

Measles, Mumps, and Rubella

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September 10, 2015

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Measles

- ❑ **Highly contagious viral illness caused by a paramyxovirus**
 - Nasopharynx is primary site of infection
- ❑ **Incubation period 10-12 days**
- ❑ **Prodrome 2-4 days**
 - Stepwise increase in fever up to 103°F-105°F
 - Cough, coryza, conjunctivitis
 - Koplik spots
- ❑ **Rash**
 - 2-4 days after prodrome and 14 days after exposure
 - Persists 5-6 days
 - Begins on face and upper neck
 - Maculopapular rash becomes confluent
 - Fades in order of appearance



Measles Complications

Diarrhea	8%
Otitis media	7%
Pneumonia	6%
Encephalitis	0.1%
Seizures	0.6-0.7%
Death	0.2%

Based on 1985-1992 surveillance data

Mumps

- ❑ Viral illness caused by a paramyovirus (contagiousness similar to influenza and rubella, but less than measles or varicella)
 - Nasopharynx and regional lymph nodes are primary sites of infection; then spreads to meninges and glands (salivary, pancreas, testes, ovaries)
- ❑ Incubation period 12-25 days
- ❑ Nonspecific prodrome of myalgia, anorexia, malaise, headache, and low-grade fever
- ❑ Parotitis in 9%-94%, typically occurs within 16-18 days
- ❑ 15%-27% of infections asymptomatic in prevaccine era



Mumps Complications

Orchitis	12%-66% in postpubertal males (prevaccine) 3%-10% (postvaccine)
Pancreatitis	3.5% (prevaccine)
Unilateral deafness	1/20,000 (prevaccine)
Death	2/10,000 from 1955-1971 No deaths in recent U.S. outbreaks

Rubella

- ❑ Incubation period 14 days (range 12-23 days)
- ❑ Prodrome
 - Rare in children
 - Low-grade fever in adults
- ❑ Maculopapular rash 14-17 days after exposure
- ❑ Lymphadenopathy occurs before rash and lasts for several weeks



Rubella Complications

Arthralgia or arthritis

Adult female – up to 70%

Children—rare

Encephalitis

1/6,000 cases

Hemorrhagic manifestations
(e.g., thrombocytopenic
purpura)

1/3,000 cases

Orchitis, neuritis, progressive
panencephalitis

Rare

No deaths in recent U.S.
outbreaks

Congenital Rubella Syndrome

- ❑ Infection may affect all organs
 - Deafness
 - Eye defects
 - Cardiac defects
 - Microcephaly
 - Mental retardation
 - Bone alterations
 - Liver and spleen damage
- ❑ May lead to fetal death or preterm delivery
- ❑ Severity of damage to fetus depends on gestational age
- ❑ Up to 85% of infants affected if infected during first trimester



Epidemiology

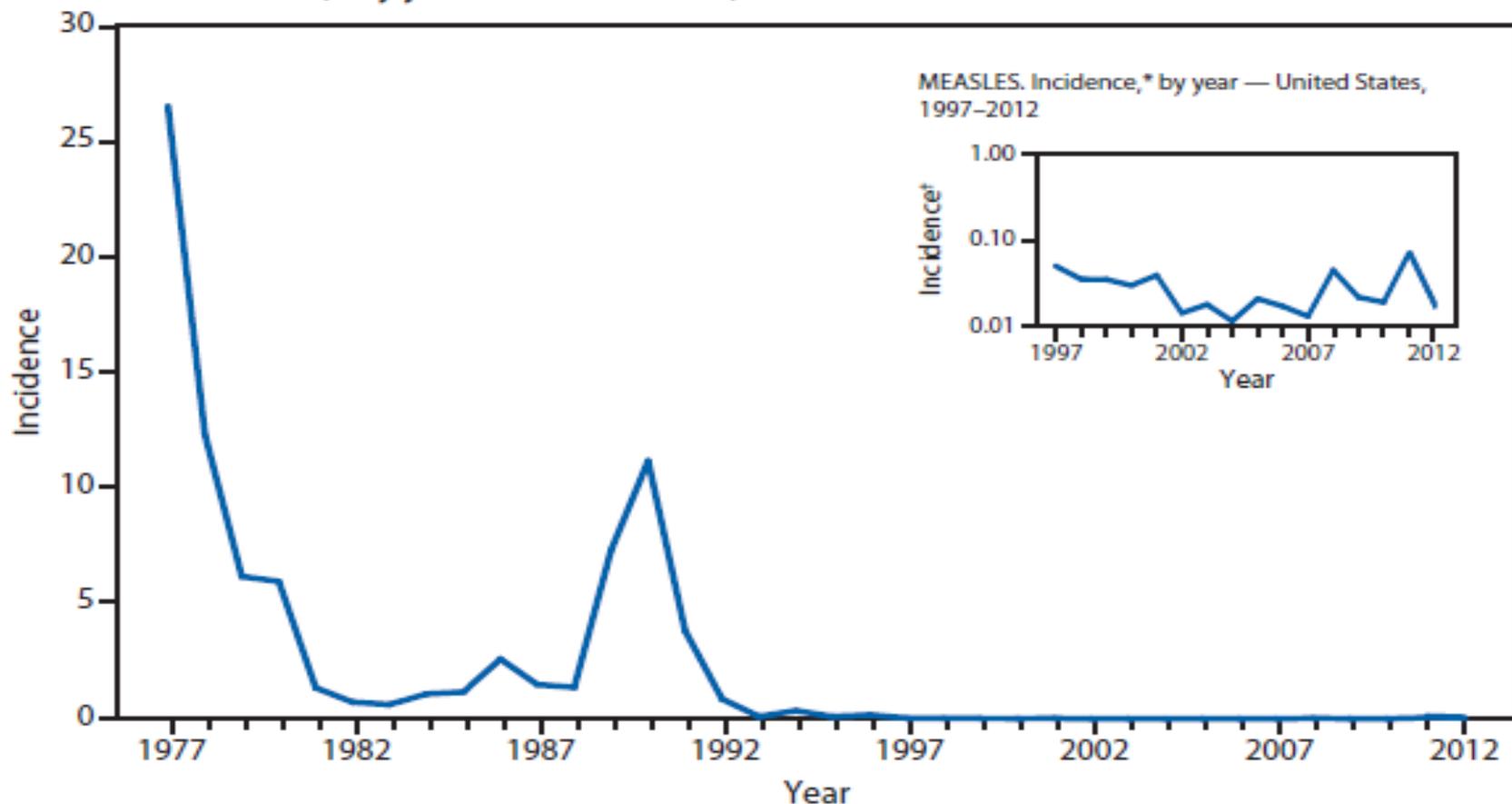
Measles

Mumps

Rubella

Reservoir	Human	Human	Human
Transmission	Respiratory Airborne	Airborne Direct contact with droplet or saliva	Respiratory
Temporal Pattern	Peaks in late winter/spring	Peaks in late winter/spring	Peaks in late winter/spring
	4 days before to 4 days after rash onset	Several days before and after onset of parotitis	7 days before to 5 to 7 days after rash onset

Measles – United States 1977-2012



* Per 100,000 population.

† In the inset figure, the Y axis is a log scale.

Measles Elimination* in the U.S.

- ❑ Declared in 2000 and achieved due to:
 - High 2-dose coverage
 - High quality measles surveillance and response
 - Improved measles control in World Health Organization Region of the Americas
- ❑ Elimination does not mean “gone forever”
 - imported cases and limited spread occur every year

*Defined as interruption of continuous measles transmission last > 12 months

Measles Importation Infographic

Get Vaccinated: Prevent and Stop Measles Outbreaks

When measles happens anywhere in the world...

A world map with the United States highlighted in orange. Several green and yellow curved arrows point from various parts of the world towards the United States, illustrating the global spread of measles. A white arrow points from the text 'It can travel here and spread' to the United States.

It can travel here and spread

Since measles is still common in many countries, unvaccinated travelers will continue to bring the disease into the U.S., and it can spread to other people.

Make sure you and your family members are up-to-date on your measles-mumps-rubella (MMR) vaccine, including before traveling internationally. Ask your doctor if everyone has received all recommended doses of MMR for best protection against measles.

www.cdc.gov/features/measles/



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

MMR3g4001 | Last updated June 3, 2014

www.cdc.gov/measles/importation-infographic.html

Measles Cases and Outbreaks

January 1 to August 21, 2015*

188

Cases

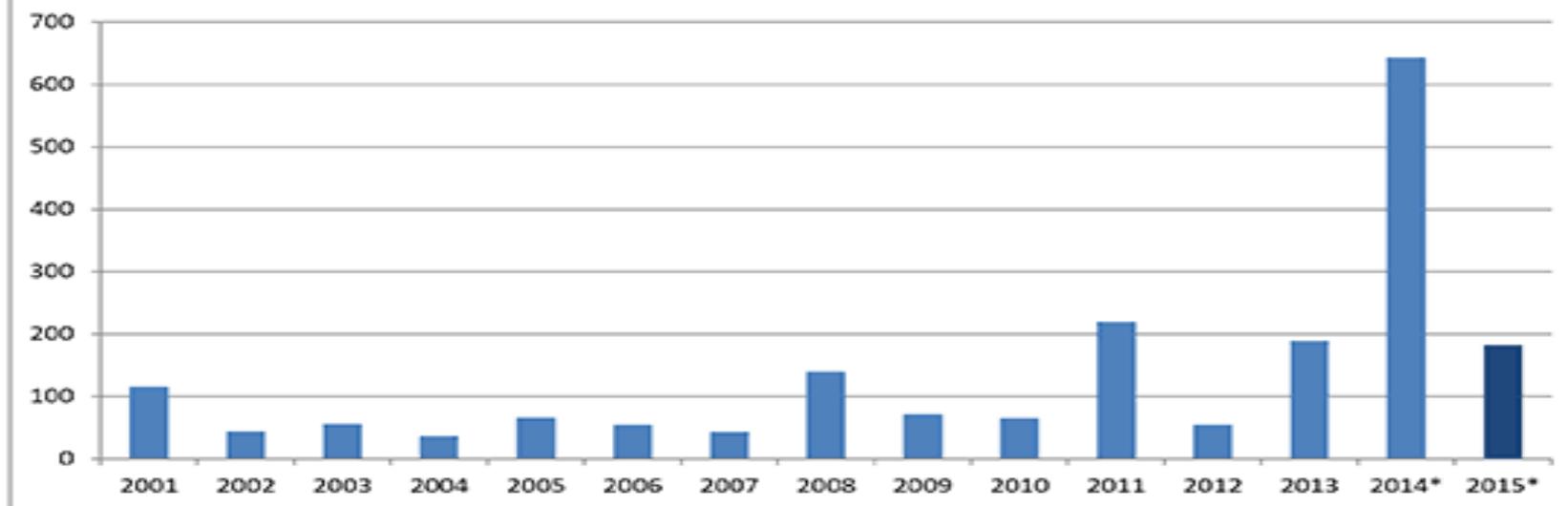
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Outbreaks

reported in 24 states and the District of Columbia: Alaska, Arizona, California, Colorado, Delaware, Florida, Georgia, Illinois, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York, Nevada, Ohio, Oklahoma, Pennsylvania, South Dakota, Texas, Utah, Virginia, Washington

representing 81% of reported cases this year

U.S. Measles Cases by Year

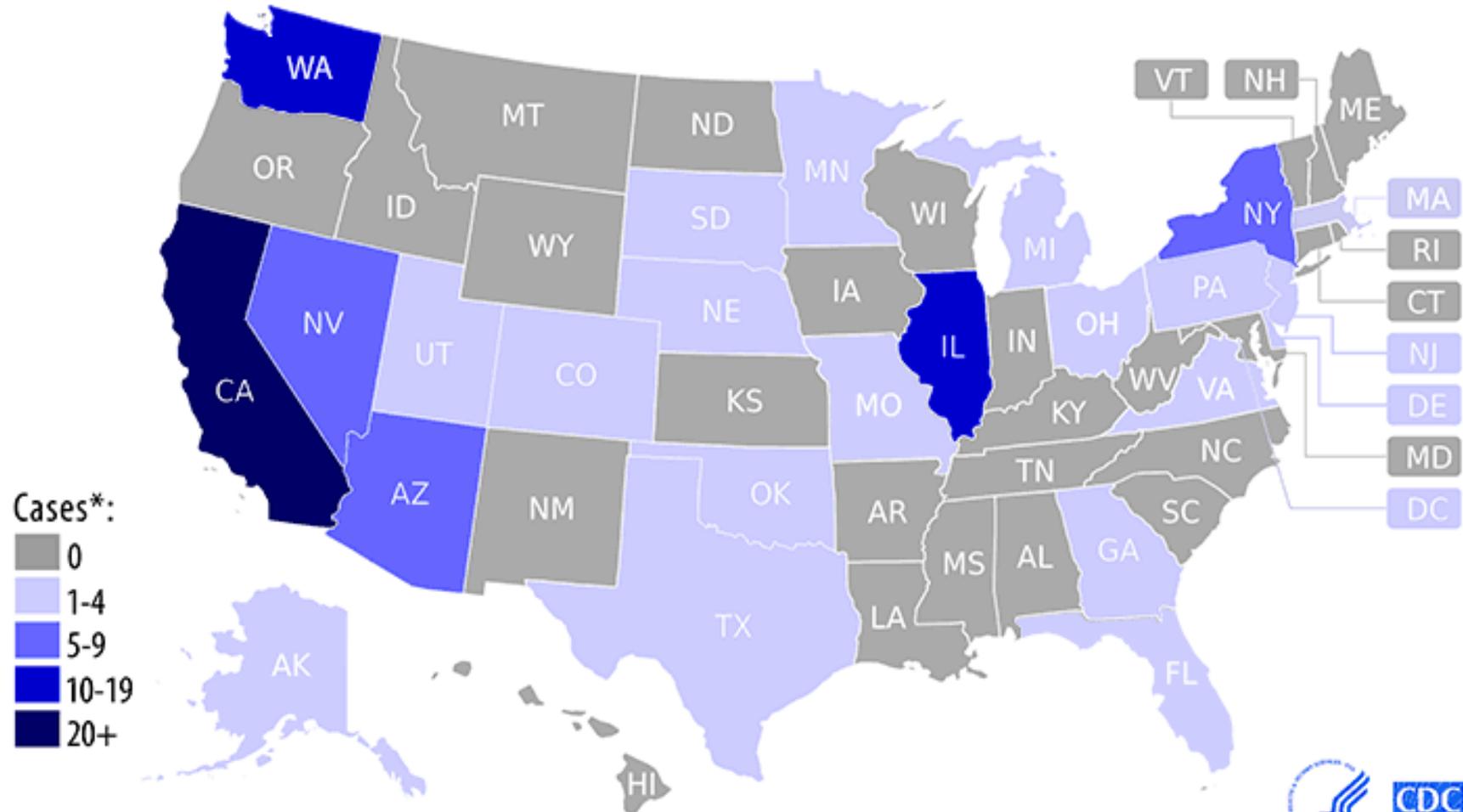


*Provisional data reported to CDC's National Center for Immunization and Respiratory Diseases

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

2015 Measles Cases in the U.S.

January 1 to August 21, 2015



*Provisional data reported to CDC's National Center for Immunization and Respiratory Diseases



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

Measles **anywhere** is a threat **everywhere**.

Measles Is Serious: Take Care Before and After Travel

HEALTH ADVISORY: MEASLES

Measles spreads easily and can cause serious illness.



Get vaccinated to prevent measles.



Protect yourself from measles.



For more information:
• Call 800-CDC-INFO (232-4636)
• Visit www.cdc.gov/travel



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Measles spreads easily and can cause serious illness. Get vaccinated to prevent measles. Protect yourself from measles.

« Back

Traveling abroad for spring or summer break?
Not protected against measles?
Get your measles vaccination.

Measles is a plane ride away.

Since measles is still common in many countries, **unvaccinated travelers** continue to **get measles in other countries** and bring it into the U.S., and spread it to others.



Get Vaccinated:
Bring home fun souvenirs, photos, and fantastic memories – **NOT measles!**



Passport

Since measles is still common, continue to **bring the disease** home.

Get Vaccinated: P

Make sure you and your family member **measles-mumps-rubella (MMR) vaccine** traveling internationally. Ask your doctor all recommended doses of MMR for babies. Visit www.cdc.gov/Features/Measles

HEALTH ADVISORY: MEASLES

Measles spreads easily and can cause serious illness.



If you get fever and a rash in the next 3 weeks...



Call a doctor. Tell the doctor that you traveled.



For more information:
• Call 800-CDC-INFO (232-4636)
• Visit www.cdc.gov/travel



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Measles spreads easily and can cause serious illness. If you get a fever and a rash in the next 3 weeks, call a doctor. Tell the doctor that you traveled.

Make sure you are up to date on your **measles-mumps-rubella (MMR) vaccine**, including before travelling internationally. Ask your doctor, if you have received all recommended doses of MMR for best protection against measles.

www.cdc.gov/Features/MeaslesInternationalTravel/



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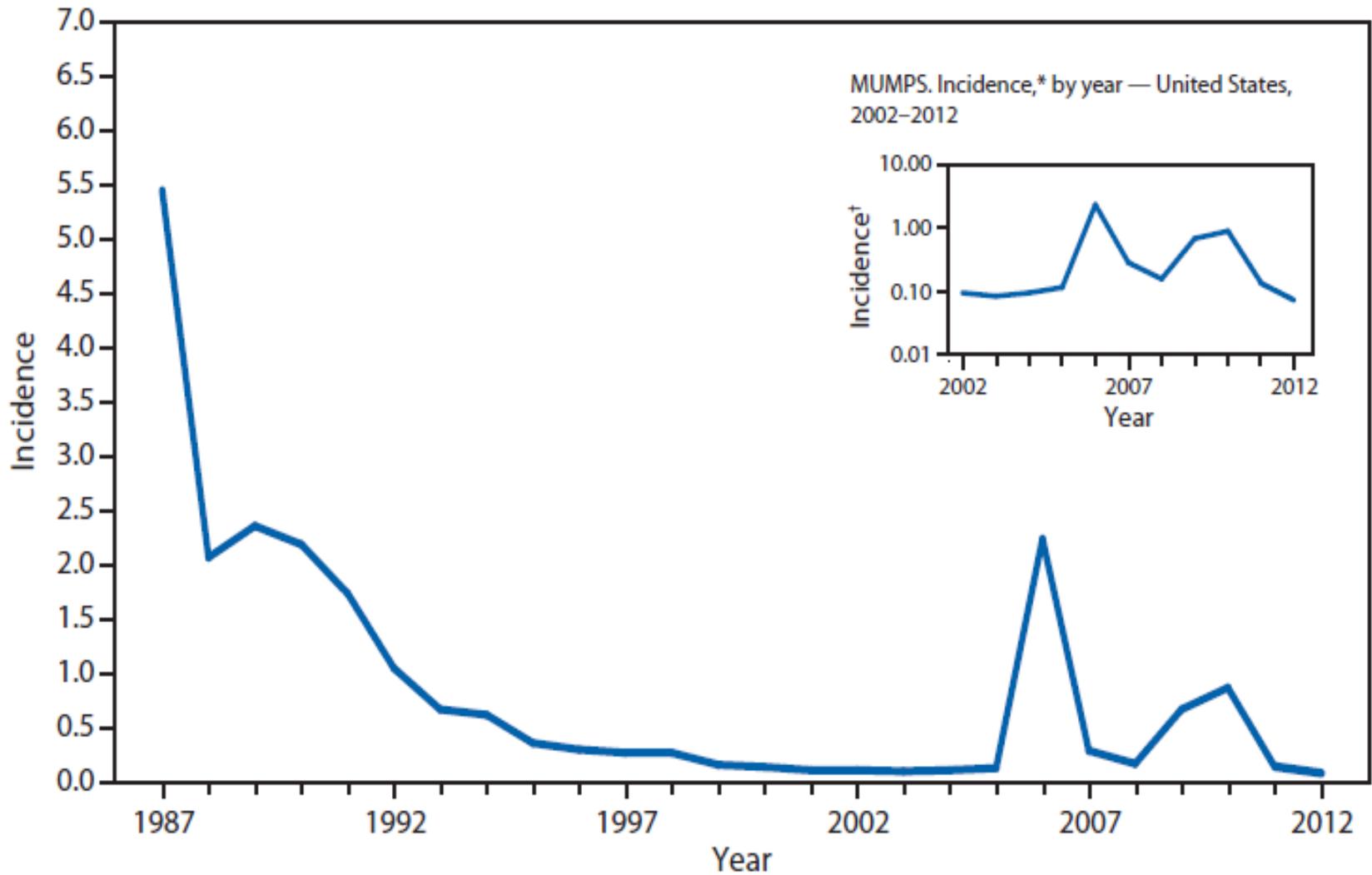


www.cdc.gov/measles/importation-infographic.html

Guidance for Healthcare Personnel

- ❑ Be vigilant about measles
- ❑ Ensure all patients are up-to-date on measles-mumps-rubella vaccination
- ❑ Consider measles in patients with febrile rash illness and clinically compatible measles symptoms (cough, coryza, and conjunctivitis)
- ❑ Ask patients about:
 - Recent travel internationally
 - Recent travel to domestic venues frequented by international travelers
 - Recent contact with international travelers
 - History of measles in the community
- ❑ Promptly isolate patients with suspected measles

MUMPS. Incidence,* by year — United States, 1987–2012



* Per 100,000 population.

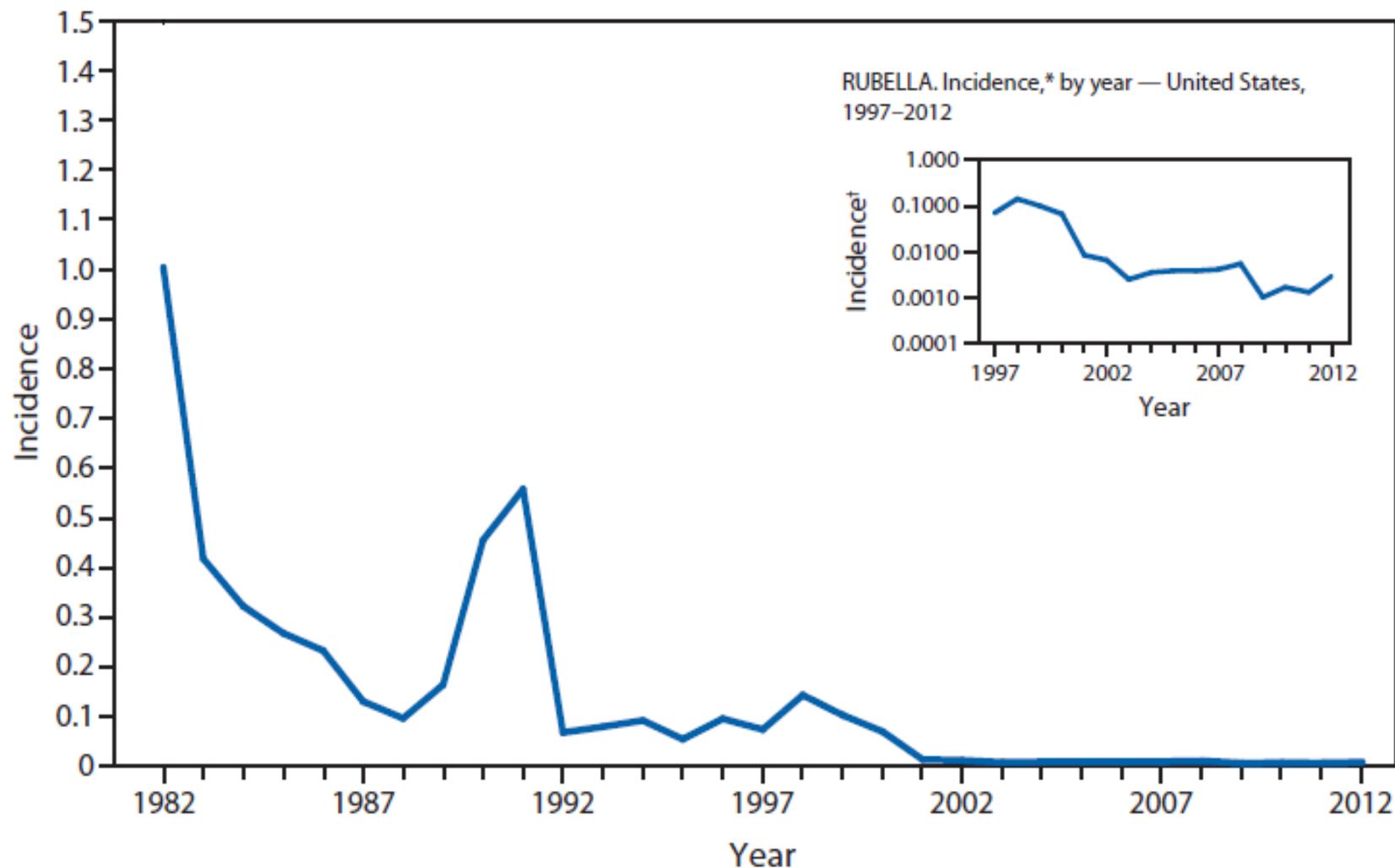
Number of Mumps Cases by Year Since 2010

Year	Cases
2010	2,612
2011	370
2012	229
2013	584
2014	1,151
2015*	330

- ❑ **2009-2010—2 large outbreaks**
 - First outbreak - mostly affected high school-aged students in close-knit religious community in NYC; started when a student returned from UK where large mumps outbreak was occurring
 - Second outbreak – mostly school-aged children in Guam
- ❑ **2011-2013—several small outbreaks on college campuses**
 - California
 - Virginia
 - Maryland
- ❑ **2014—several outbreaks**
 - ❑ National Hockey League
 - ❑ Ohio State University
 - ❑ Fordham University in NY

*Cases as of August 28, 2015

RUBELLA. Incidence,* by year — United States, 1982–2012



* Per 100,000 population.

Number of Rubella and Congenital Rubella Syndrome (CRS) Cases by Year Since 2010

Year	Rubella	CRS
2010	5	0
2011	4	0
2012	9	3
2013	9	1
2014	8	0
2015*	2	1

- Median of 11 rubella cases annually 2005-2011
- 60% of rubella cases in U.S. in persons 20-49 years of age since 2004

*Cases as of August 28, 2015

Acceptable Presumptive Evidence of Immunity

Routine	Students (college/post-high school)	Healthcare personnel	International travelers
<p>(1) Documented age-appropriate vaccination with live measles, mumps, rubella virus-containing vaccines, or</p> <p>(2) Laboratory evidence of immunity, or</p> <p>(3) Laboratory confirmation of disease, or</p> <p>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</p>	<p>(1) Documented 2 doses of live measles and mumps virus-containing vaccines; 1 dose rubella virus-containing vaccine, or</p> <p>(2) Laboratory evidence of immunity, or</p> <p>(3) Laboratory confirmation of disease, or</p> <p>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</p>	<p>(1) Documented 2 doses of live measles and mumps virus-containing vaccines; 1 dose rubella virus-containing vaccine, or</p> <p>(2) Laboratory evidence of immunity, or</p> <p>(3) Laboratory confirmation of disease, or</p> <p>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</p>	<p>(1) Documented age-appropriate vaccination with live measles, mumps, rubella virus-containing vaccines, or</p> <p>(2) Laboratory evidence of immunity, or</p> <p>(3) Laboratory confirmation of disease, or</p> <p>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</p>

MMRV (ProQuad) Vaccine

- ❑ Combined measles, mumps, rubella, and varicella vaccine
- ❑ 7 to 8 times as much varicella vaccine virus as monovalent varicella vaccine
- ❑ Approved only for children 12 months through 12 years of age

MMR Vaccine Failure

- ❑ Some recipients do not respond to the first dose
- ❑ Failure rate varies by component
- ❑ Caused by antibody, damaged vaccine, recording errors
- ❑ Most persons with vaccine failure will respond to second dose

MMR Vaccine

- ❑ First dose of MMR at 12-15 months
- ❑ 12 months is the minimum age
- ❑ MMR given before 12 months should not be counted as a valid dose
 - Infants as young as 6 months should receive MMR before international travel.*
 - Revaccinate at 12 months of age or older

*ACIP off-label recommendation. *MMWR* 2013;62(RR-4)

MMR Vaccine (Second Dose)

- ❑ Second dose of MMR at 4-6 years
- ❑ Second dose may be given at any time at least 4 weeks after the first dose
 - Children older than 12 months of age can receive a second dose of MMR before international travel (minimum interval between doses is 4 weeks)
- ❑ Intended to produce measles immunity in persons who failed to respond to the first dose (primary vaccine failure)
- ❑ May boost antibody titers in some persons
- ❑ People who received 2 doses of MMR vaccine as children according to the U.S. vaccination schedule are considered protected for life

MMR and MMRV Vaccines

- ❑ First dose – either MMR and varicella vaccines or MMRV can be used
- ❑ Providers – discuss benefits/risks of both vaccination options with parents or caregivers
- ❑ First dose – unless parent or caregiver expresses preference for MMRV, CDC recommends MMR and varicella vaccines
- ❑ Providers – if any communication barriers, then administer MMR and varicella vaccines separately
- ❑ Second dose – MMRV generally preferred over separate MMR and varicella vaccines

MMRV Recommendations

- **First dose at 12–47 months**
 - Either MMR and VAR or MMRV
 - Providers considering MMRV—discuss benefits/risks of both options with parents or caregivers
 - Unless parent or caregiver expresses preference for MMRV, CDC recommends MMR and varicella vaccines

- **Second dose at 15 months–12 years or first dose at 48 months and older**
 - MMRV generally preferred

Minimum Intervals

- ❑ MMR—2 doses of MMR can be separated by 4 weeks
- ❑ MMRV—2 doses of varicella vaccine must be separated by at least 3 months for children younger than 13 years of age

Figure 1. Recommended immunization schedule for persons aged 0 through 18 years – United States, 2015.

(FOR THOSE WHO FALL BEHIND OR START LATE, SEE THE CATCH-UP SCHEDULE (FIGURE 2)).

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are shaded.

Vaccine	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19–23 mos	2-3 yrs	4-6 yrs	7-10 yrs	11-12 yrs	13–15 yrs	16–18 yrs
Hepatitis B ¹ (HepB)	1 st dose	2 nd dose			3 rd dose											
Rotavirus ² (RV) RV1 (2-dose series); RV5 (3-dose series)			1 st dose	2 nd dose	See footnote 2											
Diphtheria, tetanus, & acellular pertussis ³ (DTaP; <7 yrs)		1 st dose	2 nd dose	3 rd dose				4 th dose				5 th dose				
Tetanus, diphtheria, & acellular pertussis ⁴ (Tdap; ≥7 yrs)													(Tdap)			
<i>Haemophilus influenzae</i> type b ⁵ (Hib)		1 st dose	2 nd dose	See footnote 5			3 rd or 4 th dose, See footnote 5									
Pneumococcal conjugate ⁶ (PCV13)		1 st dose	2 nd dose	3 rd dose			4 th dose									
Pneumococcal polysaccharide ⁶ (PPSV23)																
Inactivated poliovirus ⁷ (IPV; <18 yrs)		1 st dose	2 nd dose	3 rd dose								4 th dose				
Influenza ⁸ (IV; LAIV) 2 doses for some: See footnote 8					Annual vaccination (IV only) 1 or 2 doses						Annual vaccination (LAIV or IV) 1 or 2 doses		Annual vaccination (LAIV or IV) 1 dose only			
Measles, mumps, rubella ⁹ (MMR)					See footnote 9		1 st dose					2 nd dose				
Varicella ¹⁰ (VAR)							1 st dose					2 nd dose				
Hepatitis A ¹¹ (HepA)							2-dose series, See footnote 11									
Human papillomavirus ¹² (HPV2: females only; HPV4: males and females)														(3-dose series)		
Meningococcal ¹³ (Hib-MenCY ≥ 6 weeks; MenACWY-D ≥ 9 mos; MenACWY-CRM ≥ 2 mos)			See footnote 13											1 st dose		Booster

Range of recommended ages for all children

Range of recommended ages for catch-up immunization

Range of recommended ages for certain high-risk groups

Range of recommended ages during which catch-up is encouraged and for certain high-risk groups

Not routinely recommended

This schedule includes recommendations in effect as of January 1, 2015. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at <http://www.cdc.gov/vaccines/hcp/acip-recs/index.html>. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (<http://www.vaers.hhs.gov>) or by telephone (800-822-7967). Suspected cases of vaccine-preventable diseases should be reported to the state or local health department. Additional information, including precautions and contraindications for vaccination, is available from CDC online (<http://www.cdc.gov/vaccines/recs/vac-admin/contraindications.htm>) or by telephone (800-CDC-INFO [800-232-4636]).

This schedule is approved by the Advisory Committee on Immunization Practices (<http://www.cdc.gov/vaccines/acip/>), the American Academy of Pediatrics (<http://www.aap.org>), the American Academy of Family Physicians (<http://www.aafp.org>), and the American College of Obstetricians and Gynecologists (<http://www.acog.org>).

NOTE: The above recommendations must be read along with the footnotes of this schedule.

MMR Recommendations for Adults

- ❑ Adults born in 1957 or later should receive 1 or more doses at least 28 days apart unless they have other evidence of immunity
- ❑ A routine second dose of MMR vaccine at least 28 days after the first dose is recommended for adults who are:
 - College and post-high school students
 - Persons working in medical facilities
 - International travelers
- ❑ Adults born before 1957 are generally presumed immune to measles, mumps, and rubella (except rubella for women of childbearing age who could become pregnant)

Centers for Disease Control and Prevention

MMWR

Recommendations and Reports / Vol. 60 / No. 7

Morbidity and Mortality Weekly Report

November 25, 2011

Immunization of Health-Care Personnel

Recommendations of the Advisory Committee on
Immunization Practices (ACIP)

All persons who work in medical facilities should be immune to measles, mumps, and rubella

www.cdc.gov/mmwr/pdf/rr/rr6007.pdf

MMR Vaccination of Healthcare Personnel Born Before 1957

- ❑ For unvaccinated healthcare personnel born before 1957* who lack laboratory evidence of measles, mumps, and/or rubella immunity or laboratory confirmation of disease, healthcare facilities should:
 - Consider vaccinating with 2 doses of MMR for measles and mumps; 1 dose of MMR for rubella
 - Recommend vaccinating with 2 doses of MMR during a measles or mumps outbreak; 1 dose of MMR for rubella outbreak

* Birth before 1957 is not acceptable evidence of rubella immunity for women of childbearing age who could become pregnant

Evidence of MMR Immunity for Healthcare Personnel Born in 1957 or After

- ❑ **Appropriate vaccination**
 - 2 doses of live measles- and mumps-containing vaccines (preferably MMR)
 - 1 dose of live rubella-containing vaccine (preferably MMR), or

- ❑ **Laboratory evidence of immunity, or**

- ❑ **Laboratory confirmation of disease**

Recommended Adult Immunization Schedule—United States - 2015

Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

Figure 1. Recommended adult immunization schedule, by vaccine and age group¹

VACCINE ▼	AGE GROUP ►	19-21 years	22-26 years	27-49 years	50-59 years	60-64 years	≥ 65 years
Influenza ^{2,7}		1 dose annually					
Tetanus, diphtheria, pertussis (Td/Tdap) ^{2,3}		Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs					
Varicella ⁴		2 doses					
Human papillomavirus (HPV) Female ^{5,5}		3 doses					
Human papillomavirus (HPV) Male ^{5,5}		3 doses					
Zoster ⁶						1 dose	
Measles, mumps, rubella (MMR) ^{7,7}		1 or 2 doses					
Pneumococcal 13-valent conjugate (PCV13) ^{8,9}						1-time dose	
Pneumococcal polysaccharide (PPSV23) ⁸		1 or 2 doses					1 dose
Meningococcal ⁹		1 or more doses					
Hepatitis A ¹⁰		2 doses					
Hepatitis B ¹¹		3 doses					
<i>Haemophilus influenzae</i> type b (Hib) ¹²		1 or 3 doses					

*Covered by the Vaccine Injury Compensation Program

- For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection; zoster vaccine recommended regardless of prior episode of zoster
- Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indication)
- No recommendation

Report all clinically significant postvaccination reactions to the Vaccine Adverse Event Reporting System (VAERS). Reporting forms and instructions on filing a VAERS report are available at www.vaers.hhs.gov or by telephone, 800-822-7967.

Information on how to file a Vaccine Injury Compensation Program claim is available at www.hrsa.gov/vaccinecompensation or by telephone, 800-338-2382. To file a claim for vaccine injury, contact the U.S. Court of Federal Claims, 717 Madison Place, N.W., Washington, D.C. 20005; telephone, 202-357-6400.

Additional information about the vaccines in this schedule, extent of available data, and contraindications for vaccination is also available at www.cdc.gov/vaccines or from the CDC-INFO Contact Center at 800-CDC-INFO (800-232-4636) in English and Spanish, 8:00 a.m. - 8:00 p.m. Eastern Time, Monday - Friday, excluding holidays.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

The recommendations in this schedule were approved by the Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices (ACIP), the American Academy of Family Physicians (AAFP), the American College of Physicians (ACP), American College of Obstetricians and Gynecologists (ACOG) and American College of Nurse-Midwives (ACNM).

VACCINE ▼	AGE GROUP ►	19-21 years	22-26 years	27-49 years	50-59 years	60-64 years	≥ 65 years
		1 or 2 doses					

Figure 2. Vaccines that might be indicated for adults based on medical and other indications¹

VACCINE ▼	INDICATION ►	Pregnancy	Immuno-compromising conditions (excluding human immunodeficiency virus [HIV]) ^{4,6,7,8,12}		HIV infection CD4+ T lymphocyte count ^{4,6,7,8,12}		Men who have sex with men (MSM)	Kidney failure, end-stage renal disease, receipt of hemodialysis	Heart disease, chronic lung disease, chronic alcoholism	Asplenia (including elective splenectomy and persistent complement component deficiencies) ^{9,12}	Chronic liver disease	Diabetes	Healthcare personnel
			< 200 cells/μL	≥ 200 cells/μL	< 200 cells/μL	≥ 200 cells/μL							
Influenza ^{2,7}			1 dose IIV annually				1 dose IIV or LAIV annually	1 dose IIV annually					1 dose IIV or LAIV annually
Tetanus, diphtheria, pertussis (Td/Tdap) ³		1 dose Tdap each pregnancy	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs										
Varicella ⁴		Contraindicated			2 doses								
Human papillomavirus (HPV) Female ⁵		3 doses through age 26 yrs				3 doses through age 26 yrs							
Human papillomavirus (HPV) Male ⁵		3 doses through age 26 yrs				3 doses through age 21 yrs							
Zoster ⁶		Contraindicated			1 dose								
Measles, mumps, rubella (MMR) ^{7,7}		Contraindicated			1 or 2 doses								
Pneumococcal 13-valent conjugate (PCV13) ⁸						1 dose							
Pneumococcal polysaccharide (PPSV23) ⁸						1 or 2 doses							
Meningococcal ⁹		1 or more doses											
Hepatitis A ¹⁰		2 doses											
Hepatitis B ¹¹		3 doses											
Haemophilus influenzae type b (Hib) ¹²		post-HSCT recipients only		1 or 3 doses									

¹Covered by the Vaccine Injury Compensation Program



For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection; zoster vaccine recommended regardless of prior episode of zoster



Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)



No recommendation

VACCINE ▼	INDICATION ►	Pregnancy	Immuno-compromising conditions (excluding human immunodeficiency virus [HIV]) ^{4,6,7,8,15}		HIV infection CD4+ T lymphocyte count ^{4,6,7,8,15}		Men who have sex with men (MSM)	Kidney failure, end-stage renal disease, receipt of hemodialysis	Heart disease, chronic lung disease, chronic alcoholism	Asplenia (including elective splenectomy and persistent complement component deficiencies) ^{8,14}	Chronic liver disease	Diabetes	Healthcare personnel
			< 200 cells/μL	≥ 200 cells/μL	< 200 cells/μL	≥ 200 cells/μL							
Measles, mumps, rubella (MMR) ^{7,7}		Contraindicated			1 or 2 doses								

MMR: Indications for Revaccination

- ❑ Vaccinated before the first birthday
- ❑ Vaccinated with killed measles vaccine (KMV)
- ❑ Vaccinated from 1963 through 1967 with an unknown type of measles vaccine
- ❑ Vaccinated with IG in addition to a further attenuated strain or measles vaccine of unknown type

MMR Serologic Testing

- ❑ Serologic screening for measles, mumps, or rubella immunity before vaccination is not necessary and not recommended if a person has other acceptable evidence of immunity to these diseases
- ❑ Postvaccination serologic testing to verify an immune response is not recommended
- ❑ Documented age-appropriate vaccination supersedes the results of subsequent serologic testing

MMR Serologic Testing (cont.)

- ❑ If a person with 2 documented doses of measles- or mumps-containing vaccines is tested and determined to have negative or equivocal measles or mumps titer results, additional MMR vaccination is not recommended
- ❑ Such persons should be considered to have presumptive evidence of immunity

MMR Serologic Testing (cont.)

- ❑ If a person with 1 dose of rubella-containing vaccine is tested and determined to have negative or equivocal rubella titer results, additional MMR vaccination is not recommended, **except for women of childbearing age**
- ❑ **Women of childbearing age with 1 or 2 documented doses of rubella-containing vaccine and rubella-specific IgG level that are not clearly positive should receive 1 additional dose of MMR vaccine (maximum of 3 doses) and do not need retesting**

Postexposure Prophylaxis with MMR Vaccine

- ❑ If given within 72 hours of exposure, MMR vaccine might protect or modify clinical course of measles (preferable to IG for persons ≥ 12 months if given within 72 hours of exposure)
- ❑ If administered within 6 days of exposure, IG can prevent or modify measles in persons who are nonimmune
 - Not indicated for persons who have received 1 dose of measles-containing vaccine at age ≥ 12 months, unless they are severely immunocompromised

Postexposure Prophylaxis with MMR Vaccine (cont.)

- ❑ Postexposure MMR vaccination or IG not shown to prevent or alter the clinical severity of rubella or mumps and is not recommended

MMRVaccine

Contraindications and Precautions

- ❑ History of anaphylactic reaction to neomycin
- ❑ History of severe allergic reaction to any component of the vaccine
- ❑ Pregnancy
- ❑ Immunosuppression
- ❑ Moderate or severe acute illness
- ❑ Recent blood product
- ❑ Personal or family (i.e., sibling or parent) history of seizures of any etiology (MMRV only)

Vaccination of Women of Childbearing Age

- ❑ Ask if pregnant or likely to become so in next **4 weeks***
- ❑ Exclude those who say "yes"
- ❑ For others
 - Explain theoretical risks
 - Vaccinate

* ACIP off-label recommendation; Package insert states 3 months

MMR Vaccine and HIV Infection

- ❑ MMR recommended for persons who do not have evidence of current severe immunosuppression
- ❑ Revaccination recommended for persons with perinatal HIV infection who were vaccinated before establishment of effective antiretroviral therapy (ART) with 2 appropriately spaced doses of MMR vaccine once effective ART has been established
- ❑ Pre vaccination HIV testing not recommended
- ❑ MMRV not for use in persons with HIV infection

MMR Vaccine and Immunosuppressive Therapy

- ❑ Low-dose steroids
 - Vaccinate anytime
- ❑ Leukemia in remission without chemotherapy for 3 months
 - Vaccinate
- ❑ Hematopoietic cell transplant (HCT) recipient who is immunocompetent
 - Vaccinate 24 months after transplant

Measles-containing Vaccine and Tuberculin Skin Testing (TST)

- ❑ Measles disease can cause a person with a latent tuberculosis infection to develop active TB
- ❑ Measles vaccine does not exacerbate TB
- ❑ TB testing is not a prerequisite for MMR vaccination

Tuberculin Skin Testing (TST)* or Tuberculosis Interferon-gamma Release Assay (IGRAs) and MMR or MMRV Vaccines

- ❑ Apply TST or IGRA testing at same visit as MMR or MMRV
- ❑ Delay TST or IGRA at least 4 weeks if MMR or MMRV given first
- ❑ Apply TST first and administer MMR or MMRV when skin test read (least favored option because receipt of MMR or MMRV is delayed)

*Previously called PPD

MMR Adverse Reactions

Fever	5%-15% (Measles)
Rash, pruritis, purpura	5% (Measles)
Joint symptoms (susceptible women)	25% (Rubella)
Thrombocytopenia	1/30,000–40,000 doses (Measles)
Lymphadenopathy	Rare
Allergic reactions (rash, pruritis, purpura)	Rare
Parotitis	Rare (Mumps)
Deafness	Rare (Mumps)
Encephalopathy	<1/1,000,000 doses (Measles)

Rubella Vaccine Arthropathy

- ❑ Acute joint symptoms in about 25% of vaccinated, susceptible adult women
- ❑ Frank arthritis-like signs and symptoms occur in about 10% of recipients
- ❑ Rare reports of chronic or persistent symptoms
- ❑ Population-based studies have not confirmed association

Autism and Vaccines

- ❑ Multiple population-based studies have examined the rate of autism among vaccinated and unvaccinated children
- ❑ To date there is no convincing evidence that any vaccine causes autism or autism spectrum disorder

MMRV Adverse Reactions

- ❑ Similar to MMR
- ❑ Higher risk for fever and febrile seizures 5-12 days after the first dose among children 12-23 months of age
 - 1 additional febrile seizure occurred 5-12 days after vaccination per 2,300-2,600 children compared to children who received first dose as MMR and varicella vaccine separately
- ❑ Fever of 102°F or higher
 - 22% of MMRV recipients
 - 15% with separate injections
- ❑ Increased risk of febrile seizures has not been observed following use of MMRV as the second dose in the MMR and varicella series

MMRV Vaccine Precaution

- ❑ Children who have a personal or family history of febrile seizures or family history of epilepsy are at increased risk for febrile seizures
 - The risk for such seizures is approximately 1 case for every 3,000-4,000 doses of MMR vaccine administered
- ❑ Children with a personal or family history of seizures generally should be vaccinated with separate MMR and varicella vaccines

Vaccine Storage and Handling

MMR Vaccine

- ❑ Store 35°F-46°F (2°C-8°C) (may be stored in the freezer)
- ❑ Store diluent at room temperature or refrigerate
- ❑ Protect vaccine from light
- ❑ Discard if not used within 8 hours after reconstitution
 - Do not fill syringe with reconstituted vaccine until ready to administer

Vaccine Storage and Handling

MMRV Vaccine

- ❑ Store frozen between -58°F and $+5^{\circ}\text{F}$ (-50°C and -15°C)
 - Use of dry ice may subject MMRV to temps colder than recommended
- ❑ Store diluent at room temperature or refrigerate
- ❑ Vaccine may be stored at refrigerator temperature (between 36°F and 46°F , 2°C and 8°C) for up to 72 continuous hours after removal from freezer
- ❑ Protect vaccine from light at all times
- ❑ If not used immediately, the reconstituted vaccine may be stored at room temperature, protected from light, for up to 30 minutes
- ❑ Discard reconstituted vaccine if it is not used within 30 minutes
- ❑ Do not freeze reconstituted vaccine

Measles Resources

- ❑ **Measles 2015: Situational Update, Clinical Guidance, and Vaccination Recommendations**

http://emergency.cdc.gov/coca/calls/2015/callinfo_021915.asp

- ❑ **Health Alert Network (HAN) No. 376 - U.S. Multi-state Measles Outbreak, December 2014-January 2015**

<http://emergency.cdc.gov/han/han00376.asp>

Measles, Mumps, Rubella Resources

- ❑ ACIP's Measles, Mumps, Rubella Recommendations web pages

www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmr.html

www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmr.html

- ❑ CDC's Measles, Mumps, Rubella Infection web pages

www.cdc.gov/measles/index.html

www.cdc.gov/mumps/index.html

www.cdc.gov/vaccines/vpd-vac/rubella/default.htm#disease

- ❑ CDC's Measles, Mumps, Rubella Vaccination web pages

www.cdc.gov/vaccines/vpd-vac/measles/default.htm

www.cdc.gov/vaccines/vpd-vac/mumps/default.htm

www.cdc.gov/vaccines/vpd-vac/rubella/default.htm

Measles, Mumps, Rubella Resources

- ❑ Immunization Action Coalition Measles, Mumps, Rubella web pages

www.immunize.org/measles/

www.immunize.org/mumps/

www.immunize.org/rubella/

- ❑ Children's Hospital of Philadelphia Vaccine Education Center Measles, Mumps, Rubella web page

www.chop.edu/service/vaccine-education-center/a-look-at-each-vaccine/mmr-measles-mumps-and-rubella-vaccine.html