# Adult Vaccination Update

**Natasha N. Bray, DO, MSEd**
**Dean Cherokee Nation Campus**
**Clinical Professor Rural Medicine – Internal Medicine**
**Oklahoma State University College of Osteopathic Medicine**

EXPLORE
HEALTHCARE SUMMIT

## Disclosures

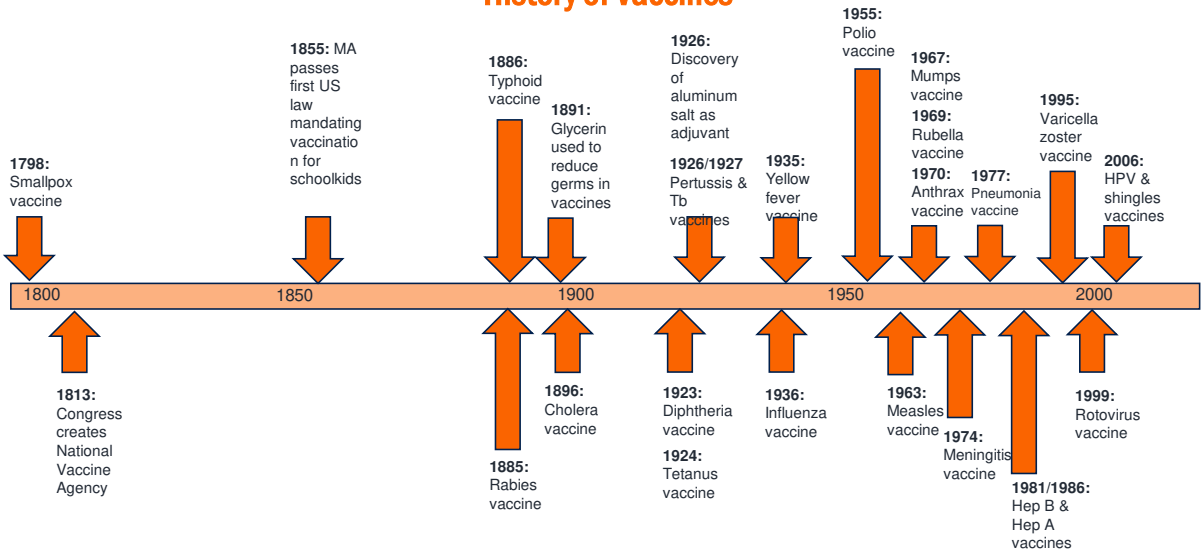
- *Employee of OSU Center for Health Sciences*
- *Director, NRMP Board of Directors*

- *No Financial Disclosures*

## Learning Objectives

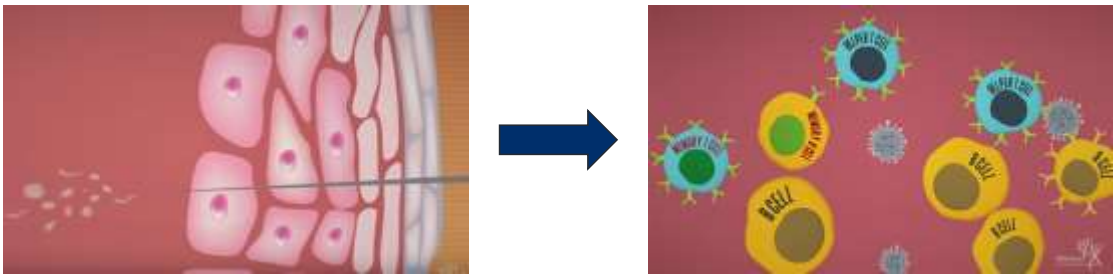
- Describe the recommend vaccinations for the adult patient
- Describe the recommend vaccinations for adults with various chronic medical conditions
- Discuss strategies to increase adult immunization rates

## History of Vaccines

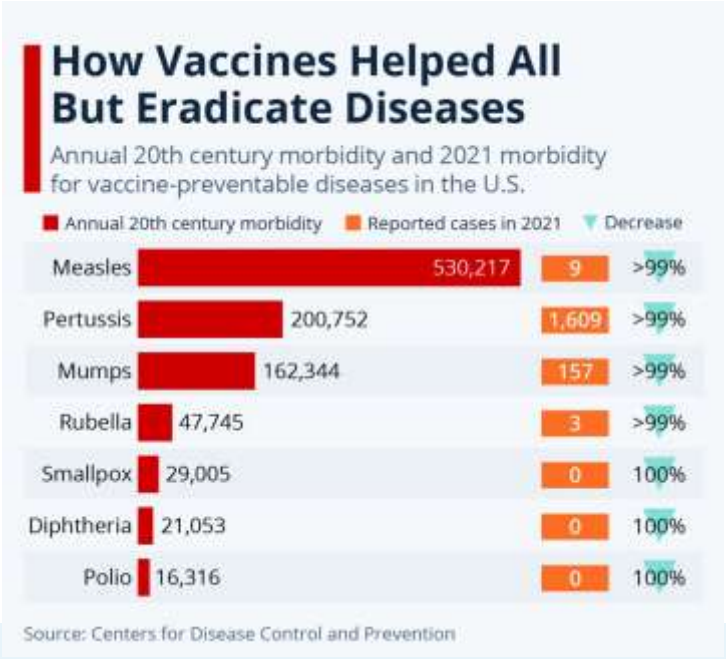



*Note that this timeline is abbreviated to give an overview of vaccine development and the recent explosion of discovery

# How Vaccines Work

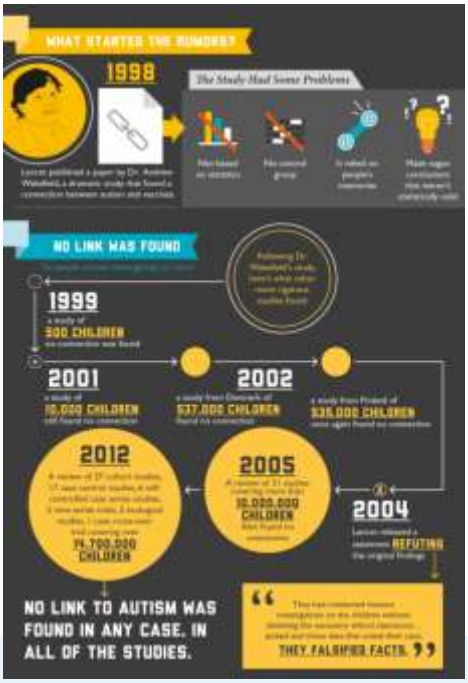


- Vaccines help us develop immunity by imitating an infection and triggering antibodies to develop
- Those antibodies will be available to fight the next time you are exposed to that virus or bacteria


How Vaccines Helped All But Eradicate Diseases
Annual 20th century morbidity and 2021 morbidity for vaccine-preventable diseases in the U.S.
Annual 20th century morbidity
Reported cases in 2021
Decrease
Measles 530,217 9 >99%
Pertussis 200,752 1,609 >99%
Mumps 162,344 157 >99%
Rubella 47,745 3 >99%
Smallpox 29,005 0 100%
Diphtheria 21,053 0 100%
Polio 16,316 0 100%
Source: Centers for Disease Control and Prevention


## Vaccine Safety

- Vaccines are tested by the FDA and are monitored by the CDC when in use
- Vaccine Adverse Events Reporting System (VAERS)
  - http://vaers.hhs.gov/index
  - Telephone number: 1-800-822-7967


WHAT STARTED THE RUMORS?
1998
The Study Had Some Problems
NO LINK WAS FOUND
1999
2001
10,000 CHILDREN
2002
537,000 CHILDREN
$35,000 CHILDREN
2012
74,700,000 CHILDREN
2005
10,920,000 CHILDREN
2004
REFUTING
NO LINK TO AUTISM WAS FOUND IN ANY CASE. IN ALL OF THE STUDIES.
THEY FALSIFIED FACTS.

## Anti-Vaccination Movement

1802, Caricature by James Gillray.
Edward Jenner inoculating patients in the Smallpox and Inoculation Hospital at St. Pancras. The patients are shown sprouting cow heads from various parts of their anatomy following vaccination.

1898. Death as a skeletal figure wielding a scythe. Representing fears concerning the Act of 1898 that made vaccination against smallpox compulsory.


Rally of the Anti-Vaccination League of Canada, Old City Hall, Toronto, November 13, 1919.

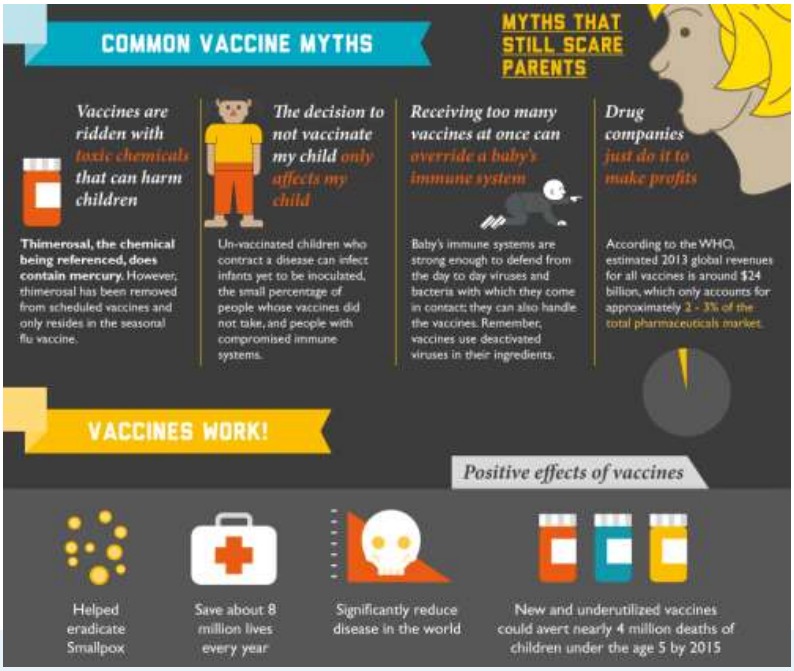
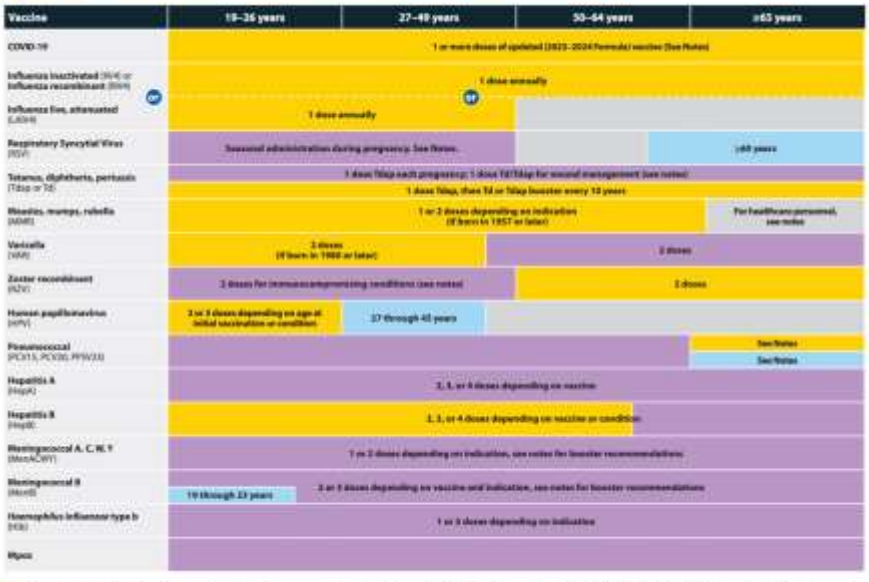
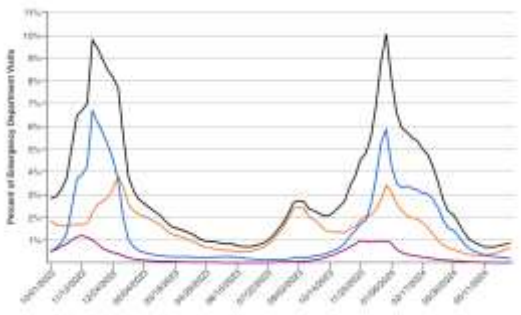

COMMON VACCINE MYTHS
MYTHS THAT STILL SCARE PARENTS
Vaccines are ridden with toxic chemicals that can harm children
Thimerosal, the chemical being referenced, does contain mercury. However, thimerosal has been removed from scheduled vaccines and only resides in the seasonal flu vaccine.
The decision to not vaccinate my child only affects my child
Un-vaccinated children who contract a disease can infect infants yet to be inoculated, the small percentage of people whose vaccines did not take, and people with compromised immune systems.
Receiving too many vaccines at once can override a baby's immune system
Baby's immune systems are strong enough to defend from the day to day viruses and bacteria with which they come in contact; they can also handle the vaccines. Remember, vaccines use deactivated viruses in their ingredients.
Drug companies just do it to make profits
According to the WHO, estimated 2013 global revenues for all vaccines is around $24 billion, which only accounts for approximately 2 - 3% of the total pharmaceuticals market.
VACCINES WORK!
Positive effects of vaccines
Helped eradicate Smallpox
Save about 8 million lives every year
Significantly reduce disease in the world
New and underutilized vaccines could avert nearly 4 million deaths of children under the age 5 by 2015

**Table 1** Recommended Adult Immunization Schedule by Age Group, United States, 2024

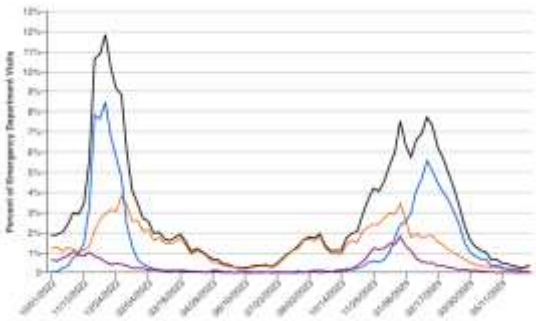


# Respiratory Virus Activity
# Fall 2023 – Spring 2024

United States



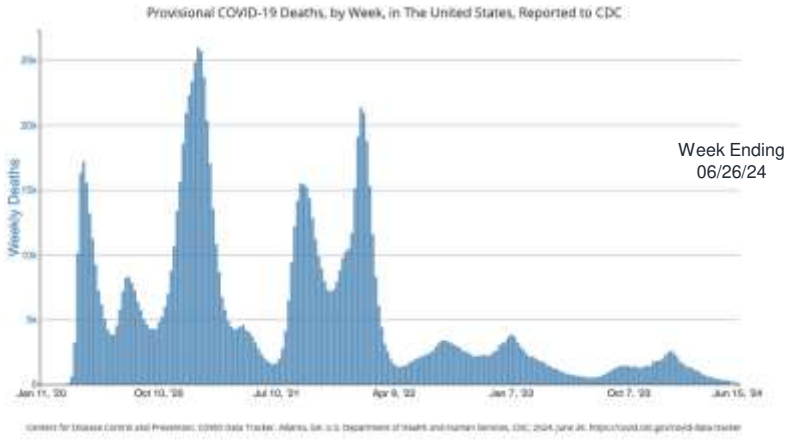
Oklahoma



https://www.cdc.gov/respiratory-viruses/data-research/dashboard/activity-levels.html accessed June 26, 2024

# COVID-19

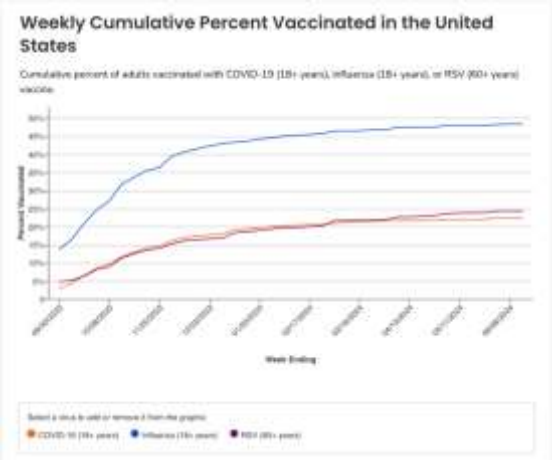
Total Deaths from COVID-19 in US:
**1,192,931**




Week Ending
06/26/24

https://covid.cdc.gov/covid-data-tracker/#maps_new-admissions-rate-county

# COVID-19 Vaccination Rates




| | 2023-2024 UpdatedCOVID-19 Vaccine* |
|---|---|
| Population ≥ 18 Years of Age | 22.5% |
| Population ≥ 65 Years of Age | 40.6% |

*As of May 11, 2024

https://covid.cdc.gov/covid-data-tracker/#vaccination-states-jurisdictions
https://www.cdc.gov/respiratory-viruses/data-research/dashboard/vaccination-trends-adults.html

# COVID-19

**Routine Vaccination for Age ≥ 12**

(not immunocompromised)

- Unvaccinated:
  - 2 doses of updated (2023-2024 Formula) Moderna or Pfizer-BioNTech vaccine at 0, 3-8 weeks
  - 2 dose series of updated (2023-2024 Formula) Novavax at 0, 3-8 weeks
- Previously Vaccinated:
  - Not including at least 1 dose of 2023-2024 vaccine
    - 1 dose of updated (2023-2024 Formula) COVID-19 vaccine at least 8 weeks after last dose
  - Including at least 1 dose of 2023-2024 vaccine
    - Age 12-64 years: No further doses indicated
    - Age ≥65 years: 1 additional dose at least 4 months after last dose

| Abbreviation(s) | Trade Name(s) |
|---|---|
| 1vCOV-mRNA | Comirnaty/Pfizer-BioNTech COVID-19 Vaccine<br>SPIKEVAX/Moderna COVID-19 Vaccine |
| 2vCOV-mRNA | Pfizer-BioNTech COVID-19 Vaccine, Bivalent<br>Moderna COVID-19 Vaccine, Bivalent |
| 1vCOV-aPS | Novavax COVID-19 Vaccine |

https://www.cdc.gov/vaccines/covid-19/downloads/COVID-19-immunization-schedule-ages-6months-older.pdf

# COVID-19

**Moderate – Sever Immunocompromised**

- Unvaccinated:
  - 3 dose series of updated (2023-2024 Formula) Moderna at 0, 4, 8 weeks
  - 3 dose series of updated (2023-2024 Formula) Pfizer-BioNTech at 0, 3, 7 weeks
  - 2 dose series of updated (2023-2024 Formula) Novavax at 0, 3 weeks

- Previously Vaccinated with Moderna (mRNA):
  - Previously vaccinated with 1 dose of any Moderna:
    - 2-dose series of updated (23-24 Formula) Moderna at 0, 4 weeks
  - Previously vaccinated with 2 dose of any Moderna:
    - 1 dose series of updated (23-24 Formula) Moderna at least 4 weeks after most recent dose
  - Previously vaccinated with ≥3 doses of Moderna, **Not** including at least 1 dose of 23-24 Formula
    - Give 1 dose at least 8 weeks after last dose
  - Previously vaccinated ≥3 doses of Moderna, **Including** including at least 1 dose of 23-24 Formula
    - Age 12-64: may receive 1 additional dose at least 8 weeks after last dose
    - Age ≥65: administer 1 additional dose at least 8 weeks after last dose

- Previously Vaccinated with Pfizer-BioNTech (mRNA):
  - Previously vaccinated with 1 dose of any Pfizer-BioNTech:
    - 2-dose series of updated (23-24 Formula) Pfizer-BioNTech at 0, 4 weeks
  - Previously vaccinated with 2 dose of any Pfizer-BioNTech:
    - 1 dose series of updated (23-24 Formula) Pfizer-BioNTech at least 4 weeks after most recent dose
  - Previously vaccinated with ≥3 doses of Pfizer-BioNTech, **Not** including at least 1 dose of 23-24 Formula:
    - Give 1 dose at least 8 weeks after last dose
  - Previously vaccinated with ≥3 doses of Pfizer-BioNTech, **Including** including at least 1 dose of 23-24 Formula
    - Age 12-64: may receive 1 additional dose at least 8 weeks after last dose
    - Age ≥65: administer 1 additional dose at least 8 weeks after last dose

https://www.cdc.gov/vaccines/covid-19/downloads/COVID-19-immunization-schedule-ages-6months-older.pdf

# COVID-19 mRNA Vaccination

## Contraindicated or Not Recommended

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a component of an mRNA COVID-19 vaccine

- Note:
  - mRNA COVID-19 vaccines contain polyethylene glycol (PEG)
  - Full list of vaccine ingredients available via package inserts & FDA EUA fact sheets

## Precautions

- Diagnosed non-severe allergy (e.g., urticaria beyond the injection site) to a component of an mRNA COVID-19 vaccine; or non-severe, immediate (onset less than 4 hours) allergic reaction after administration of a previous dose of an mRNA COVID-19 vaccine
- Myocarditis or pericarditis within 3 weeks after a dose of any COVID-19 vaccine
- Multisystem inflammatory syndrome in children (MIS-C) or multisystem inflammatory syndrome in adults (MIS-A)
- Moderate or severe acute illness with or without fever

# COVID-19 Protein Subunit Vaccination

## Contraindicated or Not Recommended

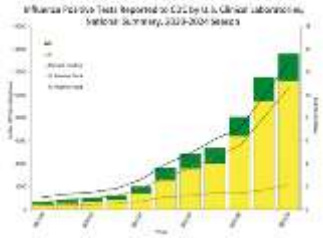
- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a component of a Novavax COVID-19 vaccine

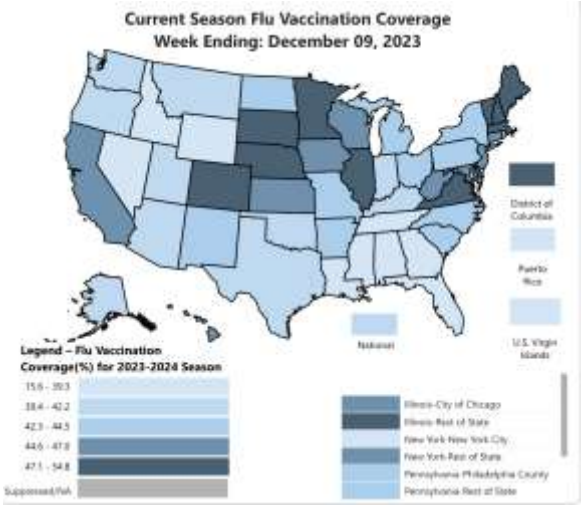
- Note:
  - Full list of vaccine ingredients available via package inserts & FDA EUA fact sheets

## Precautions

- Diagnosed non-severe allergy (e.g., urticaria beyond the injection site) to a component of the Novavax COVID-19 vaccine; or non-severe, immediate (onset less than 4 hours) allergic reaction after administration of a previous dose of the Novavax COVID-19 vaccine
- Myocarditis or pericarditis within 3 weeks after a dose of any COVID-19 vaccine
- Multisystem inflammatory syndrome in children (MIS-C) or multisystem inflammatory syndrome in adults (MIS-A)
- Moderate or severe acute illness with or without fever

# Influenza






https://www.cdc.gov/flu/weekly/index.htm

# Influenza Vaccination

**Routine Vaccination for Age ≥ 19**

- Unvaccinated:
  - 1 dose of any influenza vaccine appropriate for age and health status annually
- Age ≥ 65 years
  - Any one of quadrivalent high-dose inactivated influenza vaccine (HD-IIV4), quadrivalent recombinant influenza vaccine (RIV4), or quadrivalent adjuvanted inactivated influenza vaccine (aIIV4)

| Abbreviation(s) | Trade Name(s) |
|---|---|
| Inactivated – IIV4 | Many Brands |
| Live, Attenuated – LAIV4 | FluMist Quadrivalent |
| Recombinant – RIV4 | Flublok Quadrivalent |

**Pregnant Women**

- 1st or 2nd Trimester – vaccinate in September or October
- 3rd Trimester during July / August – vaccine to protect infant in first month of life

**New 2023-2024**

All persons aged ≥6 months with egg allergy should receive influenza vaccine. Any influenza vaccine that is otherwise appropriate for the recipient's age and health status can be used. Egg allergy alone necessitates no additional safety measures for influenza vaccination beyond those recommended for any recipient of any vaccine, regardless of severity of previous reaction to egg.

1982 – 2022:
- 77% of seasons peaked after January
- 62% of seasons peaked after February

https://www.cdc.gov/mmwr/volumes/72/rr/rr7202a1.htm

# What Flu Shot is Right for My Patient?

**Standard Dose Inactivated**
- SD-IIV4
- 15 mcg/strain
- Egg-based
- For people of all ages
- Jet Injector (needle free) version for adults aged 18-64 years

**Cell-Based**
- cc IIV4
- Grown in cell culture
- Egg-free
- For people of all ages

## AGE ≥ 65

**High Dose**
- HD-IIV4
- 4x the standard dose
- 60 mcg/strain
- Egg-based

**Adjuvanted**
- aIIV4
- Includes adjuvant M59
- Egg-based

**Recombinant**
- RIV4
- Triple antigen dose
- 4 mcg/strain
- Egg-free
- Only for adults age ≥ 18 years

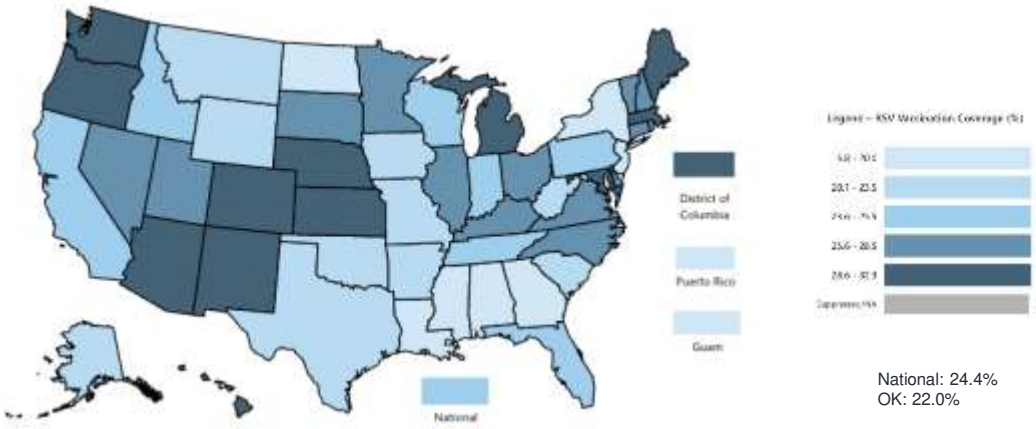
**Nasal Spray**
- LAIV4 (live attenuated influenza vaccine)
- Needle-free
- Egg-based
- Only for healthy, non-pregnant adults age < 50 years

| Flu Myths | vs. | Flu Facts |
|---|---|---|
| The flu shot never works | | You are 40% to 60% less likely to get the flu with a flu shot[1]. It also can lower the severity of sickness and reduce the risk of needing to go to the doctor or hospital |
| The flu shot can give me the flu. | | The flu shot cannot five you the flu. The virus in the vaccine is not active, so it can't infect you. |
| The flu shot will make me feel sick | | Most people have no symptoms from the flu shot except for soreness or redness at the injection site. You might develop other side effects, such as headache, fever, tiredness, and muscle aches[2]. These symptoms are usually mild and will go away within a few days. |
| The only way to get a flu vaccine is through a shot | | As an alternative to a shot, there is a nasal spray vaccine that is approved for use in healthy, non-pregnant people ages 2-49 years old. People with certain medical conditions should not get the nasal spray flu vaccine. |
| It's best to wait to get a shot so I'm covered until the end of the flu season | | It's better to have your flu shot by September or October because it takes about two weeks for the body to build antibodies to the virus. That way, you'll be protected through the flu season, or about six months. |
| I never get the flu, so I don't need a vaccine | | The shot not only protects you, but it also protects others because you are less likely to spread the flu. |

1. Centers for Disease Control and Prevention: Vaccine Effectiveness: How Well Do Flu Vaccines Work? (accessed Dec 2023): cdc.gov.
2. Centers for Disease Control and Prevention: *Flu Vaccine Safety Information* (accessed Dec 2023): cdc.gov.

# Respiratory Syncytial Virus

RSV Vaccination Coverage, Adults Age ≥ 60 years
(week ending 5/11/24)




National: 24.4%
OK: 22.0%

https://www.cdc.gov/vaccines/imz-managers/coverage/rsvvaxview/adults-60-coverage-intent.html

# Respiratory Syncytial Virus

| Abbreviation(s) | Trade Name(s) |
|---|---|
| RSV | Abrysvo<br>Arexvy |

## Routine Vaccination

- **Pregnant at 32 weeks – 36w 6 days, from September - January**
  - 1 dose RSV vaccine
- **All other pregnant patients**:
  - RSV vaccination not indicated

## Special Situations

- **Age ≥ 60 years**
  - Shared Clinical Decision-Making – 1 dose of RSV vaccine
- Increased Risk for Severe RSV Disease
  - Chronic Medical Conditions: lung disease, cardiovascular disease, neurologic or neuromuscular conditions, kidney disorders, liver disorders, hematologic disorders, diabetes mellitus, and moderate or severe immune compromise (due to medical condition or immunosuppressive medications)
  - Frail
  - Advanced Age
  - Reside in nursing home or other long-term care facilities

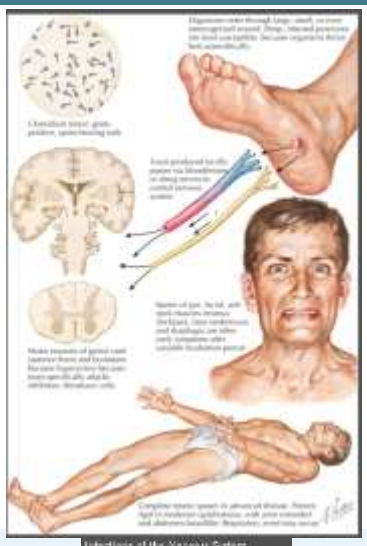
**Contraindicated or Not Recommended**:
Severe allergic reaction (e.g., anaphylaxis) to a vaccine component

**Precautions**: Moderate or severe acute illness with or without fever

https://www.cdc.gov/mmwr/volumes/72/wr/mm7229a4.htm

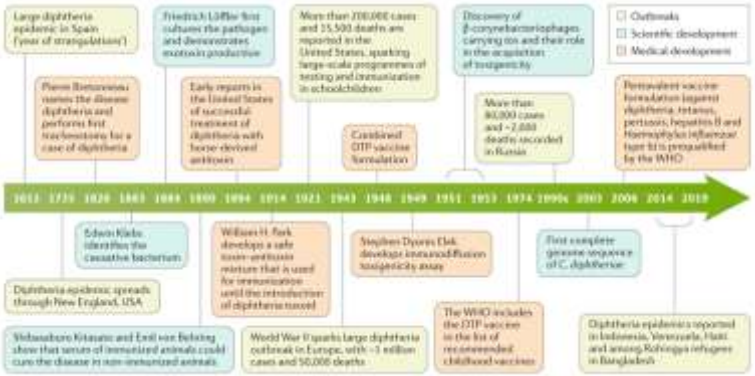
# Tetanus ~ *Clostridium tetani*

The Wounded following the Battle of Corunna: Tetanus Following Gunshot Wounds
Charles Bell (1774-1842)
The Royal College of Surgeons of Edinburgh



# Diphtheria ~ *Corynebacterium diphtheriae*



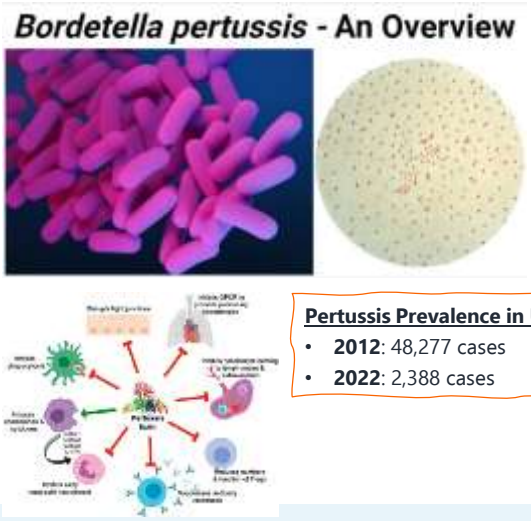



**Diptheria Prevalence in U.S.**

- **1920s** (before vaccine): 100,000-200,000 cases; 13,000-15,000 deaths
- **1996-2018**: 14 cases; 1 death

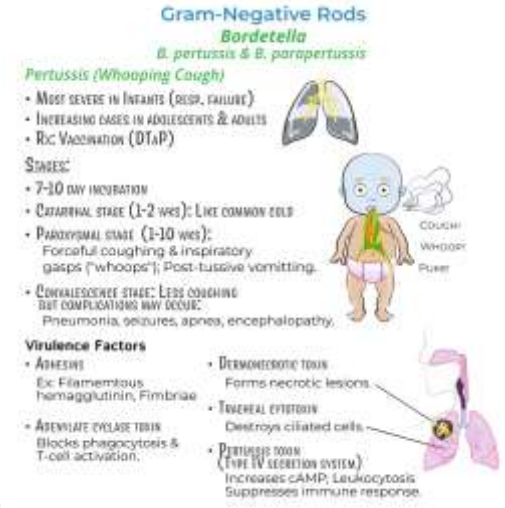
Sharma, N.C., Efstratiou, A., Mokrousov, I. *et al.* Diphtheria. *Nat Rev Dis Primers* **5**, 81 (2019). https://doi.org/10.1038/s41572-019-0131-y

# Pertussis ~ *Bordetella pertussis*




**Pertussis Prevalence in U.S.**

- **2012**: 48,277 cases
- **2022**: 2,388 cases



# Tetanus, Diphtheria, and Pertussis

| Abbreviation(s) | Trade Name(s) |
|---|---|
| Tetanus & diphtheria toxoids - Td | Tenivac<br>Tdvax |
| Tetanus, diptheria toxoids & acellular pertussis - Tdap | Adacel<br>Boostrix |

## Routine Vaccination

- **Previously did not receive Tdap at or after age 11 years**
  - 1 dose Tdap, the TD or Tdap q10 years

## Special Situations

- **Previously did not receive primary vaccination series for tetanus, diphtheria, or pertussis**
  - 1 dose Tdap followed by 1 dose 1 Td or Tdap at least 4 weeks later, & 3rd dose of Td or Tdap 6-12 month later
  - Then Td or Tdap q10 years
- **Pregnancy**
  - 1-dose Tdap during each pregnancy, preferably in early part of gestational weeks 27-36.
- **Wound Management**
  - Persons with 3 or more doses of tetanus-toxoid-containing vaccine:
    - Clean & Minor wounds – administer Tdap or Td if ≥10 years since last vaccine
    - All other wounds – administer Tdap or Td if ≥5 years since last vaccine

# Tetanus, Diphtheria, and Pertussis Vaccination

**Contraindicated or Not Recommended**

- Severe allergic reaction (e.g. anaphylaxis) after a previous dose or to a vaccine component.
- For Tdap only: Encephalopathy (e.g., coma, decreased level of consciousness, prolonged seizures), not attributable to another identifiable cause, within 7 days of administration of previous dose of DTP, DTaP, or Tdap

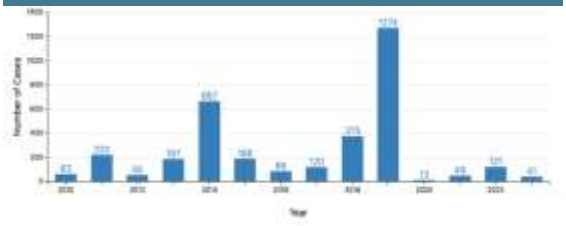
**Precautions**

- Guillain-Barre syndrome (GBS) within 6 weeks after a previous dose of tetanus-toxoid-containing vaccine
- History of Arthus-type hypersensitivity reactions after a previous dose of diphtheria-toxoid-containing or tetanus-toxoid-containing vaccine; defer vaccination until at least 10 years have elapsed since the last tetanus-toxoid-containing vaccine.
- Moderate or severe acute illness with or without fever
- For Tdap only: Progressive or unstable neurologic disorder, uncontrolled seizures, or progressive encephalopathy until a treatment regimen has been established and the condition has stabilized.

# Rubeola (Measles)



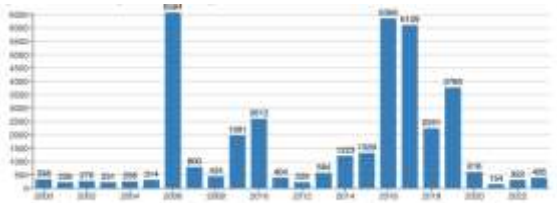
Number of Measles Cases Reported by Year




https://www.cdc.gov/measles/symptoms/photos.html
https://www.cdc.gov/measles/cases-outbreaks.html

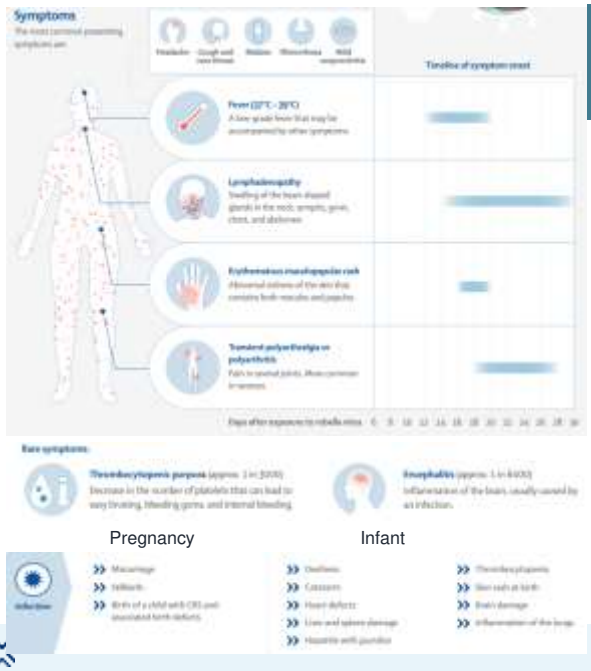
# Rubulavirus (Mumps)


Number of Mumps Cases Reported by Year



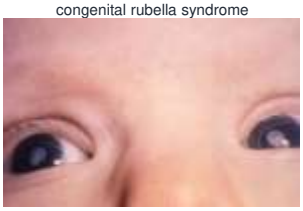
https://www.ncbi.nlm.nih.gov/books/NBK534785/
https://www.cdc.gov/mumps/outbreaks.html

# Rubella




Rubella Rash

'Blueberry muffin' skin lesions – congenital rubella syndrome



Congenital cataract – congenital rubella syndrome

https://www.thelancet.com/pb-assets/Lancet/infographics/rubella/Rubella.pdf

# Measles, Mumps, & Rubella

## Attenuated **Live** Virus Vaccine

| Abbreviation(s) | Trade Name(s) |
|---|---|
| Measles, Mumps, Rubella - MMR | M-M-R II<br>Priorix |

### Routine Vaccination

- **No Evidence of Immunity**
  - 1 dose
- **Evidence of Immunity**
  - Born before 1957 (except for healthcare personnel)
  - Documentation of receipt of MMR vaccine
  - Laboratory evidence of immunity or disease

### Healthcare Personnel

- **Born before 1957 with no evidence of immunity to measles, mumps, or rubella**
  - Consider 2-dose series at least 4 weeks apart (protection measles & mumps)
  - 1-dose (protection against rubella)
- **Born in or after 1957 with no evidence of immunity to measles, mumps, or rubella**
  - 2-dose series at least 4 weeks apart (protection measles & mumps)
  - 1-dose (protection against rubella)

# Measles, Mumps, & Rubella

| Abbreviation(s) | Trade Name(s) |
|---|---|
| Measles, Mumps, Rubella - MMR | M-M-R II<br>Priorix |

**Special Situations**

- **Pregnancy with no evidence of immunity to rubella -** MMR CONTRAINDICATED in Pregnancy
  - Vaccinate after delivery prior to d/c home: 1 dose
- **Nonpregnant woman of childbearing age with no evidence of immunity to rubella**
  - 1 dose
- **HIV infection with CD4 ≥15% & CD4 count ≥200 cells/mm$^3$ for at least 6 month and no evidence of immunity to measles, mumps, or rubella**
  - Never vaccinated: 2-dose series at least 4 weeks apart
  - Previously vaccinated: 1-dose
- **Severe Immunocompromising Conditions -** MMR CONTRAINDICATED
- **Students in postsecondary educational institutions, international travelers, & household / close contacts of immunocompromised persons – without evidence of immunity to measles, mumps, or rubella**
  - 2 – dose series at least 4 weeks apart

# Measles, Mumps, & Rubella Vaccination

**Contraindicated or Not Recommended**

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component
- Severe immunodeficiency (e.g., hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, long-term immunosuppressive therapy or patients with HIV infection who are severely immunocompromised)
- Pregnancy
- Family history of altered immunocompetence, unless verified clinically or by laboratory testing as immunocompetent

**Precautions**

- Recent (≤11 months) receipt of antibody-containing blood product (specific interval depends on product)
- History of thrombocytopenia or thrombocytopenic purpura
- Need for tuberculin skin testing or interferon-gamma release assay (IGRA) testing
- Moderate or severe acute illness with or without fever.

# Varicella Zoster Virus → Chicken Pox

**Contagious for 1-2 days prior to rash and until all lesions are scabbed over.**

Chickenpox Illness lasts 4 to 7 days
Classic Symptoms:

- Rash
  - Rash that turns into itchy, fluid-filled blisters that eventually turn into scabs.
  - Rash starts on chest, back and face, and then spreads to the entire body (including inside the mouth, eyelids, or genital area)
- Other typical symptoms (start 1-2 days before rash): fever, tiredness, loss of appetite, headache

# Varicella

## Attenuated **Live** Virus Vaccine

| Abbreviation(s) | Trade Name(s) |
|---|---|
| Varicella – VAR | Varivax |

### Routine Vaccination

- **No Evidence of Immunity to Varicella**
  - 2-dose series (4-8 weeks apart)
  - Evidence of Immunity
    - Born before 1980 (except pregnant persons and healthcare personnel), documentation of 2 doses varicella-containing vaccine at least 4 weeks apart, diagnosis ore verification of history of varicella or herpes zoster by a healthcare provider, laboratory evidence of immunity or disease

### Special Situations

- **Pregnancy - No Evidence of Immunity**
  - Varicella vaccine is CONTRAINDICATED in pregnancy
  - Vaccinate prior to discharge following delivery if never received any varicella-containing vaccine (regardless of whether US-born before 1980)
- **Healthcare Personnel - No Evidence of Immunity**
  - 2-dose series (4-8 weeks apart) if previously did not receive any varicella-containing vaccine regardless of whether U.S.-born before 1980.
  - 1-dose if previously received 1 dose of varicella-containing vaccine
- **HIV with CD4% ≥15% and CD4 Count ≥200 cells/mm3**
  - Vaccination may be considered (2 doses 3 months apart)
  - Varicella vaccination CONTRAINDICATED CD4% ≤15% or CD4 count ≤200
- **Severe Immunocompromising Conditions**
  - Varicella Vaccination CONTRAINDICATED

# Varicella Vaccination

**Contraindicated or Not Recommended**

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component
- Severe immunodeficiency (e.g., hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, long-term immunosuppressive therapy or patients with HIV infection who are severely immunocompromised)
- Pregnancy
- Family history of altered immunocompetence, unless verified clinically or by laboratory testing as immunocompetent

**Precautions**

- Recent (≤11 months) receipt of antibody-containing blood product (specific interval depends on product)
- Receipt of specific antiviral drugs (acyclovir, famciclovir, or valacyclovir) 24 hours before vaccination (avoid use of these antiviral drugs for 14 days after vaccination)
- Use of aspirin or aspirin-containing products
- Moderate or severe acute illness with or without fever

# Zoster

| Abbreviation(s) | Trade Name(s) |
|---|---|
| Zoster Vaccine, Recombinant - RZV | Shingrix |

## Routine Vaccination

- **Age ≥ 50 years**
  - 2-dose recombinant zoster vaccine 2-6 months apart (minimum interval 4 weeks; repeat dose if administered too soon)
  - Note
    - Serologic evidence or prior varicella is not necessary for zoster vaccine.
    - In patient with known serological evidence of varicella susceptibility, administer varicella vaccination prior to RZV vaccine

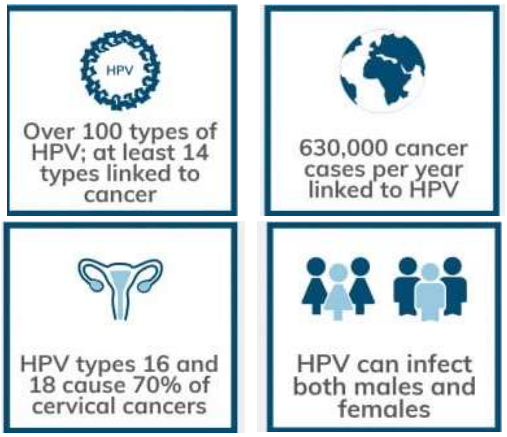
## Special Situations

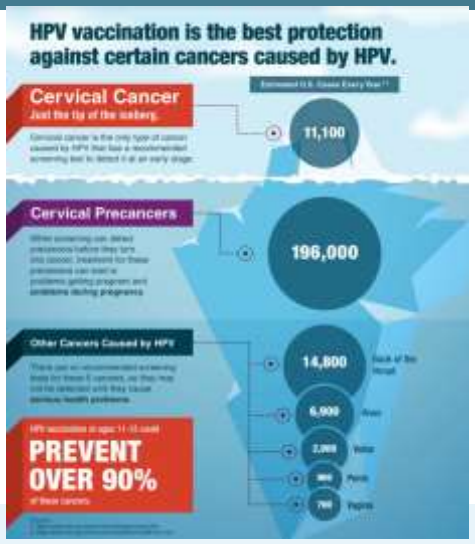
- **Pregnancy**
  - No ACIP recommendation for RZV use in pregnancy
- **Immunocompromising conditions (including persons with HIV regardless of CD4 count)**
  - 2-dose series recombinant zoster vaccine (RZV, Shingrix) 2-6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon)

**Contraindicated or Not Recommended**:
Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component

**Precautions**: Moderate or severe acute illness with or without fever; Current herpes zoster infection

# Human Papillomavirus (HPV)




https://www.cdc.gov/vaccines/pubs/surv-manual/chpt05-hpv.html

# Human Papillomavirus

| Abbreviation(s) | Trade Name(s) |
|---|---|
| Human Papillomavirus Vaccine - HPV | Gardasil 9 |

**All Persons age ≤ 26 years**

- **Age 9-14 years**
  - Received 1 dose or 2 doses less than 5 months apart – 1 additional dose
- **Age ≥ 15 years**
  - 3-dose series (0, 1-2 months, 6 months)

**Contraindicated or Not Recommended**: Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component

**Precautions**:
Moderate or severe acute illness with or without fever

**Shared Decision Making**

- Adults age 27 – 45 (Catch-Up)
  - 2-dose series (if initiated age 9-14)
  - 3-dose series (if initiated ≥15 years)

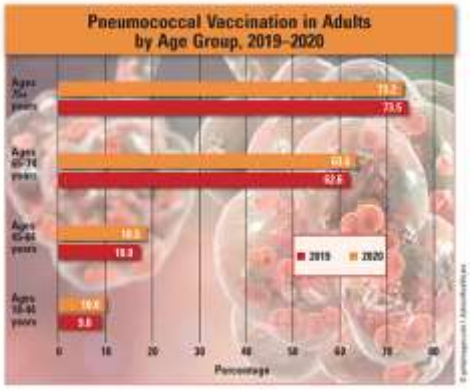
**Special Situations**

- Immunocompromising conditions (including HIV)
  - 3-dose series
- Pregnancy
  - HPV vaccine is not recommended until after pregnancy

# Pneumococcal Pneumonia

Top 5 Principal Diagnosis Among Nonmaternal, Non-Neonatal Inpatient Stays, 2018

| Rank | Principal diagnosis | Number of stays | Percent of stays | Aggregate cost, $ billions | Percent of aggregate cost | Mean cost per stay, $ |
|---|---|---|---|---|---|---|
| All non-maternal/non-neonatal stays | | 27,833,580 | 100.0 | 460.6 | 100.0 | 14,500 |
| Top 20 diagnoses | | 13,236,380 | 47.6 | 188.3 | 40.7 | 14,200 |
| 1 | Septicemia | 2,219,000 | 8.0 | 41.5 | 10.3 | 18,700 |
| 2 | Heart failure | 1,155,900 | 4.1 | 14.5 | 3.6 | 12,600 |
| 3 | Osteoarthritis | 1,128,100 | 4.1 | 10.0 | 4.5 | 16,000 |
| 4 | Pneumonia (except that caused by tuberculosis) | 749,700 | 2.7 | 7.7 | 1.9 | 10,500 |
| 5 | Diabetes mellitus with complication | 678,600 | 2.4 | 7.9 | 1.9 | 11,600 |




https://remingtonreport.com/intelligence-resources/remington-report/the-ten-most-frequent-diagnoses-for-inpatient-stays/

# Pneumococcal Vaccination

| Abbreviation(s) | Trade Name(s) |
|---|---|
| Pneumococcal conjugate vaccine | PCV 15 – Vaxneuvance<br>PCV 20 – Prevnar 20 |
| Pneumoccocal polysaccharide vaccine | PPSV23 – Pneumovax 23 |

**Routine Vaccination**

- **Age ≥ 65 years who have**
  - **Not previously received a dose of PCV13, PCV15, or PCV20 or whose previous vaccination history is unknown**
    - 1 dose PCV15 OR 1 dose of PCV20
      - NOTE: if PCV15 is used, administer 1 dose of PPSV23 at least 1 year after the PCV15 dose (May use minimum interval of 8 weeks for adults with an immunocompromising condition, cochlear implant, or cerebrospinal fluid leak)

# Pneumococcal

## Adults ≥65 years old
## Complete pneumococcal vaccine schedules

| Prior vaccines | Option A | Option B |
|---|---|---|
| None* | PCV20 | PCV15 → ≥1 year† → PPSV23 |
| **PPSV23 only** at any age | ≥1 year → PCV20 | ≥1 year → PCV15 |
| **PCV13 only** at any age | ≥1 year → PCV20 | ≥1 year† → PPSV23 |
| **PCV13** at any age & **PPSV23** at <65 yrs | ≥5 years → PCV20 | ≥5 years‡ → PPSV23 |

* Also applies to people who received PCV7 at any age and no other pneumococcal vaccines
† Consider minimum interval (8 weeks) for adults with an immunocompromising condition, cochlear implant, or cerebrospinal fluid leak (CSF) leak
‡ For adults with an immunocompromising condition, cochlear implant, or CSF leak, the minimum interval for PPSV23 is ≥8 weeks since last PCV13 dose and ≥5 years since last PPSV23 dose; for others, the minimum interval for PPSV23 is ≥1 year since last PCV13 dose and ≥5 years since last PPSV23 dose

## Shared clinical decision-making for those who already completed the series with PCV13 and PPSV23

| Prior vaccines | Shared clinical decision-making option |
|---|---|
| **Complete series: PCV13** at any age & **PPSV23** at ≥65 yrs | ≥5 years → PCV20 — Together, with the patient, vaccine providers **may choose** to administer PCV20 to adults ≥65 years old who have already received PCV13 (but not PCV15 or PCV20) at any age and PPSV23 at or after the age of 65 years old. |

www.cdc.gov/vaccines/vpd/pneumo/downloads/ pneumo-vaccine-timing.pdf.

# Pneumococcal

## Adults 19–64 years old with specified immunocompromising conditions
## Complete pneumococcal vaccine schedules

| Prior vaccines | Option A | Option B |
|---|---|---|
| None* | PCV20 | PCV15 → ≥8 weeks → PPSV23 |
| PPSV23 only | ≥1 year → PCV20 | ≥1 year → PCV15 |
| PCV13 only | ≥1 year → PCV20 | ≥8 weeks → PPSV23; ≥5 years → PPSV23<br>Review pneumococcal vaccine recommendations again when your patient turns 65 years old. |
| PCV13 and 1 dose of PPSV23 | ≥5 years → PCV20 | ≥5 years† → PPSV23<br>Review pneumococcal vaccine recommendations again when your patient turns 65 years old. |
| PCV13 and 2 doses of PPSV23 | ≥5 years → PCV20 | **No vaccines** recommended at this time.<br>Review pneumococcal vaccine recommendations again when your patient turns 65 years old. |
| Immunocompromising conditions | • Chronic renal failure<br>• Congenital or acquired asplenia<br>• Congenital or acquired immunodeficiency‡<br>• Generalized malignancy<br>• HIV infection<br>• Hodgkin disease<br>• Iatrogenic immunosuppression§<br>• Leukemia<br>• Lymphoma<br>• Multiple myeloma<br>• Nephrotic syndrome<br>• Sickle cell disease/other hemoglobinopathies<br>• Solid organ transplant | |

* Also applies to people who received PCV7 at any age and no other pneumococcal vaccines
† The minimum interval for PPSV23 is ≥8 weeks since last PCV13 dose and ≥5 years since last PPSV23 dose
‡ Includes B- (humoral) or T-lymphocyte deficiency, complement deficiencies (particularly C1, C2, C3, and C4 deficiencies), and phagocytic disorders (excluding chronic granulomatous disease)
§ Includes diseases requiring treatment with immunosuppressive drugs, including long-term systemic corticosteroids and radiation therapy

www.cdc.gov/vaccines/vpd/pneumo/downloads/ pneumo-vaccine-timing.pdf.

# Pneumococcal

### Adults 19–64 years old with a cochlear implant or cerebrospinal fluid leak
### Complete pneumococcal vaccine schedules

| Prior vaccines | Option A | Option B |
|---|---|---|
| None* | PCV20 | PCV15 → ≥8 weeks → PPSV23 |
| PPSV23 only | ≥1 year → PCV20 | ≥1 year → PCV15 |
| PCV13 only | ≥1 year → PCV20 | ≥8 weeks → PPSV23<br>Review pneumococcal vaccine recommendations again when your patient turns 65 years old. |
| PCV13 and 1 dose of PPSV23 | ≥5 years → PCV20 | **No vaccines** recommended at this time.<br>Review pneumococcal vaccine recommendations again when your patient turns 65 years old. |

* Also applies to people who received PCV7 at any age and no other pneumococcal vaccines.

### Adults 19–64 years old with chronic health conditions
### Complete pneumococcal vaccine schedules

| Prior vaccines | Option A | Option B |
|---|---|---|
| None* | PCV20 | PCV15 → ≥1 year → PPSV23 |
| PPSV23 only | ≥1 year → PCV20 | ≥1 year → PCV15 |
| PCV13† only | ≥1 year → PCV20 | ≥1 year → PPSV23<br>Review pneumococcal vaccine recommendations again when your patient turns 65 years old. |
| PCV15† and PPSV23 | **No vaccines** are recommended at this time.<br>Review pneumococcal vaccine recommendations again when your patient turns 65 years old. | |
| **Chronic health conditions** | • Alcoholism<br>• Chronic heart disease, including congestive heart failure and cardiomyopathies<br>• Chronic liver disease | • Chronic lung disease, including chronic obstructive pulmonary disease, emphysema, and asthma<br>• Cigarette smoking<br>• Diabetes mellitus |

* Also applies to people who received PCV7 at any age and no other pneumococcal vaccines.
† Adults with chronic medical conditions were previously not recommended to receive PCV15.

www.cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf.

| Pneumococcal Vaccine | | |
|---|---|---|
| | **Contraindicated or Not Recommended** | **Precautions** |
| Pneumococcal conjugate (PCV15, PCV20) | • Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component<br>• Severe allergic reaction (e.g., anaphylaxis) to any diphtheria-toxoid-containing vaccine or to its vaccine component | • Moderate or severe acute illness with or without fever |
| Pneumococcal polysaccharide (PPSV23) | • Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component | • Moderate or severe acute illness with or without fever |

# Pneumococcal


## Get the App

# Hepatitis A

| Abbreviation(s) | Trade Name(s) |
|---|---|
| Hepatitis A Vaccine - HepA | Havrix<br>Vaqta |

**Patients who Request Vaccination Not Previously Vaccinated**

- 2-dose series HepA
  - Havrix 6-12 months apart; or
  - Vaqta 6-18 months apart
- 3-dose series HepA-HepB
  - Twinrix at 0, 1, 6 months

**Contraindicated or Not Recommended**: Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component including Neomycin

**Population at Risk for Hepatitis A Infection**

- Chronic Liver Disease
- HIV Infection
- Men who have sex with men
- Injection or non-injection drug use
- Persons experiencing homelessness
- Work with Hepatitis A virus
- Travel in countries - high/intermediate endemic Hep A
- Close, personal contact - international adoptee
- Pregnancy
- Settings for exposure – healthcare, group homes, nonresidential day care facilities.

**Precautions**: Moderate or severe acute illness with or without fever

# Hepatitis B

**Routine Vaccination: Age 19 – 59**

- 2-dose series Heplisav-B*
  - doses 4 weeks apart
- 3-dose series Engerix-B, PreHevbrio*, Recombivax HB
  - at 0, 1, 6 months
  - Minimum interval: dose 1 to dose 2: 4weeks; dose 2 to dose 3: 8 weeks
- 3-dose series HepA-HepB
  - Twinrix at 0, 1, 6 months
- 4-dose series HepA-HepB
  - Accelerated Twinrix schedule of 3 doses at 0, 7, and 21-30 days; booster at 12 months

**Age ≥ 60 years without known risk factors** – may receive a Hep B Vaccine Series

**Age ≥ 60 years with known risk factors** – should receive a Hep B Vaccine Series

**HepB risk factors**

- Chronic Liver Disease
- Sexual exposure risk
- Current or recent injection drug use
- Percutaneous or mucosal risk for exposure to blood
- Incarceration
- Travel in countries with high or intermediate endemic hepatits B

**Age ≥ 60 years with diabetes** – shared clinical decision making to choose a HepB Vaccine Series

**Patients on dialysis** – 3 dose Recombivax HB or 4-dose Engerix-B (use 2mL dose instead of 1 mL)

# Hepatitis B Vaccination

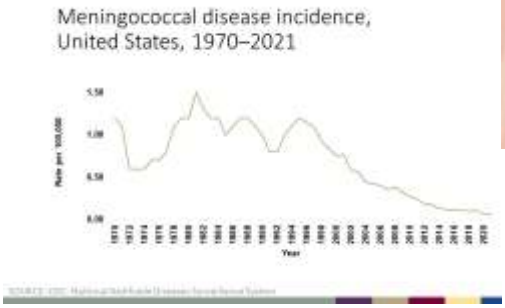
**Contraindicated or Not Recommended**

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component including yeast
- Pregnancy: *Heplisav-B* and *PreHevbrio* are note recommended due to lack of safety data in pregnant persons

**Precautions**

- Moderate or severe acute illness with or without fever

# Meningococcal






https://www.cdc.gov/meningococcal/surveillance/index.html#:~:text=Rates%20of%20meningococcal%20disease%20have,reported%20(See%20Figure%201).

# Meningococcal Serogroups ACWY

| Abbreviation(s) | Trade Name(s) |
|---|---|
| MenACWY-D | Menactra |
| MenACWY-CRM | Menveo |
| MenACWY-TT | MenQuadfi |

**Special Situations**

- **Anatomical or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, complement inhibitor (e.g. eculizumab, ravulizumab) use:**
  - 2-dose series MenACWY at least 8 weeks apart; revaccinate every 5 years if risk remains
- **Travel in countries with hyperendemic or epidemic meningococcal disease, or microbiologist routinely exposed to *Neisseria meningitidis***
  - 1 dose MenACWY; revaccinate every 5 years if risk remains
- **First-year college students who live in residential housing (if not previously vaccinated at age ≥ 16 years) or military recruit**
  - 1 dose MenACWY

# Meningococcal B

| Abbreviation(s) | Trade Name(s) |
|---|---|
| MenB-4C | Bexsero |
| MenB-FHbp | Trumenba |

**Shared Clinical Decision Making**

- **Adolescents / Young Adults age 16-23 years (preferred age 16-18) – not at increased risk for meningococcal**
  - 2-dose series MenB-4C (Bexsero) at least 1 month apart
  - 2-dose series MenB-FHbp (Trumenba) at 0, 6 months

**Special Situation for MenB**

- **Anatomical or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, complement inhibitor (e.g. eculizumab, ravulizumab) use:**
  - 2-dose series MenB-4C (Bexsero) at least 1 month apart
  - 3-dose series MenB-FHbp (Trumenba) at 0, 1-2, 6 months
  - Note: 1 dose MenB booster 1 year after primary series; revaccinate every 2-3 years if risk persists
- **Pregnancy –** delay MenB until after pregnancy unless at increased risk and vaccination benefits outweigh potential risks

| Meningococcal Serogroups ACWY Vaccination | | |
|---|---|---|
| | **Contraindicated or Not Recommended** | **Precautions** |
| MenACWY-CRM [Menveo]<br><br>MenWCWY-TT [MenQuadfi] | • Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component<br>• For MenACWY-CRM only: severe allergic reaction to any diphtheria toxoid-or CRM197-containing vaccine<br>• For MenACWY-TT only: severe allergic reaction to a tetanus toxoid-containing vaccine | • Moderate or severe acute illness with or without fever |
| MenB-4C [Bexsero]<br><br>MenB-FHbp [Trumenba] | • Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component | • Pregnancy<br>• For MenB-4C only: Latex sensitivity<br>• Moderate or severe acute illness with or without fever |

# Poliovirus

**Paul Alexander** (Jan 30, 1946 – Mar 11, 2024)
Diagnosed in 1952 at age 6
Lived in an iron long for over 70 years

Iron Lung – negative pressure ventilator designed to stimulate breathing in patients who have lost control of their respiratory muscles. The patient's head is exposed outside the cylinder, while the body is sealed inside. Air pressure inside the cylinder is cycled to facilitate inhalation and exhalation.

**Jonas Salk (1914-1995)**
American Virologist & Medical Researcher
Developed the inactivated polio vaccine

Salk vaccine available to the public in April 1955

He chose to not patent the vaccine or seek any profit from it to maximize global distribution

# Poliovirus

**Routine Vaccination**

- **Adults known or suspected to be unvaccinated or incompletely vaccinated**
  - Administer remaining doses (1, 2, oe 3 IPV doses) to complete a 3-dose primary series

**Special Situations**

- **Adults at increased risk of exposure to poliovirus who completed primary series***
  - Administer 1 lifetime IPV booster

- *Note: Complete primary series consists of at least 3 doses of IPV or trivalent oral poliovirus vaccine (tOPV) in any combination.

# *Haemophilus influenzae* type b

| Abbreviation(s) | Trade Name(s) |
|---|---|
| Hib | ActHIB<br>Hiberix<br>PedvaxHIB |

**Special Population**

- Anatomical or Functional Asplenia (including sickle cell disease)
  - Not previously Vaccinated: 1 dose
  - Elective splenectomy: 1 dose preferably at least 14 days before splenectomy
- Hematopoietic Stem Cell Transplant (HSCT)
  - 3-dose series 4 weeks apart starting 6-12 months after successful transplant, regardless of Hib vaccination history.

**Contraindicated or Not Recommended**: Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component

**Precautions**: Moderate or severe acute illness with or without fever

# Monkeypox

| Abbreviation(s) | Trade Name(s) |
|---|---|
| Mpox | Jynneos |

**Any person at risk for Mpox infection**

- 2-dose series, 28 days apart

**Mpox risk factors**

- Persons who are gay, bisexual, and other MSM, transgender or nonbinary people who in the past 6 months have had:
  - A new diagnosis of at least 1 sexually transmitted disease
  - More than 1 sexual partner
  - Sex in a commercial sex venue
  - Sex in association with a large public event in a geographic area when Mpox transmission is occurring
- Person who are sexual partners of the persons described above
- Persons who anticipate experiencing any of the situations described above

- **Pregnancy –** no recommendation from ACIP due to lack of safety data; Engage in a shared decision-making process if above risk factors present regarding whether to receive the vaccination

# Summary of Vaccines

- Inactivated Vaccines
  - Hepatitis A
  - Flu
  - Polio
  - Rabies
- Live-Attenuated Vaccines
  - MMR (Measles, mumps, rubella)
  - Varicella (Chickenpox)
  - Yellow Fever
  - Rotavirus
  - Smallpox
  - Flu (Nasal Spray)
- Messenger RNA (mRNA) Vaccines
  - COVID-19
- Subunit, Recombinant, Polysaccharide, & Conjugate Vaccines
  - Hib (*Haemophilus influenzae type b)*
  - Hepatitis B
  - HPV (Human papillomavirus)
  - Whooping cough (part of DTaP)
  - Pneumococcal disease
  - Meningococcal disease
  - Shingles
- Toxoid Vaccines
  - Diphtheria
  - Tetanus
- Viral Vector Vaccines
  - COVID-19

Egg Allergy - Contraindication to Yellow Fever vaccine & Q fever vaccine
Egg Allergy – Caution (but considered safe): MMR-V & Influenza Vaccine

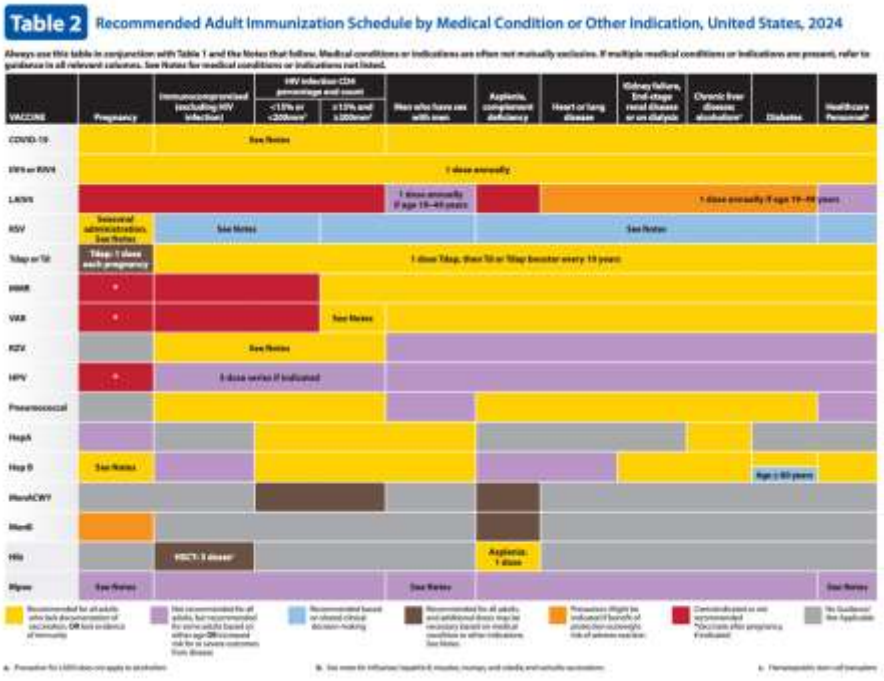


**Table 2** Recommended Adult Immunization Schedule by Medical Condition or Other Indication, United States, 2024

Always use this table in conjunction with Table 1 and the Notes that follow. Medical conditions or indications are often not mutually exclusive. If multiple medical conditions or indications are present, refer to guidance in all relevant columns. See Notes for medical conditions or indications not listed.

| VACCINE | Pregnancy | Immunocompromised (including HIV infection) | HIV infection CD4 percentage and count: <15% or <200/mm³ | HIV infection CD4 percentage and count: ≥15% and ≥200/mm³ | Men who have sex with men | Asplenia, complement deficiency | Heart or lung disease | Kidney failure, End-stage renal disease or on dialysis | Chronic liver disease; alcoholism[a] | Diabetes | Healthcare Personnel[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| COVID-19 | | See Notes | | | | | | | | | |
| Flu or RSV | 1 dose annually | | | | | | | | | | |
| LAIV4 | | | | | 1 dose annually if age 19–49 years | | 1 dose annually if age 19–49 years | | | | |
| RSV | Seasonal administration. See Notes | See Notes | | | | See Notes | | | | | |
| Tdap or Td | Tdap: 1 dose each pregnancy | 1 dose Tdap, then Td or Tdap booster every 10 years | | | | | | | | | |
| MMR | • | | | | | | | | | | |
| VAR | • | | | See Notes | | | | | | | |
| RZV | | See Notes | | | | | | | | | |
| HPV | • | 3 dose series if indicated | | | | | | | | | |
| Pneumococcal | | | | | | | | | | | |
| HepA | | | | | | | | | | | |
| Hep B | See Notes | | | | | | | | | Age ≤ 60 years | |
| MenACWY | | | | | | | | | | | |
| MenB | | | | | | | | | | | |
| Hib | | HSCT: 3 doses | | | | Asplenia: 1 dose | | | | | |
| Mpox | See Notes | | | | See Notes | | | | | | See Notes |

Recommended for all adults who lack documentation of vaccination OR lack evidence of immunity

Not recommended for all adults, but recommended for some adults based on additional age-OR risk-based risk for or severe outcomes from disease

Recommended based on shared clinical decision-making

Recommended for all adults and additional doses may be necessary based on medical conditions or other indications. See Notes.

Precaution (Might be indicated if benefit of protection outweighs risk of adverse reaction)

Contraindicated or not recommended *Vaccinate after pregnancy if indicated

No Guidance/ Not Applicable

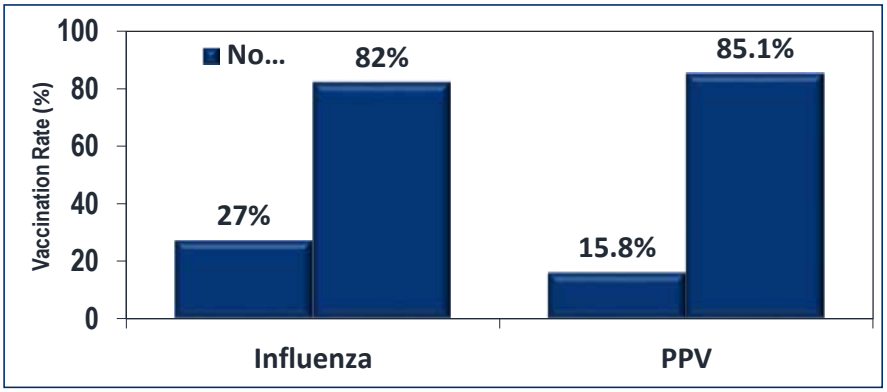
a. Precaution for LAIV4 does not apply to alcoholism.

b. See notes for influenza, hepatitis B, measles, mumps, and rubella, and varicella vaccinations.

c. Hematopoietic stem cell transplant.

# Clinician Recommendation Translates Into Higher Vaccination Rates

## (Even for Patients with Negative Attitudes Toward Vaccines)




*High-risk patients were those ages 65 and older or those having heart disease, lung disease, diabetes, or other serious illness.

Nichol KL, et al. *J Gen Intern Med.* 1996;11(11):673-677.

Date: _____

Patient Name: _____

Patient Age: _____

**Vaccines recommended for you:**

☐ Influenza (☐Standard, ☐High Dose, ☐Other specifications: _____)
☐ COVID-19
☐ Pneumococcal (☐PCV13, ☐PCV20, ☐PPSV23)
☐ Tetanus, diphtheria, pertussis (☐Tdap, ☐Td)
☐ Measles, Mumps, Rubella (MMR)
☐ Human Papillomavirus (HPV)
☐ Zoster
☐ Hepatitis A (HepA)
☐ Hepatitis B (HepB)
☐ Meningococcal A (MenA)
☐ Meningococcal B (MenB)
☐ Varicella (VAR)
☐ Respiratory Syncytial Virus (RSV)
☐ Other Vaccine(s): _____

**Information for Vaccinating Practitioner:**

Additional Patient Information (e.g., contraindications, allergies, etc.):

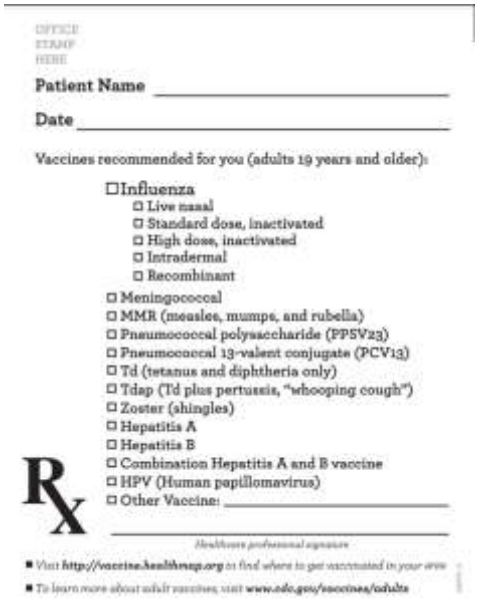
Please report vaccine administration information to the state Immunization Information System (IIS).

**Referring Healthcare Professional Information:**

Signature: _____
Name: _____
Practice: _____
Phone Number: _____

ACP
American College of Physicians

https://www.acponline.org/sites/default/files/documents/clinical_information/resources/adult_immunization/adult-vaccine-rx-pad.pdf



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**Patient Name** _____

**Date** _____

Vaccines recommended for you (adults 19 years and older):

☐ Influenza
- ☐ Live nasal
- ☐ Standard dose, inactivated
- ☐ High dose, inactivated
- ☐ Intradermal
- ☐ Recombinant

☐ Meningococcal
☐ MMR (measles, mumps, and rubella)
☐ Pneumococcal polysaccharide (PPSV23)
☐ Pneumococcal 13-valent conjugate (PCV13)
☐ Td (tetanus and diphtheria only)
☐ Tdap (Td plus pertussis, "whooping cough")
☐ Zoster (shingles)
☐ Hepatitis A
☐ Hepatitis B
☐ Combination Hepatitis A and B vaccine
☐ HPV (Human papillomavirus)
☐ Other Vaccine: _____

Rx

_____
*Healthcare professional signature*

- Visit **http://vaccine.healthmap.org** to find where to get vaccinated in your area
- To learn more about adult vaccines, visit **www.cdc.gov/vaccines/adults**

https://www.cdc.gov/vaccines/hcp/adults/downloads/vaccine-rx-pad.pdf

# Thank You – Questions?


## Natasha N. Bray, DO, MSEd, FACOI, FACP, FNAOME

**Dean, OSUCOM – Cherokee Nation Campus**

**O |** 918.280.1844
**C |** 918.817.2576
**E |** natasha.bray@okstate.edu

19500 E. Ross St.
Tahlequah, OK 74464

**Medicine.okstate.edu** @drb