

Chickenpox (Varicella)

DISEASE REPORTABLE WITHIN 24 HOURS OF DIAGNOSIS

Per New Jersey Administrative Code (N.J.A.C.) 8:57, healthcare providers and administrators shall report within 24 hours of varicella diagnosis to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. Of note, all outbreaks (suspect or confirmed) must be reported immediately by phone.

Directory of Local Health Departments in New Jersey and Directory of After Hour
Emergency Contact Phone Numbers for Local Health Departments
in New Jersey both available at:

<https://www.nj.gov/health/lh/community/index.shtml>

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to 609.826.5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609.392.2020 during all other days and hours.



1 THE DISEASE AND ITS EPIDEMIOLOGY

I. Etiologic Agent

Varicella (chickenpox) is a very contagious disease caused by the varicella-zoster virus (VZV). The varicella-zoster virus causes two distinct diseases, varicella as the primary infection, and later when the virus reactivates, herpes zoster (shingles). For more information on shingles (not reportable), please see Shingles chapter, found at https://www.nj.gov/health/cd/documents/chapters/shingles_ch.pdf. Vaccines to prevent primary varicella and shingles are available and routinely recommended.

II. Clinical Description

Varicella is characterized by a generalized, itchy, blister-like rash that evolves into dried crusts over a 5- to 6-day period. Varicella typically presents with a mild prodrome of cold-like symptoms, fever, malaise, headache, and abdominal pain, which generally occurs 1-2 days prior to the onset of rash. The rash typically appears first on the head, chest, and back then spreads to the rest of the body. The lesions are usually most concentrated on the trunk. Successive crops appear over several days, with unvaccinated children typically having 250 to 500 lesions with lesions present in several stages of development.

A. Clinical Consideration:

A small number of persons vaccinated against varicella may develop the disease if exposed to the varicella-zoster virus. As vaccination rates have increased, the majority of varicella cases now occur in vaccinated individuals (breakthrough varicella). The disease is almost always mild (with fewer than 50 skin lesions) and rash may also be atypical in appearance (maculopapular¹ with few or no vesicles², sometimes resembling bug bites). Because the clinical features of breakthrough varicella are often mild, it can be difficult to diagnose these cases based on clinical presentation alone, therefore making laboratory confirmation increasingly important. Persons with breakthrough cases are also less likely to have fever and more likely to have a shorter duration of illness.

III. Modes of Transmission

Varicella is **highly infectious**, with secondary infection rates in susceptible household contacts approaching 90%. Varicella is most commonly spread via the airborne route. Transmission may also occur from having direct contact with the lesions of a person infected with either varicella or shingles, or inhalation of aerosols from vesicular fluid.

IV. Incubation Period

The incubation period for varicella is usually 14 to 16 days, with a range of 10 to 21 days. This period may be prolonged in certain circumstances such as when varicella zoster immune globulin (VariZIG) is used or in persons who are immunocompromised.

¹ A red rash with both flat red areas (macules) and small bumps (papules) that may run together.

² Small bumps filled with fluid that can be clear or cloudy

V. Period of Communicability or Infectious Period

A person is infectious from 2 days before the onset of rash until all lesions have dried and crusted (usually 5 to 7 days from rash onset). Day of rash onset is considered day 0.

A. Clinical Consideration:

Persons with breakthrough disease may present with an atypical rash which may not result in crusting. These persons would be considered infectious until no new lesions appear within a 24-hour period; usually by the fifth day.

VI. Background

Varicella occurs worldwide. In the United States, incidence is highest between March and May, and lowest between September and November.

In the prevaccine era, varicella was a childhood disease, occurring mostly in children younger than 10 years of age. However, changes in the epidemiology of varicella are anticipated as an increasing proportion of children in the United States become protected by vaccination. Although increased vaccination of children has lowered the overall burden of disease, a higher proportion of the cases will occur among older children, adolescents, and adults who may have escaped varicella disease or vaccination. As vaccination rates have increased, the majority of varicella cases now occur as breakthrough cases among vaccinated persons.

VII. Vaccine Recommendations and Requirements

Varicella vaccine was licensed in 1995. There are both single antigen varicella vaccines and a combination vaccine (MMRV [Measles-Mumps-Rubella-Varicella]) available. Two doses are recommended for use and are about 98% effective at preventing varicella. The first dose is recommended to be given to infants 12 to 15 months of age and the second dose to children 4 to 6 years of age. In accordance with N.J.A.C. 8:57-4, Immunization of Pupils in School, New Jersey requires one dose of varicella vaccine for licensed childcare/preschool and school attendance; a second dose is highly recommended. Please check the most recent [NJ immunization regulations](#) regarding varicella dose requirements.

2 CASE DEFINITION

The NJDOH Communicable Disease Service (CDS) follows the most current case definition as published on the Centers for Disease Control's (CDC) National Notifiable Disease Surveillance System (NNDSS) website. For the most recent case definition please visit: <https://ndc.services.cdc.gov/conditions/varicella/>

Clinical Description

In the absence of a more likely alternative diagnosis*:

- An acute illness with a generalized rash with vesicles (maculopapulovesicular rash), **OR**
- An acute illness with a generalized rash without vesicles (maculopapular rash).

* Examples of alternative diagnoses include, but not limited to, coxsackievirus, folliculitis, and insect bites.

Laboratory Criteria*

Confirmatory:

- Positive polymerase chain reaction (PCR) for varicella-zoster virus (VZV) DNA, **OR**
- Positive direct fluorescent antibody (DFA) for VZV DNA, **OR**
- Isolation of VZV, **OR** Significant rise (i.e., at least a 4-fold rise or seroconversion) in paired acute and convalescent serum VZV immunoglobulin G (IgG) antibody.

Supportive:

- Positive test for serum VZV immunoglobulin M (IgM) antibody.

*A negative laboratory result in a person with a generalized rash with vesicles does not rule out varicella as a diagnosis.

Epidemiologic Linkage Criteria

Confirmatory:

- Exposure to or contact with a laboratory-confirmed varicella case, **OR**
- Can be linked to a varicella cluster or outbreak containing ≥ 1 laboratory-confirmed case, **OR**
- Exposure to or contact with a person with herpes zoster (regardless of laboratory confirmation).

Presumptive:

- Exposure to or contact with a probable varicella case that had a generalized rash with vesicles.

Healthcare Record Criteria

- Provider diagnosis of varicella or chickenpox but no rash description.

Case Classification (current as of 2024)

Confirmed:

- Meets clinical evidence **AND** confirmatory laboratory evidence, **OR**
- Meets clinical evidence with a generalized rash with vesicles **AND** confirmatory epidemiologic linkage evidence.

Probable:

- Meets clinical evidence with a generalized rash with vesicles, **OR**
- Meets clinical evidence with a generalized rash without vesicles **AND**:
 - Confirmatory or presumptive epidemiologic linkage evidence, **OR**
 - Supportive laboratory evidence.**OR**
- Meets healthcare record criteria **AND**:
 - Confirmatory or presumptive epidemiologic linkage evidence, **OR**
 - Confirmatory or supportive laboratory evidence.

NOTE: Reports of chickenpox without a rash description and without an epidemiologic linkage or laboratory confirmation will not meet case definition.

Outbreak definition: 3 or more cases of varicella in a particular setting that are epidemiologically linked.

Case Classification Algorithm:

	1. Does person have a VESICULAR rash?		
	YES-Vesicular	NO-Maculopapular	UNKNOWN
2. Lab evidence?			
Yes			
Confirmatory	Confirmed	Confirmed	Probable
Supportive	Go to epi linkage	Probable	Probable
No	Go to epi linkage	Go to epi linkage	Go to epi linkage
3. Epi linkage?			
Yes			
Confirmatory	Confirmed	Probable	Probable
Presumptive	Probable	Probable	Probable
No	Probable	NAC	NAC

3 LABORATORY TESTING

Laboratory testing is not routinely required but is useful in confirming varicella, especially in special circumstances such as outbreak settings or vaccinated persons with atypical presentations.

Immunity testing of exposed contacts is also not routinely required, although it may be useful in certain circumstances, such as in pregnant women and other high-risk contacts, in healthcare settings, or in outbreak settings.

Diagnostic tests for recent varicella infection include:

- Rapid varicella virus identification using PCR* (preferred if available) or DFA
- Isolation of varicella virus from clinical specimen (viral culture)
- Paired acute/convalescent serologic testing for IgG to varicella-zoster virus (the acute serum should be collected within 7 to 10 days of rash onset, the convalescent at least 7 to 14 days [preferably 2 to 3 weeks]) that shows a significant rise

PLEASE NOTE:

- **Laboratory confirmation does not distinguish between a varicella (chickenpox) and shingles diagnosis. Clinical information from the provider is necessary to make this distinction for VZV positive labs results.**
- **The NJDOH Public Health Environmental Laboratories (PHEL) does not perform routine laboratory testing for VZV. Testing is available through private commercial laboratories.**
- **CDC is capable of conducting testing to differentiate between wild-type and vaccine-type virus. Please contact NJDOH for additional information on this testing.**

Additional information on lab testing can be found at:

<https://www.cdc.gov/shingles/hcp/infection-control/index.html>

4 DISEASE REPORTING REQUIREMENTS

I. Purpose of Surveillance and Reporting

- To monitor the impact over time of the vaccination program on age-specific incidence and severity of varicella
- To evaluate vaccine efficacy under conditions of routine use and track instances of vaccine failure
- To identify groups and areas in which risk of disease is highest so prevention and control efforts can be focused

II. Laboratory Reporting Requirements

The N.J.A.C. 8:57 stipulates that laboratories shall report any positive result within 72 hours, by telephone, any positive culture, test, or assay result specific to varicella to the local health department (LHD) where the patient resides. If the laboratory director or his/her designee is unable to reach the LHD where the patient resides, he/she should report the result to NJDOH CDS at (609) 826-5964 (nonholiday weekdays between 8 a.m. and 5 p.m.). Please refer to the lists of reportable diseases (https://www.nj.gov/health/cd/documents/reportable_disease_magnet.pdf) for information.

III. Healthcare Provider Reporting Requirements

Per N.J.A.C. 8:57, healthcare providers and administrators shall report within 24 hours of varicella diagnosis to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. If the health officer is unavailable, the healthcare provider or administrator shall make the report to the NJDOH CDS.

IV. Health Officer Reporting and Follow-up Responsibilities

As specified at N.J.A.C. 8:57-1 each local health officer notified of varicella must report the occurrence of any case of varicella to NJDOH CDS within 24 hours of receiving the report. The health officer shall within 24 hours of receipt of a report initiate or update the information on the Communicable Disease Reporting and Surveillance System (CDRSS). If the initial report is incomplete, a health officer shall seek complete information and provide all available information to NJDOH CDS within 5 days of receiving the initial report.

5 CASE INVESTIGATION

I. Objectives of the investigation

The primary objective of the case investigation is to ensure that susceptible and high-risk susceptible close contacts of the case are identified and referred to their healthcare provider for vaccination or post-exposure prophylaxis, if appropriate, to prevent further spread of illness.

A second objective of the case investigation is to document information obtained and actions taken. Thorough and timely documentation in CDRSS will facilitate communication between disease investigators and assist with public health surveillance. Refer to section II D, below, for specific information on filing the report in CDRSS.

II. Investigation guidelines

A. **Verify the diagnosis**

Often, VZV positive lab reports are ultimately identified as shingles cases. Laboratory confirmation does not distinguish between chickenpox and shingles. Information from the provider is necessary to make this distinction when positive labs are entered into CDRSS.

- “Varicella” is not an adequate final diagnosis as it can mean either chickenpox or shingles. If a provider states the diagnosis is “varicella”, further question if diagnosis is “chickenpox” or “shingles/herpes zoster”
- Shingles is currently a non-reportable disease (See [shingles disease chapter](#))

B. **Identify contacts**

Contacts should be identified starting 2 days prior to case’s rash onset until all lesions have crusted. Special focus should be placed on identifying susceptible and high-risk contacts. For guidelines on prophylaxis of close contacts, please see Section 6 below.

C. **Disease control measures**

Institution of disease control measures is an integral part of case investigation. Please consult with NJDOH before recommending quarantine or exclusions. It is the local health officer’s responsibility to understand and institute control guidelines listed below in section 6.

D. **Entry into CDRSS**

It is the health officer’s responsibility to investigate the case by interviewing the patient and others who may be able to provide pertinent information. Following notification, the local health officer shall update the case in CDRSS. Use the following guidelines to accurately record all information required for case close out:

- **Demographic information** – at minimum, document/verify the patient’s name, date of birth, gender, race/ethnicity, home address, and telephone number
- **Laboratory data**
 - Specimen collection date

- Specimen type
- Test results
- **Case Assessment**
 - Final diagnosis
 - Rash characteristics
 - Description (Vesicular vs. maculopapular)
 - Location
 - History of disease
- **Clinical information**
 - Illness onset date
 - Hospitalizations
 - Mortality
 - Pre-existing conditions
- **Signs and symptoms**
 - Rash onset date
 - Rash severity (approximate number of lesions)
 - Fever, cold symptoms, pruritus
- **Risk factors**
 - Recent history of travel (to where and dates)
 - Recent out-of-town visitors (from where and dates)
 - Possible transmission setting (e.g., children, school, healthcare setting)
 - Recent contact with anyone diagnosed with chickenpox or shingles/herpes zoster
 - Vaccination status
 - Reason for status
- **Immunization information**
 - Dates of varicella vaccination(s)
- **Contact tracing**
 - Add close contacts (including household members)
 - Any close contacts who develop symptoms during the incubation period should have their own case created and investigated
 - Any additional cases identified as epi-linked should have a case created and should be linked to index case.
 - NJDOH can assist with determining appropriate linkage.

6 CONTROLLING FURTHER SPREAD OF VARICELLA

I. Isolation and Quarantine Requirements (N.J.A.C. 1-1.2)

NJDOH CDS should be notified for consultation and approval before any institutional, exclusion, or community-wide outbreak control measures are planned or implemented. In most cases, outbreak control measures are not necessary in response to a sporadic case.

A. Minimum Period of Isolation of Patient

Until lesions have dried and crusted, or until no new lesions appear within a 24-hour period; usually by the fifth day.

B. Minimum Period of Quarantine of Contacts

- Susceptible healthcare workers shall be excluded from their occupations from the 8th day from the first exposure through the 21st day after their last exposure.
- Anyone receiving varicella immune globulin (VariZIG) shall extend their exclusion to 28 days post-exposure. Otherwise, no restrictions for sporadic cases of varicella.

II. Protection of Contacts of a Case

A. **Identify high-risk susceptible individuals among the exposed.** Some examples of high-risk susceptible individuals are:

- **Immunocompromised individuals** identified as exposed should be advised to consult their healthcare provider. These individuals have a higher risk of serious complications with varicella infection, including disseminated disease, resulting in multiple organ system involvement. Frequent complications include pneumonia and encephalitis. Immunocompromised persons without evidence of immunity should receive VariZIG as soon as possible after exposure to the varicella-zoster virus, and within 10 days.
- **Susceptible pregnant women** identified as exposed should be advised to consult their obstetrician. These women may be at higher risk for serious complications than adults in general, and their fetuses are at risk for congenital varicella syndrome. Hence, VariZIG is indicated for pregnant women without evidence of immunity as soon as possible after exposure to the varicella-zoster virus, and within 10 days. Whether the fetus is protected by VariZIG is unknown.
- **Newborns** should receive VariZIG as soon as possible after exposure to the varicella-zoster virus, and within 10 days, as indicated below:
 - Newborns whose mothers' onset of varicella occurred within the period of days before delivery to 2 days after delivery should receive VariZIG.
 - Clinical Consideration: In the event that there is a neonate born to a mother with active varicella, please contact NJDOH for further guidance on isolation recommendations.

- Exposed hospitalized premature infants (≥ 28 weeks of gestation) whose mothers have no history of varicella or serologic proof of immunity should receive VariZIG.
- Exposed hospitalized premature infants (< 28 weeks of gestation or $\leq 1,000$ g), regardless of mother's evidence of immunity to varicella, should receive VariZIG.
- For healthy, full-term infants exposed postnatally to varicella (except those whose mothers' rash developed between 5 days before delivery and 2 days after delivery), VariZIG is NOT indicated, although it MAY be considered, depending on age and mother's immune status. The package insert and expert guidelines should be consulted.

Additional information on post-exposure prophylaxis can be found at:

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6228a4.htm>

B. Consider the need to identify and contact all those exposed. When practical, a healthcare provider or public health authority may desire to inform those in contact with cases of their exposure. Consider members of the following groups who may have been in contact with the case during his/her infectious period:

- Household members
- School/daycare students and staff (consider interaction patterns, staffing patterns, and possibilities of shared airspace, face-to-face contact, and saliva exchange)
- Staff and patients of healthcare facilities that patient visited
- Workplace contacts (especially in daycare, school, and healthcare settings)
- Social and religious groups
- Sports teams and extracurricular groups
- Bus/carpool mates
- Close friends
- Persons potentially exposed at social events or travel sites

C. Identify (and, if eligible, consider recommending vaccination for) exposed susceptible individuals. Susceptible individuals are those without proof of immunity, outlined below.

Proof of Immunity to Varicella
<ul style="list-style-type: none"> • Documentation of age-appropriate vaccination <ul style="list-style-type: none"> - Preschool-aged children 12 months of age or older: 1 dose - School-aged children, adolescents, and adults: 2 doses - For children younger than 13 years of age, the minimum interval between doses is 3 months. - However, if the child received the first dose before age 13 years and the interval between doses was at least 28 days, the second dose is considered valid. • Laboratory evidence of immunity or laboratory confirmation of disease • Born in the United States before 1980 <ul style="list-style-type: none"> - For healthcare workers and pregnant women, birth before 1980 should not be considered evidence of immunity. • A healthcare provider diagnosis of varicella or verification of history of varicella disease • History of herpes zoster based on healthcare provider diagnosis.

Note: Bone marrow transplant recipients should be considered susceptible *regardless* of past history of disease.

D. Vaccination as post-exposure prophylaxis: After consultation with NJDOH, consider recommending varicella vaccine to eligible, susceptible individuals exposed in institutional settings (e.g., day-care centers, schools, healthcare settings) and advising them to contact their private physicians for guidance and possible vaccination services.

- Varicella vaccine can prevent or modify disease if given within 3 days, and possibly up to 5 days, after exposure.
- Vaccinating someone who is incubating varicella or is immune is not harmful.
- If vaccine is given following exposure, parents and others should be informed that varicella could occur despite vaccination.

E. Supply potentially exposed individuals with information. In institutional settings where there is a case or outbreak of varicella, including daycare centers and schools, (a) recommend that the setting provide potentially exposed attendees (or their parents) and staff with written or verbal notification of the case or outbreak, encouraging them (or their parents) to consult their regular medical provider to consider vaccination if unvaccinated and eligible; and (b) have staff instruct their affected population on recommended infection control practices such as the importance of careful hand-washing, especially after touching discharges from nose, throat, or varicella lesions, and the importance of not sharing eating utensils or toys that are put into the mouth. However, since varicella is airborne, these practices will likely not protect those who are exposed.

F. Conduct surveillance in those exposed to varicella for 21 days (one incubation period) after the last exposure to varicella. Follow up with contacts to ensure no one else became ill during the incubation period.

III. Managing Special Situations

A. Management of patients with varicella in a healthcare setting

- Standard precautions along with airborne precautions (negative airflow rooms) and contact precautions should be followed for all patients suspected of having varicella until lesions are dried and crusted.
- If a negative airflow room is not available, patient should be isolated in a closed room with no contact with persons who do not have evidence of immunity. When choosing placement, healthcare facilities should be aware of airflow/ventilation patterns within their facility to ensure high-risk individuals are not exposed through the airborne route.
- Patients suspected of having varicella should only be cared for by staff members who have documented evidence of immunity, as outlined on page 10. *Note: birth before 1980 should not be considered as evidence of immunity for healthcare workers.*

B. Varicella exposures in healthcare settings (including acute and long-term care facilities)

Note: To prevent disease and spread of varicella in healthcare settings, all healthcare institutions should ensure that healthcare personnel have evidence of immunity, and that the evidence of immunity is documented and available if needed.

Steps listed above in the “Protection of Contacts of a Case” section should be followed to identify and notify patients and staff members exposed to varicella in a healthcare setting.

However, the following steps should be taken for healthcare personnel exposed to varicella, based on their evidence of immunity (see table on page 10).

- **If healthcare worker has 2 documented doses of varicella vaccine, or positive titers**, the individual should be monitored daily for symptoms (e.g., fever, cold symptoms, rash) for 21 days following last exposure to the infected individual.
- **If healthcare worker has 1 documented dose of varicella vaccine**, the individual should receive the second dose after exposure to someone with varicella (as long as 4 weeks have passed since the first dose), and then can be monitored in the same manner as individuals with 2 documented doses (above).
- **Unvaccinated healthcare workers, or those with negative titers**, should be furloughed from day 8 from the first exposure through day 21 from the last exposure, as they are potentially infectious during that period. They should also receive vaccination as post-exposure prophylaxis as soon as possible within 5 days after exposure to rash.

Note: Any staff member who develops symptoms indicative of varicella should be removed immediately from patient care areas. If a healthcare worker is diagnosed with varicella, they should be excluded from work until all lesions are dried and crusted, or in the absence in vesicular lesions, until no new lesions have appeared for 24 hours.

C. Varicella in a [childcare or school setting](#)

If a case of varicella is identified in a childcare or school setting, please notify the local health department where the ill individual resides, as well as the school nurse. Consider sending a notification letter to parents/guardians and staff about the case of varicella (see section II.D. above). Letters can be distributed to exposed classrooms, grades, extracurricular groups, or to the entire childcare or school depending on the situation. Before distribution of notification letters, please consult with your local health department or the NJDOH. Exclusion of contacts is not recommended for a sporadic case.

Note: an interview with the school nurse, case-patient, or parent/guardian may reveal unreported cases in school, household, or other contacts. These cases should also be entered into CDRSS and investigated.

D. Varicella outbreak

An outbreak is defined as 3 or more varicella cases in a particular setting that are epidemiologically linked. Once an outbreak is declared, please work in collaboration with NJDOH. In most scenarios, exclusion of exposed, susceptible individuals in the setting will be recommended through 21 days from the latest exposure occurring in the setting.

Note: if susceptible exposed individuals turn 12 months and are eligible to receive vaccine, or receive a catch-up dose, they can return to the setting following vaccination.

Additional information on outbreak control and investigation can be found at:

<https://www.cdc.gov/vaccines/pubs/surv-manual/chpt17-varicella.html#outbreak>

IV. Preventive Measures

Vaccination, including routine childhood vaccination, catch-up vaccination of adolescents, and targeted vaccination of high-risk adult groups, is the best preventive measure against varicella and subsequent shingles. Good personal hygiene (which consists of proper hand-washing, disposal of used tissues, not sharing eating utensils, etc.) is also important. Shingles vaccine is also the best preventive measure against shingles in persons eligible for the vaccine. Please refer to the NJDOH website and other relevant resources available at various websites listed as references for additional information.

REFERENCES

American Academy of Pediatrics. Varicella-Zoster Virus Infections. In: Kimberlin DW, Barnett ED, Lynfield R, Sawyer MH, eds. Red Book: 2021 Report of the Committee on Infectious Disease. Itasca, IL: American Academy of Pediatrics: 2021[831-843].

Centers for Disease Control and Prevention. *Definitions of Symptoms for Reportable Illnesses*. Atlanta, GA: Page last reviewed: June 30, 2017. Available at: <https://www.cdc.gov/port-health/php/definitions-symptoms-reportable-illness/>

Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine-Preventable Diseases. Hall E., Wodi A.P., Hamborsky J., et al., eds. 14th ed. Washington, D.C.: Public Health Foundation, 2021. Available at: <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>

Centers for Disease Control and Prevention. Immunization of Health-Care Personnel: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR November 25, 2011;60(RR07):1-45.

Centers for Disease Control and Prevention. *Manual for the Surveillance of Vaccine-Preventable Diseases*. Atlanta, GA: Page last reviewed: November 1, 2022. Available at: <https://www.cdc.gov/vaccines/pubs/surv-manual/chpt17-varicella.html>

Centers for Disease Control and Prevention. Updated Recommendations for Use of VariZIG – United States, 2013. MMWR July 19, 2013; 62(28);574-576. Available at: <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6228a4.htm>

Heymann DL, ed. Control of Communicable Diseases Manual. 20th ed. Washington, DC: American Public Health Association; 2015.