Dolor, Rubor, et Calor: Vaccine-Preventable Disease Surveillance & Investigation




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WEST VIRGINIA Department of Health & Human Resources
BUREAU FOR PUBLIC HEALTH

Objectives

1. Describe the reporting process and requirements for reportable infectious diseases in West Virginia.

2. Emphasize the significance of complete and prompt disease investigation and response.

3. Discuss the role of public health in disease management and outbreak response.

4. Review the steps of case investigation using a case-based scenario.

Public Health Surveillance
and
Disease Investigation

What is Surveillance?

- Public health surveillance is “the ongoing, systematic collection, analysis, and interpretation of health-related data essential to planning, implementation, and evaluation of public health practice.” [1]

- Goal – Provide information that can be used for public health action.

- One potential source of surveillance data is from **disease investigations**.

- Drivers of infectious disease surveillance – W. Va. Code (including the Reportable Disease Rule), grant requirements, and professional/ethical obligations

[1] https://www.cdc.gov/training/publichealth101/surveillance.html

Goals of Disease Surveillance and Investigation

- Identify patients and their contacts for treatment and intervention
- Guide immediate action for cases of public health importance
- Estimate disease status and population behavior
- Determine disease trends
- Detect epidemics, health problems, and changes in health behaviors
- Guide the planning, implementation, and evaluation of programs to prevent and control disease
- Prioritize the allocation of health resources

Responsibilities of Local Health

Local Health Department (LHD) roles related to disease surveillance and investigation:

- Annually **notify reporting sources** of reporting requirements
  - Healthcare providers (HCP), facilities, and labs
  - Provide education to reporting sources that fail to comply

- **Investigate** cases, **identify contacts**, look for undetected and unreported cases, and implement prevention and control methods

- Report any disease or condition listed in the reportable disease rule to the Bureau **within the time frame** specified in each category

Timeliness of Response to LHD

IMMEDIATE NOTIFICATION

- Outbreaks or clusters
- Novel pathogens
- Rubella (German Measles)
- Rubeola (Measles)

WITHIN 24 HOURS

- Diphtheria
- *Haemophilus influenzae*, invasive
- Meningococcal infection, invasive
- Mumps
- Pertussis
- Emerging pathogens

WITHIN 72 HOURS

- Coronavirus Disease 2019 (COVID-19)

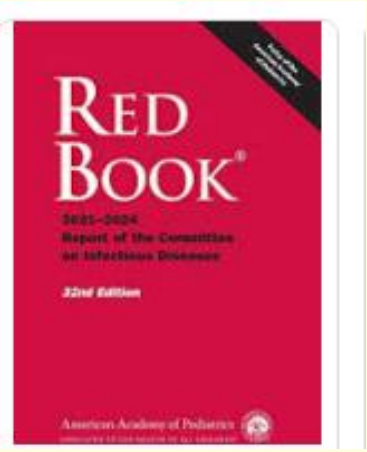
WITHIN 1 WEEK

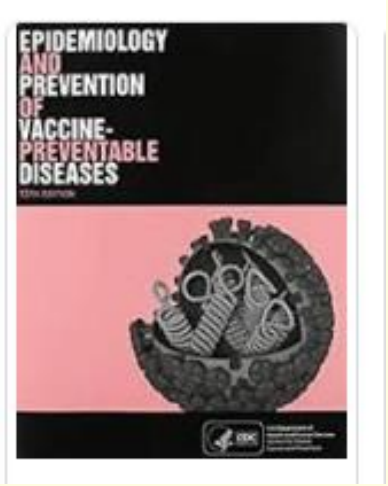
- Acute Flaccid Myelitis (AFM) – investigate ASAP
- Varicella – aggregate
- *Streptococcus pneumoniae*, invasive
- Toxic shock syndrome

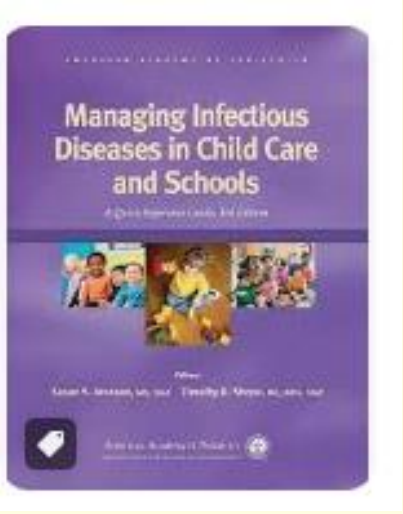
oeps.wv.gov/reporting/documents/hcp/provider-color-chart.pdf

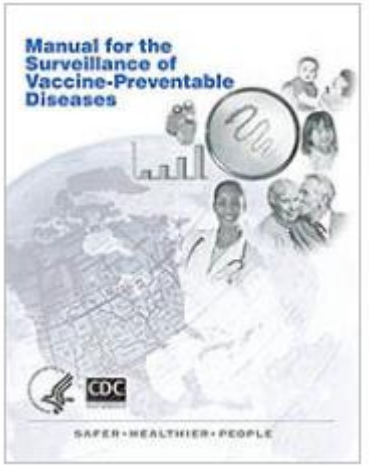
Case Investigation Resources

- West Virginia Department of Health and Human Resources (DHHR), Division of Infectious Disease Epidemiology (DIDE) **Epi on-call**
- DHHR's Office of Epidemiology and Prevention Services DIDE website
- Disease protocols
- Pink Book
- Red Book
- Purple Book
- Centers for Disease Control and Prevention (CDC) website









Best Practices: Surveillance and Investigation

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1. Utilize Disease Protocol

- **Ascertain case** – review clinical presentation, lab results
  - Measles: PCR, IgM, IgG acute and convalescent titer
  - Mumps: PCR or culture only
  - Was specimen collected from appropriate source?

GOAL: Detect cases and determine trends using standardized criteria.

- **Determine communicability**
  - Onset of infectious period, identify exposed

GOAL: Guide immediate action to protect the public; prioritize resources.

- **Collect information about case** – exposure, strain, case vaccination, etc.
  - Travel, other risk factors
  - Strain – *H. flu, N. meningitidis, S. pneumo.*

GOAL: Guide immediate action to protect the public, prioritize resources, identify behavior and social factors that impact public health.

Best Practices: Surveillance and Investigation (cont'd)

- **Identify Contacts**
  - Type of exposure – close contact, household, and healthcare worker

  GOAL: Guide immediate action to protect the public, prioritize resources, identify behavior and social factors that impact public health.

- **Testing** – specimen collection, susceptibility testing
  - Which specimens to collect and from what source?
  - Do you have the necessary collection kits, shipping process, timing of shipment to DHHR's Office of Laboratory Services (OLS)?
  - Additional testing needed – antiobiotic susceptibility, molecular testing to identify strain

  GOAL: Ascertain case, guide planning, implementation, and disease control (e.g., guide treatment using susceptibility testing, molecular characterization can influence vaccine development and determine vaccine target population, etc.).

Best Practices: Surveillance & Investigation (cont'd)

2. Provide guidance to caller

- **Infection Prevention and Control Measures** – document in the West Virginia Electronic Disease Surveillance System (WVEDSS)
  - Who needs isolation or quarantine?
  - Case treatment and prophylaxis started on time?
  - Contacts on appropriate treatment?
  - Precautions to implement – airborne vs. contact vs. standard.
  - Materials to implement precautions – masks, gown, etc.
- When is **case not infectious**? – see protocol
- **Guidance to public, HCP** – see OEPS page for sample letters

GOAL: Immediate action, prevent disease spread, prioritize resources, mitigate misinformation.

3. Notify DIDE on-call

- For **IMMEDIATE** and **24-HOUR** Reportable Conditions
- What was **advised** to caller?

GOAL: Coordinate facility, local, state (and federal) response, notify agency authorities, and request state assistance.

Best Practices: Surveillance and Investigation (cont'd)

4. Report in WVEDSS

- **Complete the information**, document response in WVEDSS *Public Health Action*
- Documented information **is correct and consistent**
  - If there is documentation of antimicrobial susceptibility, make sure it is reflected correctly on the report
  - Make sure vaccine information is complete
- **LHD** – Two weeks to complete investigation
- **Regional Epi** – One week to **complete investigation** then submit to State Review
  - Assist LHD with investigation
  - Document activities in WVEDSS
  - Document if patient/contact is lost to follow-up
- **Varicella** – collect from schools, report weekly aggregate case data in WVEDSS

GOAL: Correctly estimate disease status, determine disease trend, guide planning and evaluation to control disease spread, and resource allocation.

Best Practices: Surveillance and Investigation (cont'd)

5. Report Deaths as Cases to LHD

- **Influenza** – under 18 years old
- **RSV** – 5 years old and younger
- **Varicella** – all deaths

GOAL: Determine human factors and health practices, determine trend, etc.

6. Recruit Sentinel Providers

- For more information, contact the Influenza Epidemiologist

GOAL: Contribute to United States data, determine trend, resource allocation.

Case Investigation Scenario

The Call…

On Friday at 3:45 p.m., the infection preventionist (IP) from the local hospital calls the LHD to report that a 7-month-old girl was brought to the emergency room (ER) because of high fever, cough, and difficult to console. The infant has been sick for two days. The family just returned from India 10 days ago following a 2-week visit.

During the interview, the physician noted a dark pink rash on the girl's face. The doctor suspects measles.

What Should You Do?

A. Go home and deal with it on Monday.

B. Tell the IP that measles are a thing of the past and it's probably nothing to worry about.

C. Wait for lab confirmation since you really don't have anything to go on other than the physician's suspicions.

D. Immediately notify the regional epi and the DIDE Epi on call.

IMMEDIATE Notification

- Outbreaks
- Novel pathogens
- Rubella (German Measles)
- Rubeola (Measles)

Can This Really Be Measles?

Measles declared eliminated in the United States in 2000

- Last case in West Virginia in 2009
- Does not imply zero incidence
- Maintenance of elimination due to
  - Highly effective vaccine
  - Strong public health response to each case

Epidemiology of measles during elimination characterized by:

- Travelers who get measles abroad and bring it to the United States
- Further spread of measles in communities with pockets of unvaccinated people in the United States

What's next?

- COVID-19 pandemic has increased the risk of measles outbreaks
- Decline in childhood vaccinations due to healthcare disruptions during pandemic
- Increase in international travel after the pandemic
- Dramatic increase in the number of measles outbreaks worldwide

emergency.cdc.gov/coca/ppt/2019/slides_052119_Measles.pdf
www.cdc.gov/measles/cases-outbreaks.html

In the News

Washington Post
https://www.washingtonpost.com › health › 2019/04/29

U.S. officials say measles cases hit 25-year record high

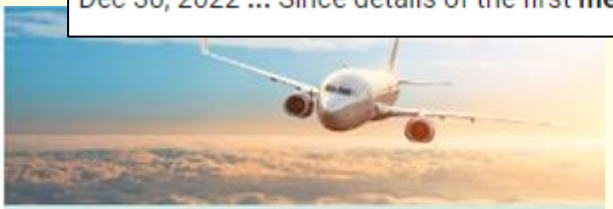
Apr 29, 2019 — **More** than 500 of the 704 people sickened in 22 states were not vaccinated. ... At least 704 people in the United States have been sickened this ...

The Kentucky Department for Public Health identified a confirmed case of measles in an unvaccinated individual with a history of recent international travel. While infectious, the individual attended a large religious gathering on February 17–18, 2023, at Asbury University in Wilmore, Kentucky. Mar 9, 2023

Measles Outbreak in Ohio Infects 82 Kids, Most of Them Unvaccinated

https://www.usnews.com/news/health-news/articles/2022-12-30/measles-outbreak-in-ohio-inf

Dec 30, 2022 ... Since details of the first **measles** cases were announced last month by Columbu



Did you know that measles can be found around the world?

Global Measles Outbreaks

GOATS AND SODA

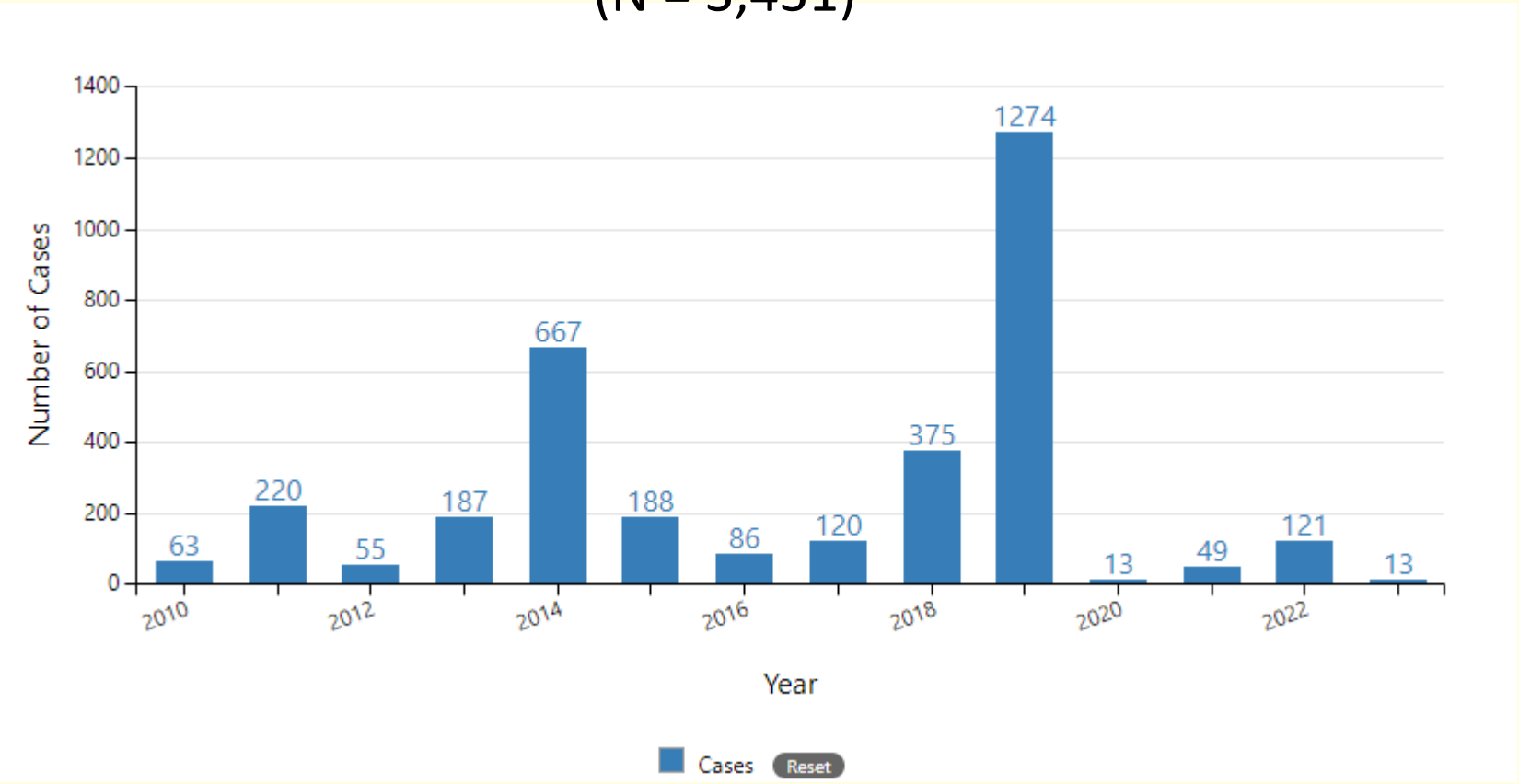
Why millions of kids aren't getting their routine vaccinations

by Rhitu Chatterjee

April 19, 2023 • ...already seeing rising cases of the infectious diseases that these childhood vaccines protect against. "We're seeing a pretty unprecedented number of measles outbreaks," says O'Brien. Last year, 33 countries reported "large or disruptive cases of measles," he says. "That's compared to 22 countries in the previous year." And the total number of measles cases doubled from 2021 to 2022, says Keeley, with major outbreaks in India, Somalia, Nigeria, Afghanistan and Ethiopia. Measles...

Measles Cases

Number of Measles Cases Reported by Year, United States, 2010-2023* (N = 3,431)

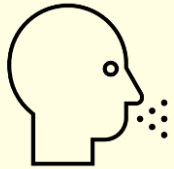


*As of June 5, 2023

www.cdc.gov/measles/cases-outbreaks.html

Measles

Rubeola (Measles)

- Acute, febrile rash illness caused by the measles virus
- Transmission
  - Lives in nose and throat of infected people 
  - Spreads through direct contact with large respiratory droplets **and**
  - Airborne spread
    - The virus can live for up to 2 hours in an airspace after infected person leaves an area.
- Highly communicable
  - R_0 = 12 to 16
  - Person infectious from 4 days before to 4 days after rash onset

www.cdc.gov/vaccines/pubs/pinkbook/meas.html
www.cdc.gov/measles/transmission.html

Clinical Features

Incubation period: ~8-12 days to start of prodrome

Prodrome

- Fever as high as 104°
- "The 3 C's": cough, coryza (runny nose), and conjunctivitis (red, watery eyes)
- Koplik spots – tiny white spots on mucus membranes 2-3 days after symptoms begin

Rash begins ~14 days after exposure and 2-6 days after initial symptoms

- Rash onset date is "day 0"
- Macupapular rash that begins at hairline and spreads downward to the neck, trunk, arms, legs, and feet

www.cdc.gov/measles/symptoms/signs-symptoms.html

Complications

Complications include:

- Otitis media
- Pneumonia
- Acute encephalitis
- Seizures, neurological
- Death
- Subacute sclerosing panencephalitis
- Pregnant women – premature labor, spontaneous abortion

High-risk for severe illness and complications:

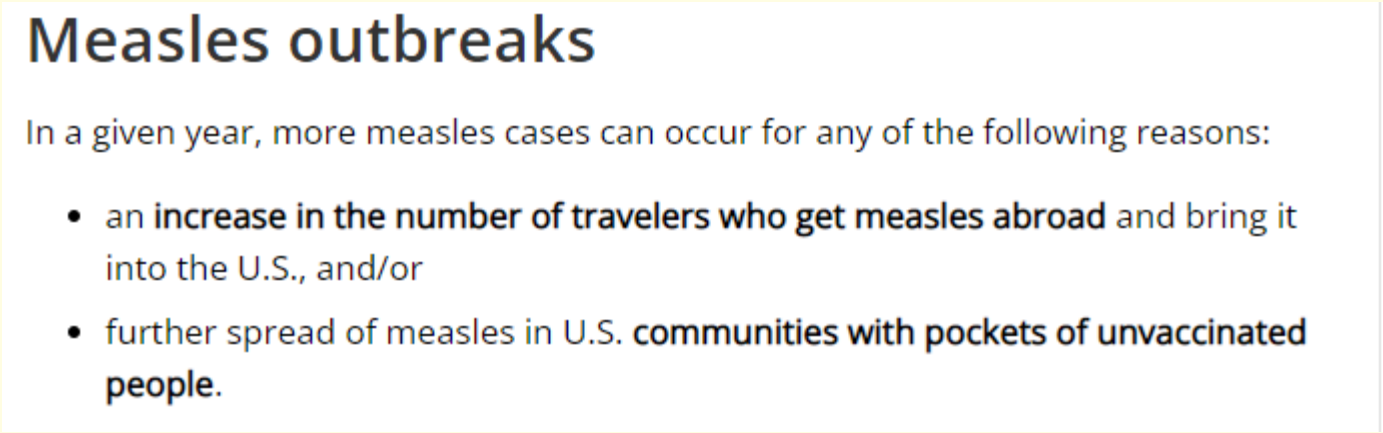
- Infants and children younger than 5 years old
- Adults 20 years and older
- Pregnant women
- People with compromised immune systems, such as from leukemia and HIV infection

www.cdc.gov/measles/index.html

Risk Factors

Risk factors increasing the likelihood of measles diagnosis:

- Born after 1957 and has not been vaccinated against measles
  - Born before 1957 = presumptive evidence of immunity
- International travel in the 21 days prior to rash onset
- Is living or visiting a community where there is a measles outbreak



Measles outbreaks

In a given year, more measles cases can occur for any of the following reasons:

- an **increase in the number of travelers who get measles abroad** and bring it into the U.S., and/or
- further spread of measles in U.S. **communities with pockets of unvaccinated people**.

www.cdc.gov/measles/cases-outbreaks.html

Back to the Scenario

On Friday at 3:45 p.m., the IP from the local hospital calls the LHD to report that a 7-month-old girl was brought to the ER because of high fever, cough, and being difficult to console. The infant has been sick for two days. The family just **returned from India 10 days ago** following a 2-week visit.

During the interview, the physician noted a dark pink rash on the girl's face. The doctor suspects measles.

Given the information we just reviewed, would you initiate an investigation? If so, why?

Yes, one case, or suspect case, of measles is an outbreak and should be investigated.

Initial Steps

What immediate steps should be taken?

1. Ensure the patient is:
    - Wearing a mask (if able)
    - Placed on airborne and standard precautions in an airborne infection isolation room (preferred) or in a room with the door closed
    - Cared for by HCP with evidence of measles immunity
    - Kept in isolation until four days after rash onset – infectious four days before/after rash onset

2. Call the DIDE Epi on-call to report the case and for further guidance

3. Reference the measles protocol

4. Obtain the clinical information using the measles report form

Case Report Form Clinical Information

WEST VIRGINIA Department of Health & Human Resources BUREAU FOR PUBLIC HEALTH

Measles (Rubeola)

PATIENT DEMOGRAPHICS

Reporter Name: _____ Address: _____ Phone: _____

***CLINICAL**

Physician Name: _____ Physician Facility : _____

Physician Address: _____ Phone: _____

Hospital *Was patient hospitalized for this illness? ☐ Y ☐ N ☐ U

If yes: Hospital name: _____ Admit date: _/_/_____ Discharge date: _/_/_____

Condition Diagnosis date: __/__/_____ * Illness onset date: __/__/_____ Illness end date: _/_/_____

Y N U

☐ ☐ ☐ Did the patient have a rash? If yes: Rash onset date: / /_____ Rash duration (in days) _____

Was the rash generalized? ☐ Y ☐ N ☐ U

☐ ☐ ☐ Did the patient have a fever? If yes: Fever onset date: __/__/_____ Highest measured temperature_____° ☐ Celsius ☐ Fahrenheit

Symptoms

Did the patient have any of the following:

Y	N	U	
☐	☐	☐	Cough
☐	☐	☐	Coryza (runny nose)
☐	☐	☐	Conjunctivitis

Complications

Y	N	U		Y	N	U	
☐	☐	☐	Croup	☐	☐	☐	Encephalitis
☐	☐	☐	Otitis media	☐	☐	☐	Thrombocytopenia
☐	☐	☐	Diarrhea	☐	☐	☐	Other (specify): _____
☐	☐	☐	Pneumonia				_____

☐ ☐ ☐ Did the patient develop hepatitis?

☐ ☐ ☐ Did the patient die from measles or complications (including secondary infection) associated with measles?

If yes, date of death: _/_/_____

Next Steps

What are the next steps?

5. Continue to collect information and ascertain case using the WVEDSS measles case report form

6. Coordinate with DIDE to provide PCR testing via DHHR's OLS

Measles Testing

	PCR – preferred test	Serology
Detects	measles virus RNA	IgM, IgG
Collection method	NP or throat swab & Urine	Venipuncture
When to collect	NP/throat swab – ASAP after rash onset	At the same time as the NP swab IgM - detectable 1-4 days after rash onset IgG - detectable 7-10 days after rash onset ▪ Paired serum samples to detect significant rise in IgG
	Urine – additional opportunity to isolate virus after day 5 of rash onset	
Testing available through	OLS	Reference labs

Next Steps (cont'd)

Important details to know…

Where did the case-patient obtain measles?

7. Assess potential exposure during incubation period - ~21 days before prodrome/rash onset
   - Travel history or contact with someone who recently traveled
   - Contact with known measles case
   - Other activities and dates of attendance

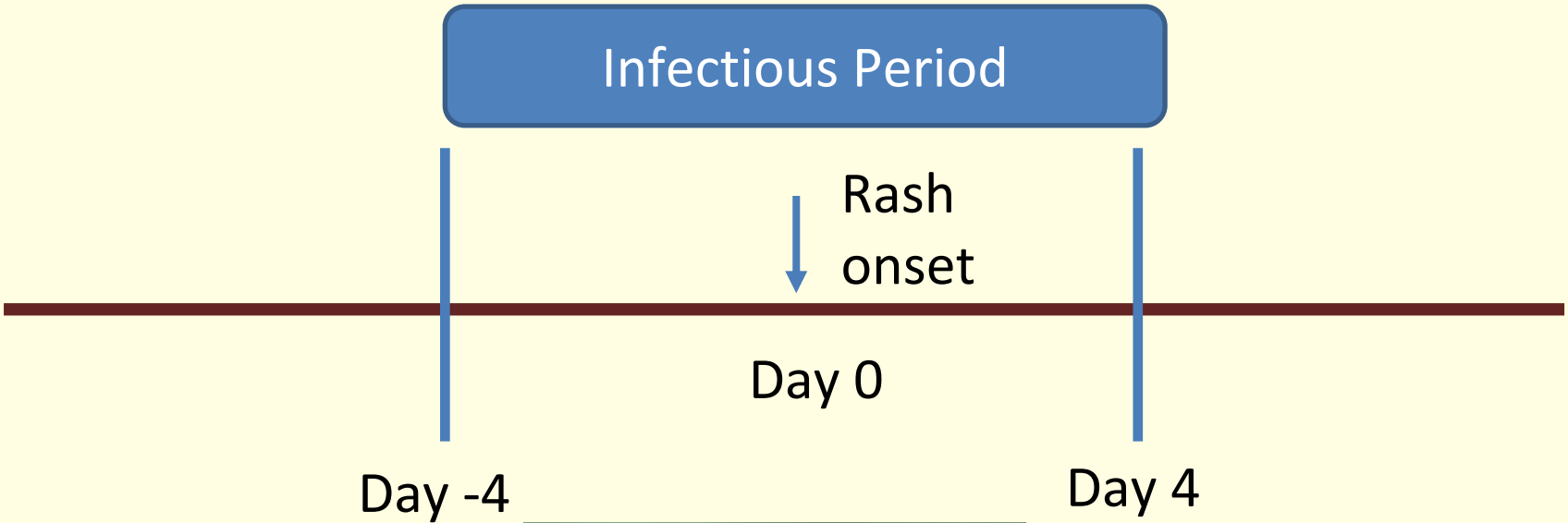
Who was exposed to the case-patient during their infectious period?

8. Identify people who were in contact with the case-patient

Infectious Period

Important to remember:

- Measles is highly infectious
- Can remain in the air for up to two hours after patient leaves the room



Scenario Update

You learn the family does not believe in vaccination. You also learn the infant was in daycare soon after the family returned from India and was there until the day she became ill. You also learned that a grandmother has been staying with the family. She did not go to India as she is recovering from breast cancer.

Scenario Update

What recommendations do you have for those around the infant?

- HCP caring for the child
  - Ensure they have evidence of immunity or vaccination
    - Two doses of MMR vaccine
    - Lab confirmation of prior measles infection
    - Lab evidence of immunity
  - Wear the appropriate personal protective equipment (PPE) regardless of their immunity status
- Susceptible HCP and visitors (no proof of immunity)
  - Not exposed - restrict from patient's room
  - Exposed – vaccinate with MMR within 72 hours of initial exposure
    - >72 hours – too late for post-exposure prophylaxis (PEP)
      - Quarantine or exclude from work per guidance

Contact Tracing

High-level view of contact tracing steps and required information:

- Obtain case-patient's date of fever onset
- Establish infectious period dates
- Identify contacts exposed during case-patient's infectious period
- Document evidence of immunity for contacts (including HCP)
- Establish date of first exposure to case-patient
- Establish last date of exposure to case-patient
- PEP and quarantine as appropriate
  - MMR vaccine within 72 hours of initial exposure
  - If unable to receive MMR, administer immune globulin within six days
  - Susceptible HCP must be excluded from work regardless of PEP

PEP, Quarantine, and Work Exclusions

Recommendations are based on:

- Evidence of immunity to measles
- Age
- Setting (daycare/school and hospitals)
- Timing of exposure
  - Date of first exposure – vaccine and IG
  - Date of last exposure – quarantine and work exclusions
- Immunocompromising conditions
  - Grandmother would require immune globulin within 6 days of initial exposure and home quarantine

Resources available to guide follow-up.

Evidence of Immunity

Establish immunity or vaccine status of contacts.

Acceptable presumptive evidence of immunity against measles includes at least **one** of the following:

- **Written** documentation of adequate vaccination
- Laboratory confirmation of past measles infection
- Laboratory evidence of immunity
- Birth before 1957*
  *not for HCP

- **1 dose:** Preschool-age children & adults not at high risk
- **2 doses:** School-age children & adults at high risk – college students, HCP, international travelers

→ Sources of vaccination information include West Virginia Statewide Immunization Information System (WVSIIS), school records, medical provider

Contact Tracing (cont'd)

In this scenario, who are the potential contacts?

For all confirmed and suspected measles cases, do not wait to initiate contact tracing and control measures.

- Family members and other household contacts
- HCP who came in contact before patient placed on airborne precautions
- Daycare staff and attendees
- Anyone who shared air space with the case-patient – including up to two hours after the patient left the room

Completing the Investigation in WVEDSS

Completing the investigation in WVEDSS

- Timeframe
  - Two weeks for LHD to complete
  - One week for regional epidemiologist review
  - One week for state review
- Fields to pay attention to will vary based on condition. Examples include:
  - Case status – probable, confirmed, etc.
  - Vaccine history
  - Clinical information
  - Contacts
  - Serotype and antibiotic susceptibility patterns (for certain bacteria)
- Surveillance indicators

Measles Case Definition

Clinical Description

An acute illness characterized by:

- Generalized, maculopapular rash lasting ≥3 days; **and**
- Temperature ≥101°F or 38.3°C; **and**
- Cough, coryza, or conjunctivitis.

Case Classification

Probable	**Confirmed**
In the absence of a more likely diagnosis, an illness that meets the clinical description with: ▪ No epidemiologic linkage to a laboratory-confirmed measles case; **and** ▪ Noncontributory or no measles laboratory testing.	An acute febrile rash illness† with: ▪ Isolation of measles virus‡ from a clinical specimen; or ▪ Detection of measles-virus specific nucleic acid‡ from a clinical specimen using polymerase chain reaction; or ▪ IgG seroconversion‡ or a significant rise in measles immunoglobulin G antibody‡ using any evaluated and validated method; or ▪ A positive serologic test for measles immunoglobulin M antibody‡§; or ▪ Direct epidemiologic linkage to a case confirmed by one of the methods above

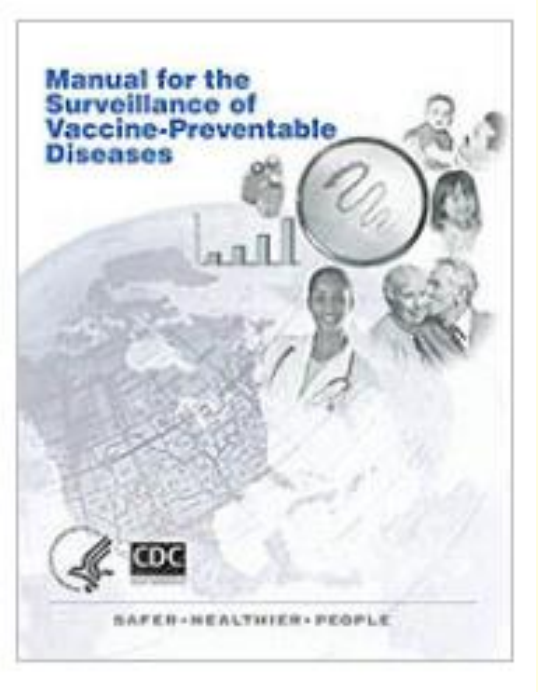
† Temperature does not need to reach ≥101°F/38.3°C and rash does not need to last ≥3 days.
‡ Not explained by MMR vaccination during the previous 6-45 days.
§ Not otherwise ruled out by other confirmatory testing or more specific measles testing in a public health laboratory.

ndc.services.cdc.gov/

Disease Surveillance Indicator

What are surveillance indicators?

Surveillance indicators are surveillance information that measures adequacy of case investigations, timeliness of notification, timeliness of response, etc. (CDC)



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

Measles Surveillance Indicators

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

Manual for the Surveillance of Vaccine-Preventable Diseases

Indicators for measles surveillance

- The proportion of confirmed cases reported to the NNDSS with complete information (clinical case definition, hospitalization, laboratory testing, vaccination history, date reported to health department, transmission setting, outbreak related, epidemiologic linkage, date of birth, and onset date)
- The interval between date of symptom onset and date of public health notification
- The proportion of confirmed cases that are laboratory confirmed
- The proportion of cases that have an imported source
- The proportion of cases for which at least one clinical specimen for virus isolation was submitted to CDC

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

Scenario Conclusion

The case-patient's measles PCR came back positive. Thankfully, the LHD was able to provide guidance to the hospital and initiate timely contact tracing. All contacts received the appropriate PEP and there were no additional cases. The family now understands the importance of vaccines.

Once again, the LHD saves the day!

Summary of Steps

To recap, the investigation steps from the scenario are:

1. Ensure the appropriate precautions are implemented at the healthcare facility
2. Call the DIDE Epi on-call
3. Reference the disease protocol
4. Collect clinical information and ascertain the case using the case report form
5. Coordinate appropriate specimen collection and shipping to DHHR's OLS
6. Assess potential exposures to the case-patient during their incubation period
7. Identify contacts and recommend the appropriate PEP and quarantine/work restrictions
8. Complete the case investigation in WVEDSS

The WHY?

Overall, why is disease investigation and surveillance important?

- Identify cases with reportable conditions
- Maintain elimination status of vaccine-preventable diseases
- Rapid identification can halt transmission through
  - Identification of contacts
  - PEP
  - Quarantine and work exclusion
- Contribute information via case investigation in WVEDSS
  - Impact of vaccine
  - Changes in the epidemiology
  - Antibiotic susceptibility patterns
  - Guide prevention efforts

In Closing

When in doubt call DIDE **On-call Staff** at (304) 558-5358, ext. 2

- Determining if condition is reportable
- Laboratory result interpretation
- Consultation

It is okay to report even if you have preliminary information, e.g., child with rash resembling measles, lab report of suggestive of reportable disease.

Contact Information

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