Requires close contact to spread from person to person
- People are most contagious from 2 days before until 5 days after parotitis onset
- People with non-specific respiratory symptoms or asymptomatic infections can also transmit disease
- Incubation period ranges from 12 to 25 days
- Outbreak is defined as 3 or more cases linked by time and space

Mumps Vaccine in the U.S.

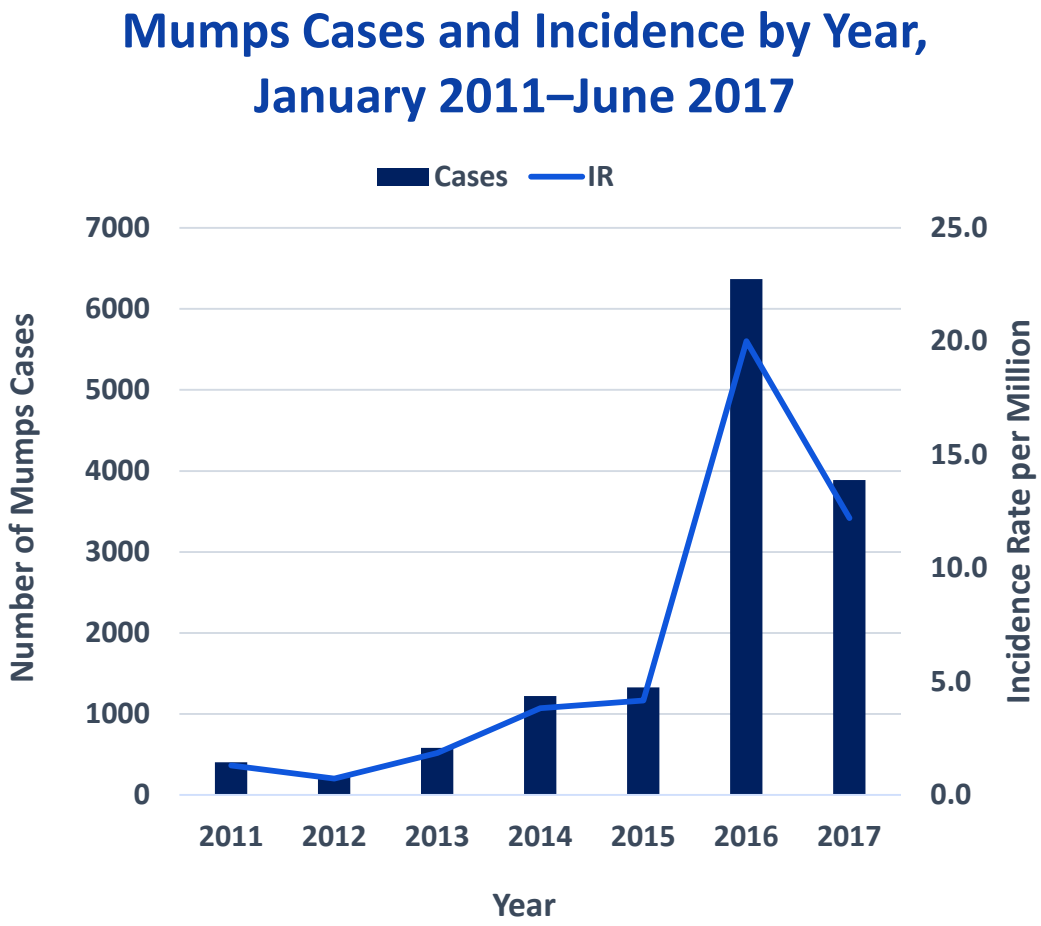
- A component of the combined measles, mumps, and rubella vaccine (MMR)
- Advisory Committee on Immunization Practices (ACIP) Recommendations
  - 1977: First dose of MMR
  - 1989: Second dose of MMR for measles control
  - 2006: Second dose of MMR for mumps control
- Vaccine effectiveness estimated at 78% for 1 dose and 88% for 2 doses
  - Effectiveness estimates have large ranges (49%–91% for 1 dose, 66%–95% for 2 doses)
- Factors that may decrease vaccine effectiveness include:
  - Crowded or very close-contact settings
  - Behaviors that foster sharing of intimate air space or oral secretions

Mumps, Vaccine Era, United States, 1968–June 2017



Mumps Cases and Outbreak (OB) Related Data: 2011–2017

	2011	2012	2013	2014	2015	2016	June 2017
Case Count	404	229	584	1223	1329	6366	3887
Incidence rate (IR)	1.3	0.7	1.9	3.8	4.2	20.0	12.2
OB Cases	128	3	313	747	836	4975	3120
% of OB Cases	32	1.3	54	61	63	78	80
Jurisdictions w/OB cases	9	3	11	15	14	32	33

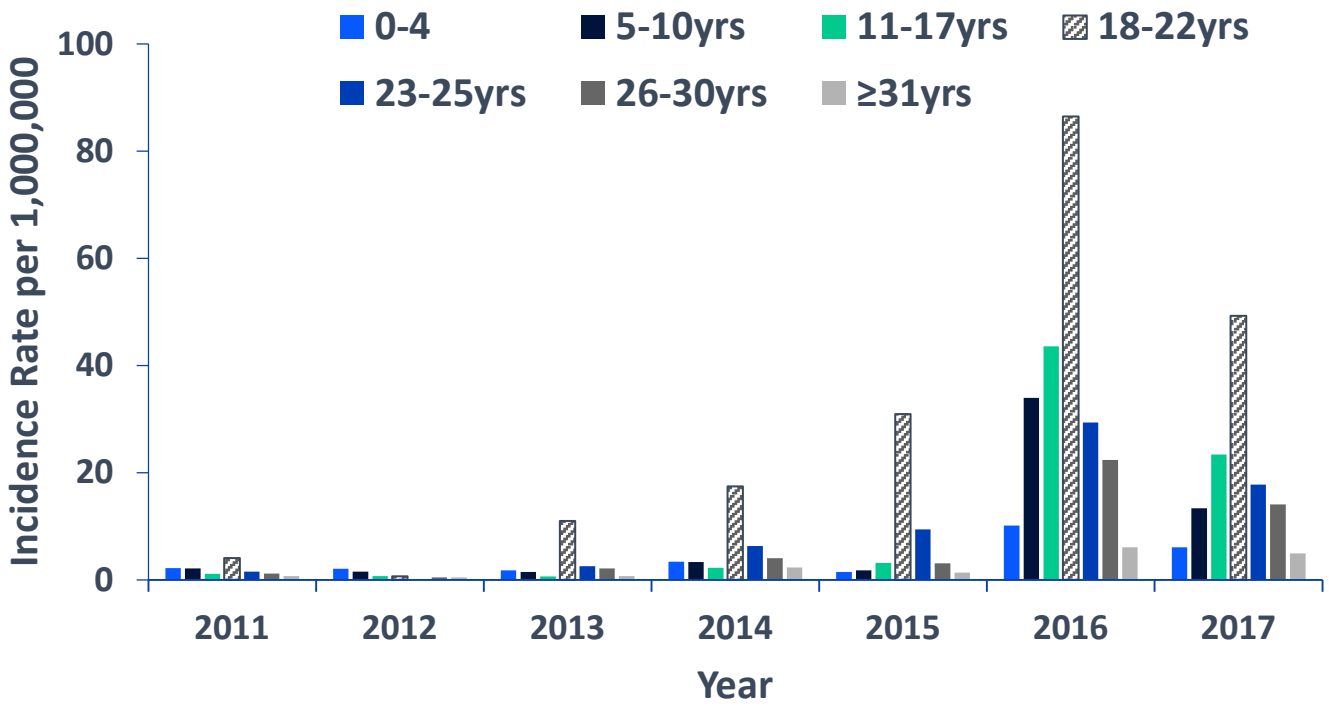


Source: National Notifiable Disease Surveillance System (passive surveillance); 2017 data as of October 7, 2017.

Characteristics of Reported Mumps Cases, United States, 2017

- Highest incidence: 18-22 years of age
- Age: median=21 years (IQR=15-31 years)
- Vaccination status: 75% ≥2 MMR doses

Reported Mumps Incidence Rates by Year and Age Group, United States, 2011-2017



Source: National Notifiable Disease Surveillance System (passive surveillance); 2017 data as of October 12, 2017.
Vaccination status calculated as percent of persons with known vaccination status and for whom information on number of doses was reported.
IQR=Interquartile range

Outbreak Data: January 2016–June 2017

- 150 mumps outbreaks (9,200 cases)*
  - 39 (76%) jurisdictions reported outbreaks
  - Median number of cases per outbreak: 10 (IQR: 4-26)
  - Median age of case-patients: 21 years (IQR: 19-22)
  - 70% of case-patients with known vaccination history had two doses of MMR prior to infection
  - Outbreak/MMR3 dose used in 35 (23%) outbreaks
  - 75 (50%) outbreaks occurred in universities
  - 20 (13%) had ≥50 cases and accounted for 83% (n=7600) of the total case count

*Some outbreaks began in 2015 and continued into 2016.
IQR=Interquartile range
Outbreak dose: an MMR dose was administered without checking individual records prior to vaccination.
MMR3 dose: dose was administered after checking individual records and persons with documented 2 doses of MMR vaccine received a 3rd dose.

Recommended Outbreak Control Measures

- Define the population at risk and transmission settings
- Rapidly identify and vaccinate persons without presumptive evidence of immunity
- Consider excluding persons without presumptive evidence of immunity to prevent exposure and transmission
  - Considerations for recommending exclusion:
    - Increased risk of complications in susceptible persons
    - Contribution of unvaccinated persons to on-going transmission
  - Excluded students can be readmitted immediately after they are vaccinated
  - Students with one dose of MMR vaccination should be allowed to remain in school and are recommended to receive their second vaccine dose

Considerations for an Outbreak Dose of MMR

- October 2017 ACIP: Determined a third dose of MMR vaccine was safe and effective at preventing mumps and its complications in persons at increased risk because of an outbreak and recommended its use
- Persons previously vaccinated and who are identified as at increased risk for mumps because of an outbreak should receive a dose of a mumps-containing vaccine:
  - Second dose for persons previously vaccinated with one dose
  - Third dose for persons previously vaccinated with two doses

Groups at Increased Risk due to a Mumps Outbreak – Considerations for Public Health Officials

- Number and distribution of cases
- Intense exposure settings likely to facilitate transmission
  - Schools, universities, correctional facilities, congregate living facilities
- Site(s) of ongoing transmission and place(s) of residence during outbreak
- Intensity and duration of close contact and social networks
- ACIP recommendation for high-risk persons
- Prompt identification of cases and reducing opportunities for close-contact transmission remain key factors in outbreak control

Mumps Laboratory Specimens

- Two types of specimens should be collected from all patients with clinical features compatible with mumps:
  - Buccal or oral swab specimen for molecular testing
  - Blood specimen for serologic testing
- Buccal or oral swab specimens
  - Enhance the ability to confirm a mumps infection
  - Used to determine a mumps genotype
  - Provide additional information to aid in epidemiologic investigations
- The determination of a genotype from a buccal or oral specimen is necessary to distinguish a vaccine reaction from a wild-type infection

Mumps Laboratory Diagnostic Tests

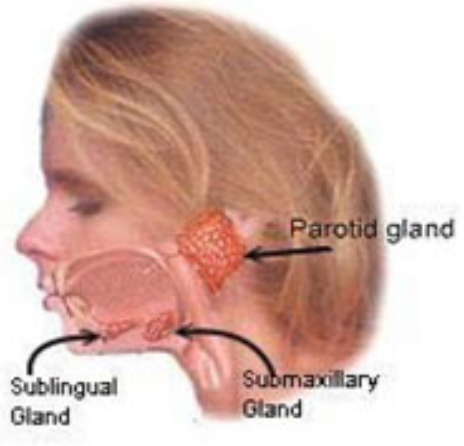
- Mumps RNA can be detected in a buccal or oral swab by either end-point or real-time reverse transcription PCR (RT-PCR)
- Mumps virus can be isolated in cell culture
- Mumps-specific IgM can be detected in serum
- Mumps-specific IgG seroconversion or a 4-fold rise in IgG titer is indicative of a mumps infection
  - Less likely to detect seroconversion or a 4-fold rise in previously vaccinated persons
- Specimens with a positive RT-PCR result are classified as confirmed while specimens that are IgM positive are classified as probable

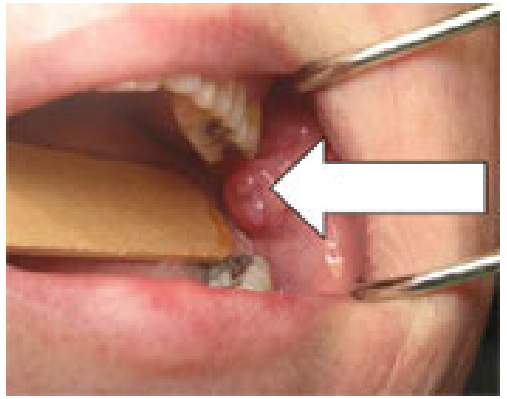
Mumps IgM Serology

- No FDA-approved IgM assay (as of November 2017)
- Enzyme immunoassays (EIAs) and immunofluorescence assays (IFAs) are commonly used and the sensitivity among these assays can vary greatly
- Capture assays provide the best sensitivity but are not commercially available (as of November 2017)
- IgM detection is improved if serum specimens are collected on or after the third day following parotitis onset
- Patients who were previously vaccinated or previously infected may not have an IgM response, or it may be transient and undetectable due to the timing of specimen collection
- Parainfluenza viruses 1, 2, and 3, Epstein-Barr virus, influenza, adenovirus, and human herpesvirus 6 can interfere with mumps serologic assays and cause false positive results

Viral Specimen Collection

- For PCR assays, successful detection of mumps virus from buccal or oral swabs is dependent on timing of collection, proper collection technique, and proper storage of the specimen
- Swabs should be collected as soon as mumps disease is suspected
- RT-PCR for mumps has the greatest diagnostic sensitivity when the specimen has been collected within 3 days of parotitis onset
- Buccal swabs yield the best viral sample, but in patients presenting with complications, it may be useful to collect urine or cerebrospinal fluid (CSF) specimens in addition to oral specimens

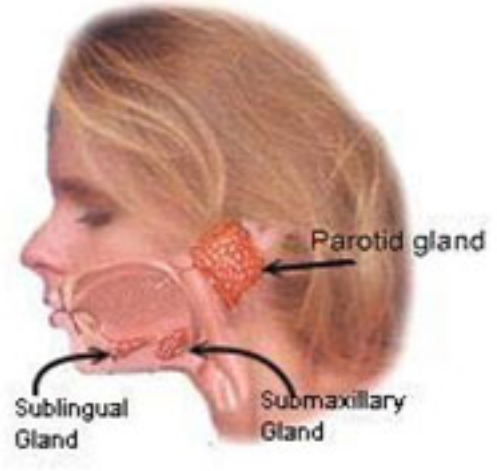


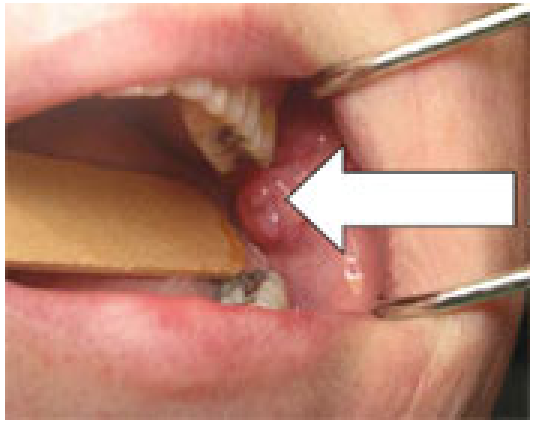


Viral Specimen Collection

Proper technique for collecting a swab:

1. Massage the parotid gland for 30 seconds
2. Swab the parotid duct and buccal cavity by sweeping the swab along the cheek and gum between the upper and lower molars





Interpreting Negative Laboratory Results

Absence of a positive laboratory result does not rule out mumps

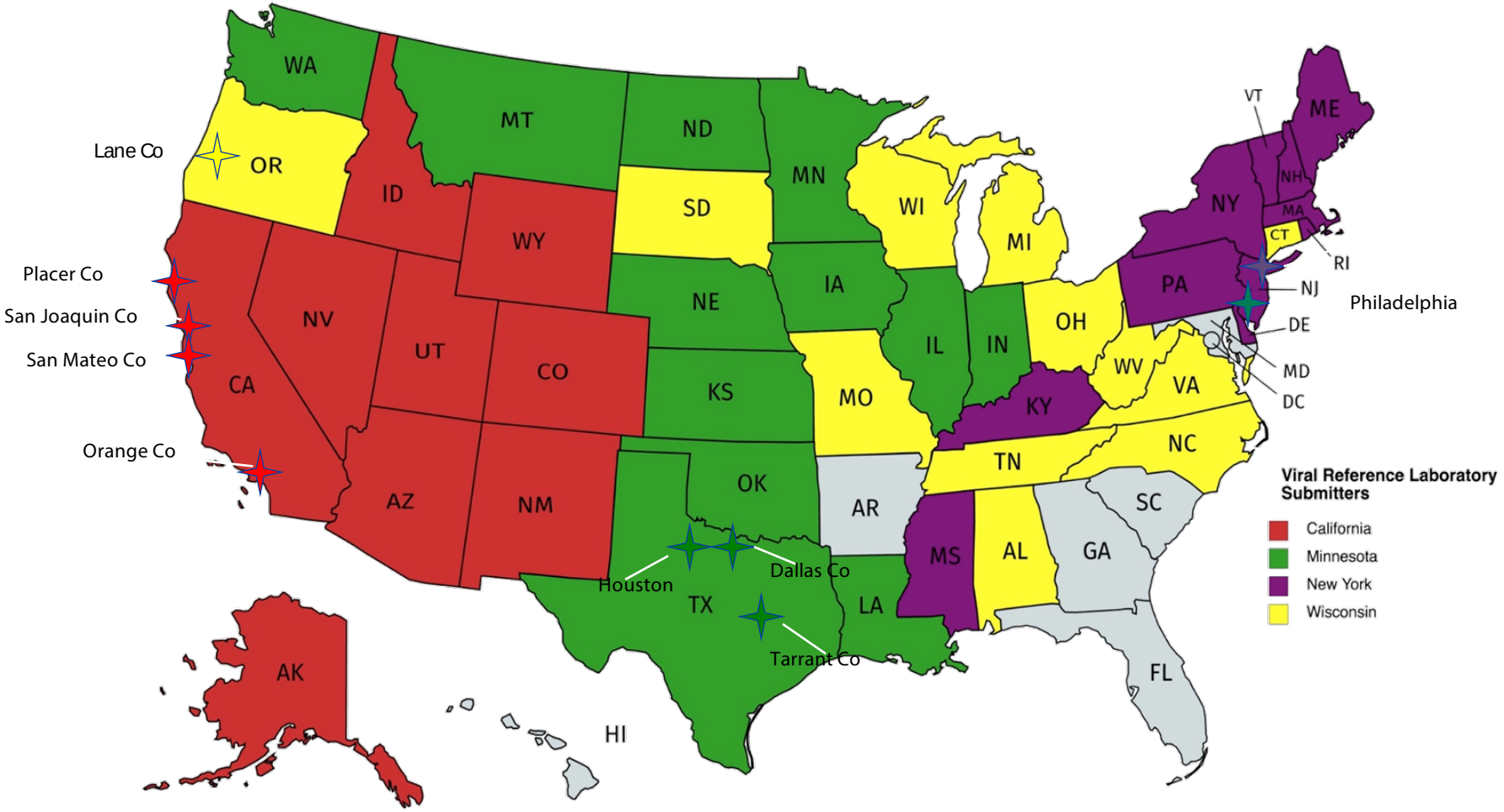
- Vaccinated individuals may shed virus for a shorter period and may shed smaller amounts of virus
- Vaccinated individuals may not have an IgM response at all or the response may be transient and not detected due to the timing of specimen collection
- In mumps outbreaks among 2-dose vaccine recipients, mumps virus RNA was detected by PCR in specimens from 30% to 71% of case patients when the specimens were collected within 3 days of parotitis onset; IgM was detected in 13% to 50% of these cases

Interpreting Laboratory Results: Sporadic Cases

- For sporadic cases of parotitis with negative laboratory results, consider testing for other etiologies for the illness such as:
  - Influenza virus
  - Epstein Barr virus
  - Adenovirus
  - Parainfluenza viruses types 1, 2, and 3
  - Bacteria (including *Staphylococcus aureus* and alpha hemolytic streptococcus)

Vaccine-Preventable Diseases Reference Centers

51 submitters representing 44 states



Sending Specimens to Reference Centers or CDC

Laboratory Guidance for Buccal Swab Specimens

- Sporadic Cases
  - Collect and test buccal swab
  - If RT-PCR positive, send to assigned reference center or CDC for genetic analysis
- Outbreaks
  - Send up to 5 buccal swabs or PCR-positive specimens per week for testing to assigned reference center or directly to CDC (batched specimens are acceptable)
  - If an additional outbreak is identified or if the outbreak spreads from the original institution or community into other settings, send up to 5 buccal swabs or PCR-positive specimens per week per outbreak to assigned reference center or CDC for genotyping
- Samples to CDC
  - Complete SF 50.34 for each sample going to CDC (available on CDC website http://www.cdc.gov/laboratory/specimen-submission/index.html)
  - Provide clinical information including date of disease onset and immunization history

Mumps Summary

- Steady increase in the number of reported cases since 2011
- Numerous large mumps outbreaks in the United States have occurred between 2011 and 2017
  - Primarily in young adults vaccinated with 2 doses of MMR vaccine
  - Settings with intense, close-contact exposures, such as college campuses

Polio & Acute Flaccid Myelitis (AFM)

Outline

- Clinical background and case definition
- Epidemiology and surveillance
- Laboratory investigation and specimen collection
- Conclusions

Acute Flaccid Myelitis (AFM)

- Rare condition that affects the nervous system, specifically the spinal cord
- Characterized by sudden onset of weakness or loss of muscle tone in one or more arms or legs
- May also present with facial droop or weakness, difficulty moving eyes, droopy eyes, difficulty swallowing, or slurred speech
- Specifically involves neurons (gray matter) of the spinal cord
- Can have many causes:
  - Viral infections (e.g., poliovirus, West Nile virus)
  - Environmental toxins
  - Genetic disorders

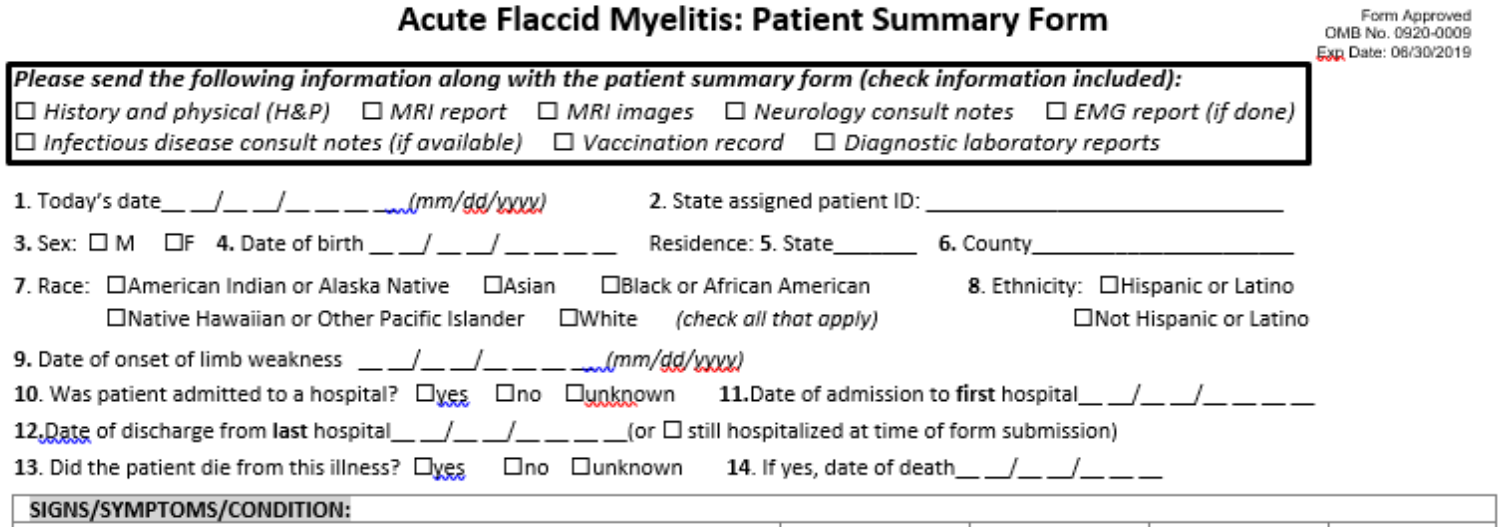
AFM Case Definitions

- Case definition modified from the initial 2014 investigation to better determine occurrence of AFM and to add sensitivity
- National standardized case definition adopted by CSTE in 2015 and updated in 2017
  - Confirmed case of AFM: a patient with acute onset of flaccid limb weakness, AND an MRI showing a spinal cord lesion largely restricted to gray matter and spanning one or more spinal segments. A normal MRI performed in the first 72 hrs of limb weakness does not rule out AFM.
  - Probable case of AFM: a patient with acute onset of flaccid limb weakness, AND cerebrospinal fluid (CSF) with pleocytosis (white blood cell count >5 cells/mm^3).

Sources:
Council of State and Territorial Epidemiologists. Standardized case definition for acute flaccid myelitis. Position Statement 15-ID-01; 2015.
http://c.ymcdn.com/sites/www.cste.org/resource/resmgr/2015PS/2015PSFinal/15-ID-01.pdf
Council of State and Territorial Epidemiologists. Revision to the standardized surveillance and case definition for acute flaccid myelitis. Position Statement 17-ID-01; 2017.
http://c.ymcdn.com/sites/www.cste.org/resource/resmgr/2017PS/2017PSFinal/17-ID-01.pdf

Report All Suspected AFM Cases to the Health Department

- Clinicians should report all suspected cases of AFM, or patients with flaccid limb weakness, to local or state health departments, who will share the information with CDC
  - Use the patient summary form (type “CDC AFM data collection form” into your search engine) and attach reports of the MRI findings and other clinical information like neurology and infectious disease consult notes
  - All case classification will be done at CDC by national experts in AFM surveillance for consistency



Acute Flaccid Myelitis: Patient Summary Form

Form Approved
OMB No. 0920-0009
Exp Date: 06/30/2019

Please send the following information along with the patient summary form (check information included):
☐ *History and physical (H&P)* ☐ *MRI report* ☐ *MRI images* ☐ *Neurology consult notes* ☐ *EMG report (if done)*
☐ *Infectious disease consult notes (if available)* ☐ *Vaccination record* ☐ *Diagnostic laboratory reports*

1. Today's date__ __/__ __/__ __ __ __ *(mm/dd/yyyy)* **2**. State assigned patient ID: _____

3. Sex: ☐ M ☐F **4**. Date of birth __ __/ __ __/ __ __ __ __ Residence: **5**. State_____ **6**. County_____

7. Race: ☐American Indian or Alaska Native ☐Asian ☐Black or African American ☐Native Hawaiian or Other Pacific Islander ☐White *(check all that apply)* **8**. Ethnicity: ☐Hispanic or Latino ☐Not Hispanic or Latino

9. Date of onset of limb weakness __ __/__ __/__ __ __ __ *(mm/dd/yyyy)*

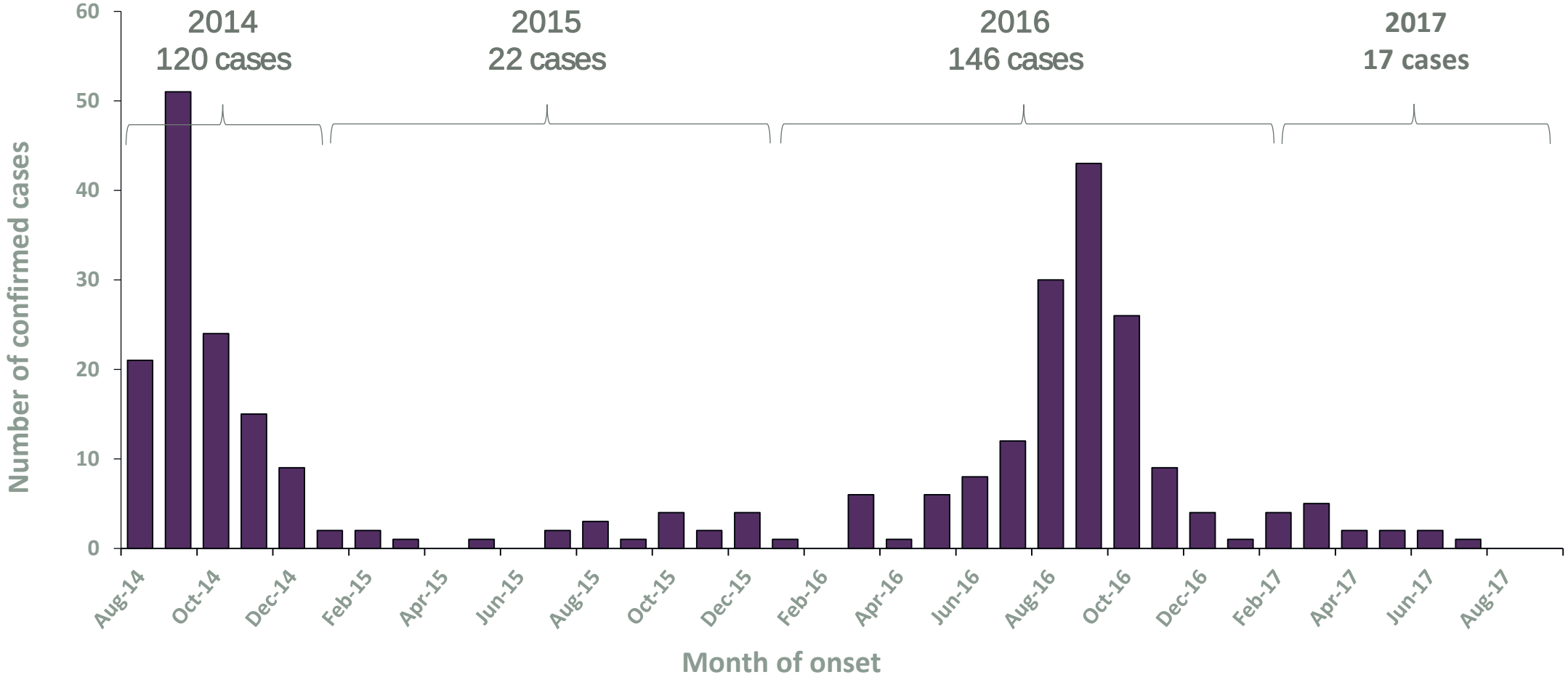
10. Was patient admitted to a hospital? ☐yes ☐no ☐unknown **11**.Date of admission to **first** hospital__ __/__ __/__ __ __ __

12.Date of discharge from **last** hospital__ __/__ __/__ __ __ __(or ☐ still hospitalized at time of form submission)

13. Did the patient die from this illness? ☐yes ☐no ☐unknown **14**. If yes, date of death__ __/__ __/__ __ __

SIGNS/SYMPTOMS/CONDITION:

Number of Confirmed U.S. AFM Cases Reported by Month of Onset, August 2014 – August 2017



Source: CDC AFM surveillance (passive surveillance); 2016 and 2017 data is preliminary (as of September 26, 2017) and subject to change

* 2 reports with missing onset, hospitalization date used as proxy.

Diagnostic Testing for AFM

- Despite testing many specimens since 2014, no consistent pathogen has been identified from patients with AFM
- CDC is expanding testing to include potential infectious and non-infectious causes, including immune-mediated mechanisms
- CDC will no longer perform diagnostic testing for enteroviruses or meta-genomic sequencing for suspected AFM cases

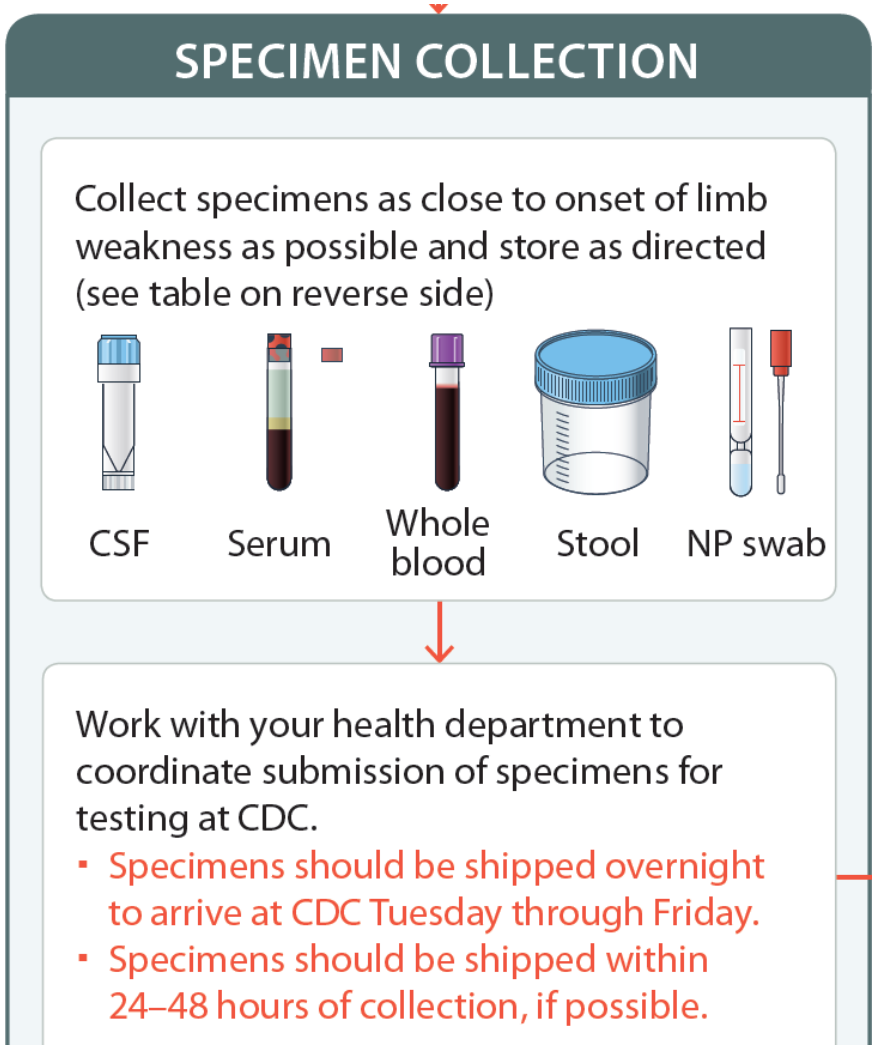
Clinician Specimen Collection

- When a suspect case of AFM is identified:
  - Clinicians should collect specimens as early in course of illness as possible for diagnosis and clinical management
  - Clinicians should work with their local or state health departments to submit additional specimens to CDC

Specimen Collection

- Serum
- CSF
- Whole blood (collected within 24 hours of CSF)
- Two stool samples, collected 24 hours apart to rule out polio

*Respiratory specimens will be accepted for genotyping ONLY if they tested positive for entero/rhinovirus at an external laboratory



Specimen Collection and Shipping

- Ship specimens within 24 hours of collection to ensure optimal results
- Detailed information on specimen collection and shipping can be found on the CDC AFM website:
  - https://www.cdc.gov/acute-flaccid-myelitis/hcp/instructions.html#table
- Clinician specific “job aid” is available on website to help with the process

AFM Summary

- No consistent pathogen detected despite hundreds of specimens tested
- No specific risk factors have yet been identified
- Suggested prevention measures to prevent polio and West Nile virus are encouraged
  - Make sure patients are up to date on polio vaccination
  - Use mosquito repellent
  - Practice good hand hygiene
- AFM, characterized by flaccid weakness and involvement of the spinal cord grey matter, remains a rare condition
- Vigilance in identification and reporting cases to the health department and CDC will improve understanding of this condition

Varicella

Varicella Vaccination Program

- Annual varicella disease burden in the U.S. before varicella vaccine licensed in 1995
  - About 4 million cases
  - >10,000 varicella-related hospitalizations
  - 100–150 deaths
- Routine varicella vaccination program
  - 2 doses recommended for children
    - Dose 1: 12–15 months of age
    - Dose 2: 4–6 years of age

Varicella Vaccination Coverage in the U.S.

- As of 2015, the one-dose coverage in children 19–35 months of age is 92%
- As of 2015, the two-dose coverage in adolescents 13–17 years of age is 83%
  - One-dose only coverage in adolescents 13–17 years of age is 12%

Varicella Surveillance in the U.S.

- 90% reductions in incidence, hospitalizations, and deaths during 1-dose varicella vaccination program (1996–2005)
- Continued reduction in varicella incidence during the 2-dose varicella vaccination era (2006–present)
  - 85% decline from end of 1-dose era to 2013–2014
  - Largest decreases in children and adolescents aged 5–14 years in the 2-dose vaccination era
- The number of varicella outbreaks, numbers and rates of hospitalizations, and deaths also continue to fall in the 2-dose era

Improving National Varicella Surveillance

- 38 states are conducting varicella case-based surveillance
- 52 jurisdictions are funded through CDC's Epidemiology and Laboratory Capacity (ELC) cooperative agreement, which provides opportunities for improving varicella surveillance

Key Variables for Varicella Case-Based Surveillance

- Age
- Disease severity
  - Number of lesions
  - Hospitalization
- Case status
  - Confirmed or probable
- Laboratory testing
- Vaccination status
  - Number of doses received
- Association with an outbreak

Varicella Outbreak Surveillance in the U.S.

- Monitor impact of 2-dose varicella vaccination program
- Varicella outbreak definition
  - 5 or more epidemiologically linked cases in one location
- Varicella cluster definition
  - 3–4 epidemiologically linked cases in one location

Varicella Case Definition

- An illness with acute onset of diffuse, generalized maculopapulovesicular rash without other apparent cause
- Breakthrough disease
  - Due to wild-type varicella-zoster virus
  - In a vaccinated person more than 42 days after vaccination
  - Occurs in about 15% persons vaccinated with 1 dose and less than 5% vaccinated with 2 doses
  - Generally mild with fewer lesions, shorter duration, and maculopapular rash with few or no vesicles

Laboratory Confirmation of Varicella

- Virologic
  - Polymerase chain reaction (PCR)
  - Direct fluorescent antibody (DFA)
  - Viral culture
- Serologic
  - Varicella IgM antibody positive
  - Seroconversion for IgG
  - Significant rise in IgG antibody

Laboratory Confirmation of Varicella

- Virologic methods are preferred
  - PCR is the best choice because it is the most sensitive and specific
  - DFA can be used if PCR is unavailable
- Vesicular fluid or scabs from skin lesions are the preferred specimens for laboratory confirmation of varicella
- Commercially available IgM tests are not reliable for diagnosis
- Serology not useful in vaccinated persons
  - IgM may not be present
  - 4-fold rise may not occur
- The CDC varicella laboratory has developed a reliable IgM capture assay and can assist with laboratory evaluation of unusual cases

Summary

- Further reductions in varicella morbidity and mortality have occurred during the 2-dose varicella vaccination program
- Reductions in number of varicella cases provide opportunities for improving varicella case-based surveillance
  - NNDSS data are primary source for monitoring impact of vaccination program
  - Monitoring surveillance indicators for varicella will help improve surveillance
  - Monitoring varicella outbreaks important for documenting impact of second-dose recommendation
- Laboratory testing for varicella increasingly important in vaccine era because of atypical presentation
  - Preferred method for diagnosis is PCR testing of vesicular fluid or scabs from skin lesions

Measles

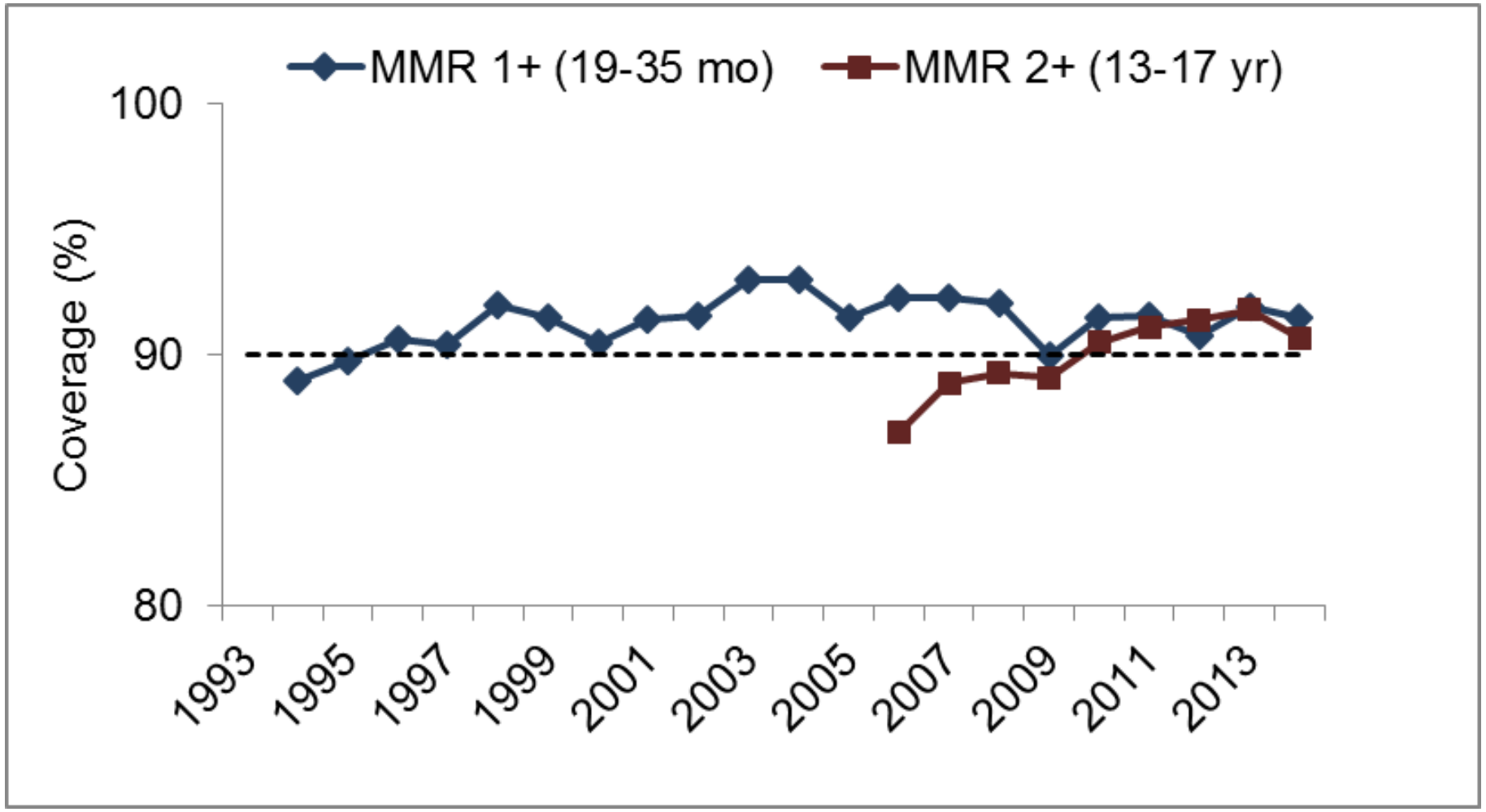
Measles in the U.S.

- In March 2000, the Pan American Health Organization (PAHO) and other experts concluded that measles was no longer endemic in the U.S.
- In 2011, PAHO and the United States verified and documented the continued elimination of measles in the U.S.
- In 2015, PAHO and the United States verified and documented the continued elimination of measles in the U.S.

Measles Case Definition

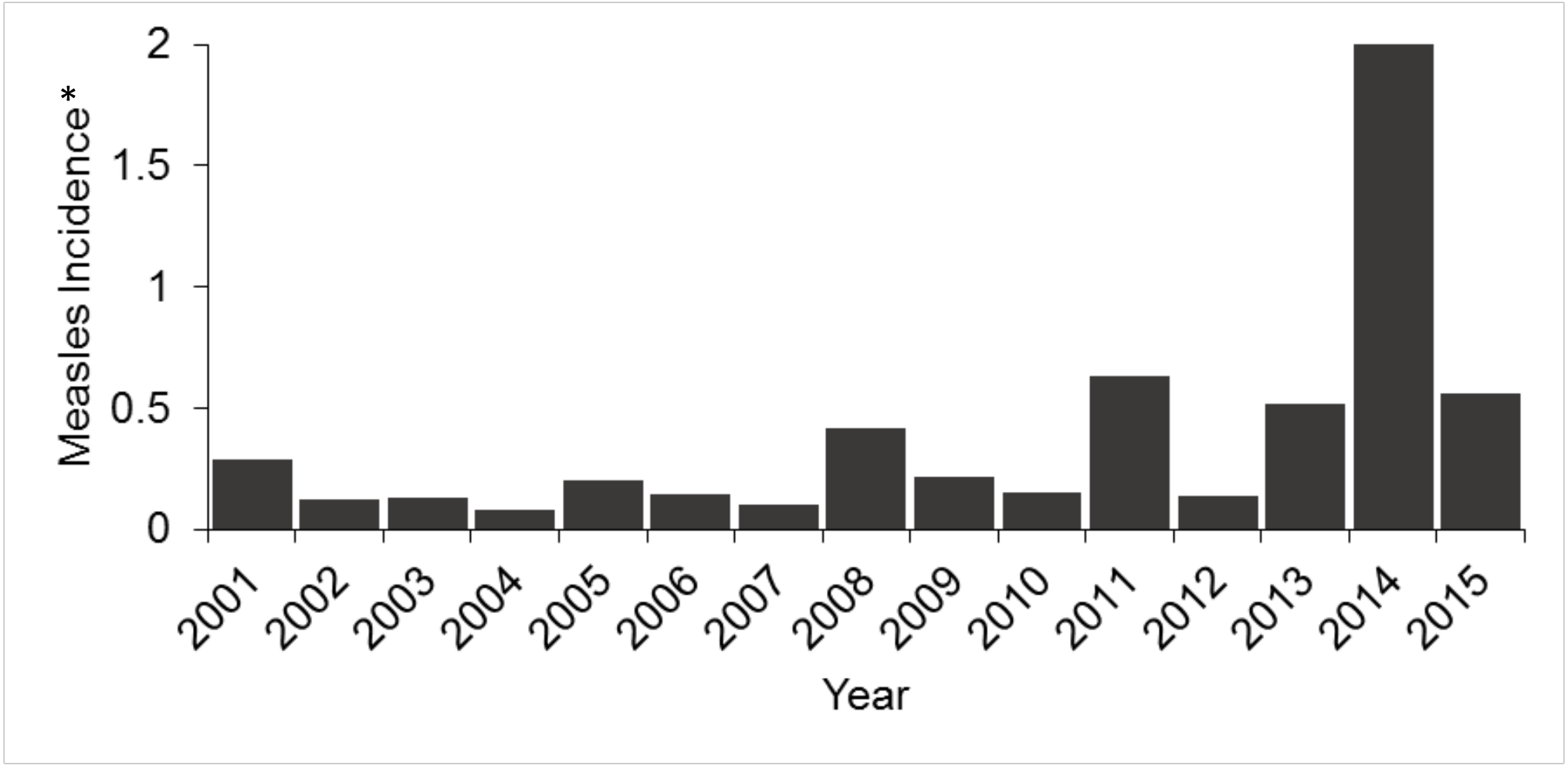
- Generalized macropapular rash for 3 days or more, and
- Temperature of 101 °F (38.3 °C) or higher, and
- Cough, or coryza, or conjunctivitis

Measles Vaccine Coverage, United States, 1993–2014



Source: National Immunization Survey

Reported Incidence of Measles by Year, United States, 2001–2015



*Rate of measles per million population

Measles Surveillance Worksheet

NAME (Last, First)			Hospital Record No.
Address (Street and No.)	City	County / Zip	Phone
Reporting Physician/Nurse/Hospital/Clinic/Lab	Address		Phone

DETACH HERE and transmit only lower portion if sent to CDC

Measles Surveillance Worksheet

County | State | Zip

Birth Date (Month Day Year) | Age (Unk = 999) | Age Type (0 = 0-120 years; 1 = 0-11 months; 2 = 0-52 weeks; 3 = 0-28 days; 9 = Age unknown) | Ethnicity (H = Hispanic; N = Not Hispanic; U = Unknown) | Race (N = Native Amer./Alaskan Native; A = Asian/Pacific Islander; B = African American; W = White; O = Other; U = Unknown) | Sex (M = Male; F = Female; U = Unknown)

Event Date (Month Day Year) | Event Type (1 = Onset Date; 2 = Diagnosis Date; 3 = Lab Test Done; 4 = Reported to County; 5 = Reported to State or MMWR Report Date; 9 = Unknown) | Outbreak Associated (Unk = 999) | Reported (Month Day Year) | Imported (1 = Indigenous; 2 = International; 3 = Out of State; 9 = Unknown) | Report Status (1 = Confirmed; 2 = Probable; 3 = Suspect; 9 = Unknown)

CLINICAL DATA

Any Rash? (Y = Yes; N = No; U = Unknown) | Rash Onset (Month Day Year) | Rash Duration (0 - 30 Days; 99 = Unknown)

Rash Generalized? (Y = Yes; N = No; U = Unknown) | Fever? (Y = Yes; N = No; U = Unknown) | If Recorded, Highest Measured Temp. (38.0 - 110.0 degrees; 999.9 Unknown)

Cough? (Y = Yes; N = No; U = Unknown) | Coryza? (Y = Yes; N = No; U = Unknown) | Conjunctivitis? (Y = Yes; N = No; U = Unknown)

COMPLICATIONS

Otitis? | Diarrhea? | Pneumonia? | Encephalitis? (Y = Yes; N = No; U = Unknown)

Thrombocytopenia? | Death? | Other Complications? (Y = Yes; N = No; U = Unknown)

Hospitalized? (Y = Yes; N = No; U = Unknown) | Days Hospitalized (0 - 888; 999 - Unknown)

If Yes, Please Specify:

LABORATORY

Was Laboratory Testing For Measles Done? (Y = Yes; N = No; U = Unknown)

Date IgM Specimen Taken (Month Day Year) | Result (P = Positive; N = Negative; I = Indeterminate; E = Pending; X = Not Done; U = Unknown)

Date IgG Acute Specimen Taken (Month Day Year) | Date IgG Convalescent Specimen Taken (Month Day Year)

Result (P = Significant Rise in IgG; N = No Significant Rise in IgG; I = Indeterminate; E = Pending; X = Not Done; U = Unknown)

Other Lab Result (P = Positive; N = Negative; I = Indeterminate; E = Pending; X = Not Done; U = Unknown)

Specify Other Lab Method:

VACCINE HISTORY

Vaccinated? (Received measles-containing vaccine?) (Y = Yes; N = No; U = Unknown)

If Not Vaccinated, What Was The Reason? (See Reason Codes Below)

Vaccination Date (Month Day Year)	Vaccine Type	Vaccine Manuf	Lot Number (See Type and Manuf. Codes Below)

Number of doses received BEFORE 1st birthday

Number of doses received ON or AFTER 1st birthday

If vaccinated BEFORE 1st birthday, but no doses given ON or AFTER 1st birthday, what was the reason?

If received one dose after 1st birthday, but never received 2nd dose after 1st birthday, what was the reason?

Reason Codes: 1 = Religious Exemption; 2 = Medical Contraindication; 3 = Philosophical Objection; 4 = Lab. Evidence of Previous Disease; 5 = MD Diagnosis of Previous Disease; 6 = Under Age For Vaccination; 7 = Parental Refusal; 8 = Other; 9 = Unknown

Vaccine Type Codes: A = MMR; B = Measles; O = Other; U = Unknown

Vaccine Manuf. Codes: M = Merck; O = Other; U = Unknown

EPIDEMIOLOGIC INFORMATION

Date First Reported to a Health Department (Month Day Year)

Date Case Investigation Started (Month Day Year)

Transmission Setting (Where did this case acquire measles?): 1 = Day Care; 2 = School; 3 = Doctor's Office; 4 = Hospital Ward; 5 = Hospital ER; 6 = Hospital Outpatient Clinic; 7 = Home; 8 = Work; 9 = Unknown; 10 = College; 11 = Military; 12 = Correctional Facility; 13 = Church; 14 = International Travel; 15 = Other

Outbreak Related? (Y = Yes; N = No; U = Unknown) | If Yes, Outbreak Name

Source of Exposure For Current Case (Enter State ID if source was an in-state case; enter Country if source was out of US; enter State if source was out-of-state)

Were Age and Setting Verified? (Is age appropriate for setting, i.e. aged 45 years and in day care, etc.) (Y = Yes; N = No; U = Unknown)

If Transmission Setting Not Among Those Listed And Known, What Was The Transmission Setting?

Epi-Linked to Another Confirmed or Probable Case? (Y = Yes; N = No; U = Unknown)

Is Case Traceable Within 2 Generations to an International Import? (Y = Yes; N = No; U = Unknown)

03 3/2010

Indicates epidemiologically important items not yet on NETSS screen

Critical Data for Measles Case Investigation

- Demographic and clinical data
- Complete immunization history
- Laboratory confirmation
- Source of infection:
  - Contact with other known cases
  - Opportunities for exposure to unknown cases

Opportunities for Exposure to Unknown Measles Cases

- Schools
- Childcare facilities
- Contact with international travelers or visitors
- Tourist locations or settings
- During air travel including at airports
- Healthcare settings

Contacts of Measles Cases

- Infectious period 4 days before to 4 days after rash onset
- Contacts without evidence of measles immunity should be vaccinated as soon as possible, ideally within 72 hours
- Unvaccinated contacts should be asked to quarantine themselves for 21 days after last exposure and monitor symptoms daily

Contacts of Measles Cases

- Immune globulin can be administered within 6 days of exposure and is indicated for:
  - Household or other close contacts without evidence of immunity, particularly:
    - Contacts younger than 1 year of age
    - Pregnant women
    - Immunocompromised persons

Rotavirus

Rotavirus

- Incubation period of 1–3 days
- Vomiting often precedes the onset of diarrhea
- Severe, dehydrating infection occurs primarily among children 3–35 months of age
- Gastrointestinal symptoms generally resolve in 3–7 days

Rotavirus

- Shed in high concentrations in the stool
- Transmitted primarily by the fecal-oral route
- Highly communicable

Rotavirus Vaccine in the U.S.

- Live, oral, human-bovine reassortant rotavirus vaccine
  - RV5 (RotaTeq) licensed in the U.S. in 2006
  - Recommended for routine vaccination of infants at 2, 4, and 6 months of age
- Live, oral, attenuated monovalent rotavirus vaccine
  - RV1 (Rotarix) licensed in the U.S. in 2008
  - Recommended for routine vaccination of infants at 2 and 4 months of age

Rotavirus Surveillance in the U.S.

- Surveillance is needed to:
  - Monitor the impact of vaccination
  - Evaluate vaccine effectiveness in field use
  - Identify and determine the causes of vaccine failure
  - Monitor possibly emerging strains
  - Identify groups in which vaccination coverage may be inadequate
  - Monitor the safety of rotavirus vaccines
- Surveillance at national level should focus on:
  - Monitoring trends of severe rotavirus disease
  - Viral strain surveillance

Rotavirus Surveillance in the U.S.

- New Vaccine Surveillance Network (NVSN)
  - Conduct active, population-based surveillance for rotavirus-associated medical encounters among children
  - 7 medical centers in Tennessee, New York, Ohio, Texas, Missouri, Washington State, and Pennsylvania
  - Identification and investigation of acute gastroenteritis cases
  - Analyses to estimate disease burden, vaccine impacts, and vaccine effectiveness

Rotavirus Surveillance in the U.S.

- Laboratory-based sentinel surveillance systems
  - National Respiratory and Enteric Virus Surveillance System
  - National Rotavirus Strain Surveillance System
- National health utilization datasets

Documentation of Rotavirus Vaccine Impact

- Decreases in rates for acute, all-cause gastroenteritis hospitalization for children <5 years of age
- Decreases in rotavirus-coded hospitalization for children <5 years of age
- Decreases in rotavirus gastroenteritis emergency department visits
- Lower rate of rotavirus- or unspecified-gastroenteritis hospitalization among household members having a vaccinated child
- Biennial disease pattern observed following rotavirus vaccine introduction
- Rotavirus case investigations are usually not warranted, however, outbreaks among childcare or school settings could indicate vaccine coverage gaps and possible waning immunity
- Surveillance will continue to adapt to new epidemiologic and surveillance trends

Surveillance Needs in the Context of a Control Program

Vaccine-Preventable Diseases

- Due to effective immunization programs, diseases that were once major causes of death and morbidity among children in the United States have decreased in frequency.
- A remaining challenge is to identify factors that allow remaining cases of vaccine-preventable diseases to occur.
- It is important to extend the success of eliminating endemic measles, rubella, and polio to other vaccine-preventable diseases.

Disease Reporting and Case Notification

- Reporting requirements for diseases and conditions of public health concern
  - Mandated by state laws or regulations
  - Differ by state
  - Rely on healthcare providers, laboratories and other public health personnel to report the occurrence of disease and conditions
- Council of State and Territorial Epidemiologists (CSTE)
- National Notifiable Diseases Surveillance System (NNDSS)

Public Health Uses of Surveillance Data: Local Level

- Disease control activities
  - Prophylaxis
  - Vaccination
- Standardized case definitions

Manual for the Surveillance of Vaccine-Preventable Diseases

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Search The CDC
VPD Surveillance Manual

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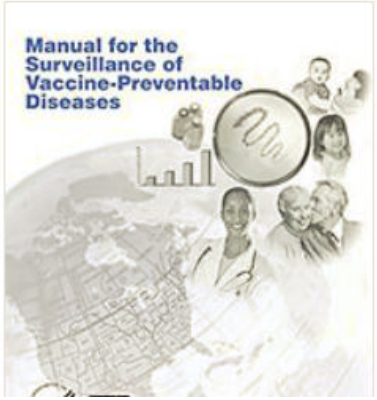
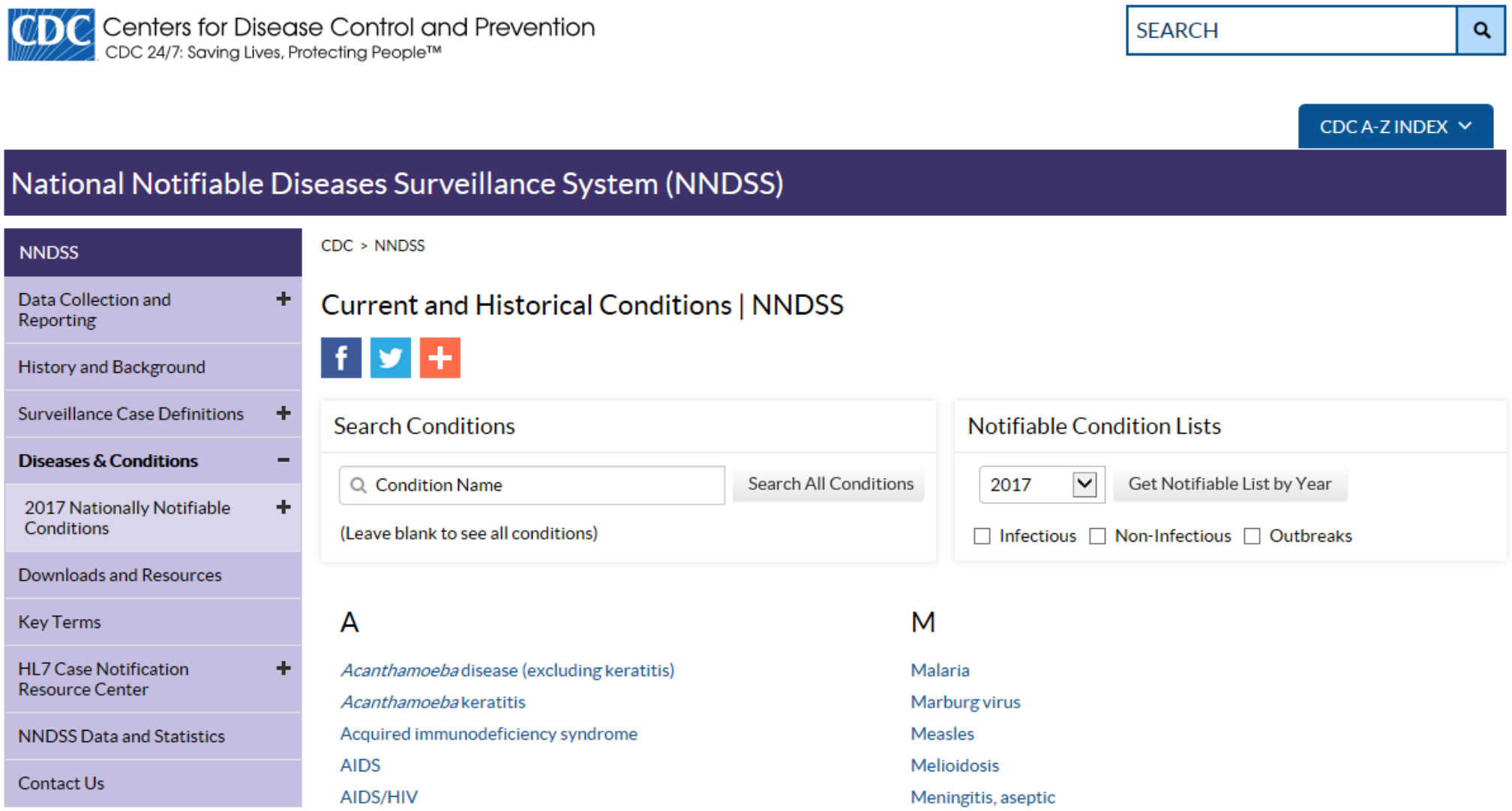
Manual for the Surveillance of Vaccine-Preventable Diseases



The **Manual for the Surveillance of Vaccine-Preventable Diseases** provides current guidelines for those directly involved in surveillance of vaccine-preventable diseases (VPD), especially personnel at the local health departments. For each of the vaccine-preventable diseases, this manual includes a chapter describing the importance of rapid case identification; the importance of surveillance; disease reduction goals; case definitions (including clinical description and case classifications); epidemiologically important data to be collected during case investigation; activities for enhancing surveillance; activities for case investigation; and activities for outbreak control. Other

www.cdc.gov/vaccines/pubs/surv-manual/index.html

Case Definitions for Public Health Surveillance

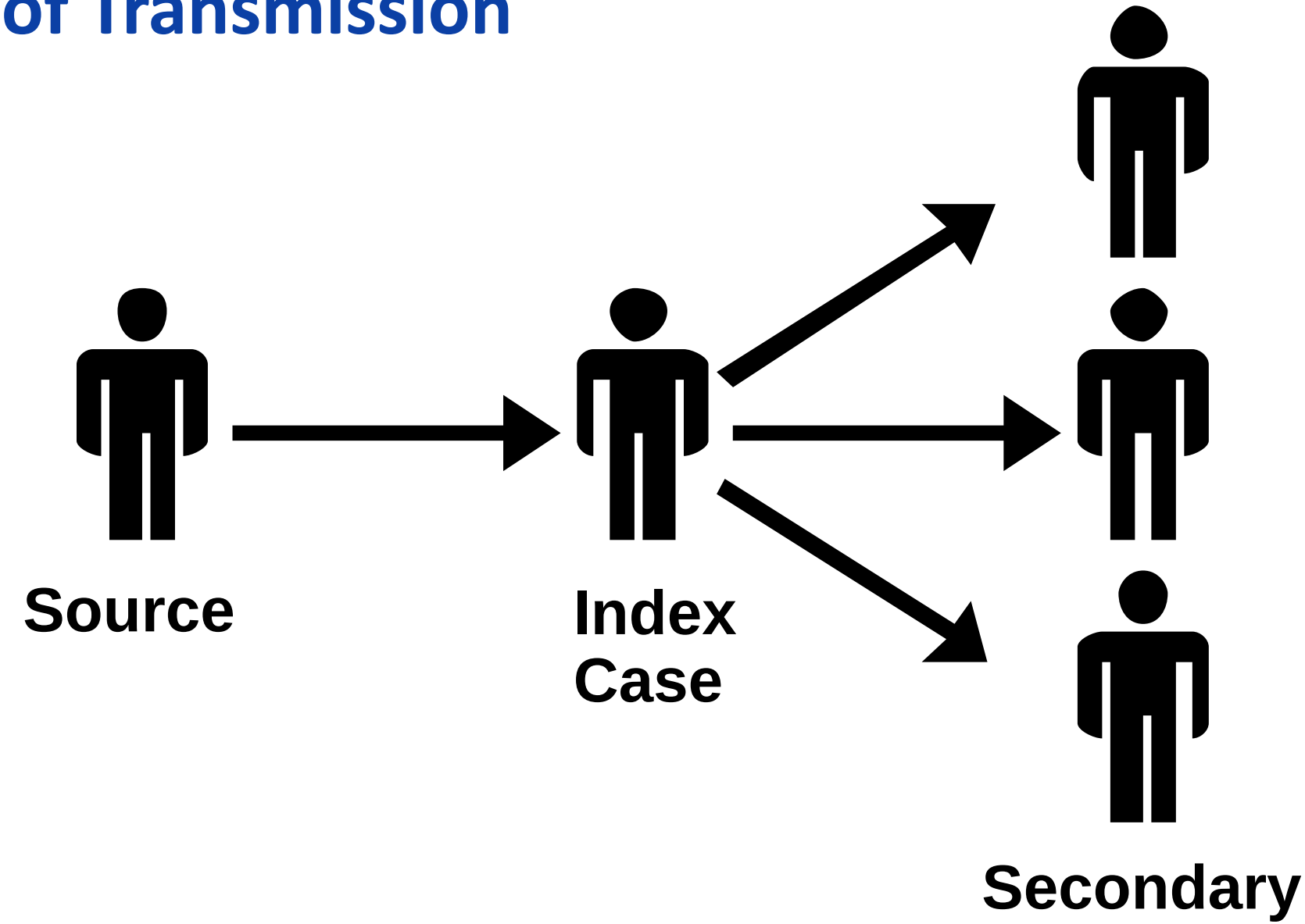


wwwn.cdc.gov/nndss/conditions/

Critical Data Elements

- Demographic data
- Clinical data
- Vaccination history
- Laboratory test results

Chain of Transmission



Public Health Uses of Surveillance Data: State Level

- Evaluate the effectiveness of disease control programs
- Formulate and evaluate immunization policy

Disease in the Vaccine Era

- Warning to public health officials
  - Other susceptible individuals who should have been vaccinated
  - Waning immunity in vaccinated individual
- Public health officials need to ask:
  - Was the person vaccinated? (And if not, why not?)
  - Were there missed opportunities to vaccinate?
  - Is there a more widespread problem?

Uses of Surveillance Data: National Level

- Formulate national immunization policy
- Evaluate the effectiveness of immunization programs
- Evaluate the effectiveness of vaccines
- Document the impact of national immunization efforts

Surveillance Requirements

- Depends on stage of the disease control program
  - Early program needs when there are many cases vs. late program needs when there are only a few cases left
- Regardless of stage of disease control, need to ensure adequate surveillance for vaccine adverse events for any vaccine currently in use

Surveillance Requirements: Before Vaccine Availability

- Baseline of reported disease
- Complete reporting is not essential
- Year-to-year consistency
- Aggregate reporting

Surveillance Requirements: Disease Control

- Enhanced surveillance
  - Document vaccine impact
  - Evaluate effectiveness
  - Monitor progress toward disease elimination
- Detailed information from individual case investigations
  - Vaccination status
  - Laboratory confirmation
- Highly specific case definitions

Enhanced Surveillance: Extremely Low Incidence

- Importance of data quality and completeness
- Organism may no longer be circulating
  - Molecular typing methods can help document this

Summary

- Surveillance activities must be designed to fit the public health need
- Baseline data needed for diseases for which a new vaccine is available
- Detailed, individual case investigations for disease with a higher level of control through vaccination programs

Resources

- VPD Surveillance Manual
  - Guidelines for those directly involved in the surveillance of VPDs
  - Includes chapters for each VPD, surveillance indicators and data analyses, laboratory support for surveillance, and appendices with disease-specific worksheets and instructions
  - Available on the CDC website: www.cdc.gov/vaccines/pubs/surv-manual/index.html
- VPD Reference Centers
  - Four public health laboratories that work with APHL (aphl.org) and CDC to provide quality testing to other public health jurisdictions free of charge
  - Provide testing for measles, mumps, rubella, varicella-zoster, *B. pertussis, S. pneumoniae, N. meningiditis,* and *H. influenzae*
- National Notifiable Disease Surveillance System
  - Public health case definitions for all infectious conditions under national public health surveillance: wwwn.cdc.gov/nndss/conditions/

Resources

- Collecting a buccal swab for mumps (video)
  - www.cdc.gov/vaccines/ed/surv/index.html
- Investigation and control of mumps outbreaks on college campuses: Indiana, 2016
  - www.cdc.gov/vaccines/ed/surv/index.html
- SF 50.34 (CDC Specimen Submission Form)
  - www.cdc.gov/laboratory/specimen-submission/index.html
- Specimen collection and shipping information for AFM
  - www.cdc.gov/acute-flaccid-myelitis/hcp/instructions.html#table
- CDC Varicella Laboratory
  - www.cdc.gov/chickenpox/lab-testing/cdc-vzv-lab.html

Questions?

Nakia Clemmons, MPH – xjb4@cdc.gov
Rebecca McNall, PhD – dqo2@cdc.gov
Adriana Lopez, MHS – ail7@cdc.gov
Jessica Leung, MPH – ctf2@cdc.gov
Manisha Patel, MD, MS – dvn4@cdc.gov
Daniel Payne, MSPH, PhD – dvp6@cdc.gov
Sandy Roush, MT, MPH – swr1@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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Thank you!