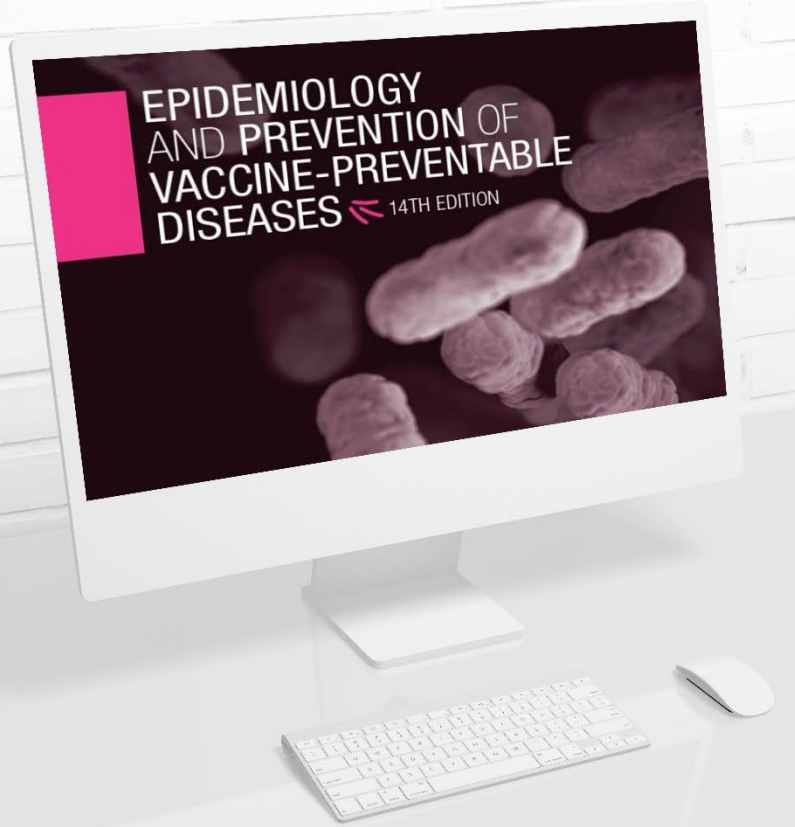
Influenza Vaccines



Pink Book Web-on-Demand Series

Andrew Kroger, MD, MPH
Medical Officer
Immunization Services Division

Learning Objectives

- Describe the fundamental principles of the immune response.
- Describe immunization best practices.
- Describe an emerging immunization issue.
- For each vaccine-preventable disease, identify those for whom routine immunization is recommended.
- For each vaccine-preventable disease, describe characteristics of the vaccine used to prevent the disease.
- Locate current immunization resources to increase knowledge of team's role in program implementation for improved team performance.

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1

Influenza

Influenza

Highly infectious viral illness

- **1930s: Influenza A and B viruses isolated**
- **1930s and 1940s: First non-live vaccines**

- **Has led to multiple pandemics**
  - 1580: First pandemic
  - 1918–1919: Estimated 21 million deaths worldwide
  - 2009–2010: Most recent pandemic (H1N1)

2009 - CDC activated the Emergency Operations Center (EOC) during the H1N1 Pandemic

Chapter 12: Influenza | Pink Book | CDC

Influenza Virus Antigenic Changes

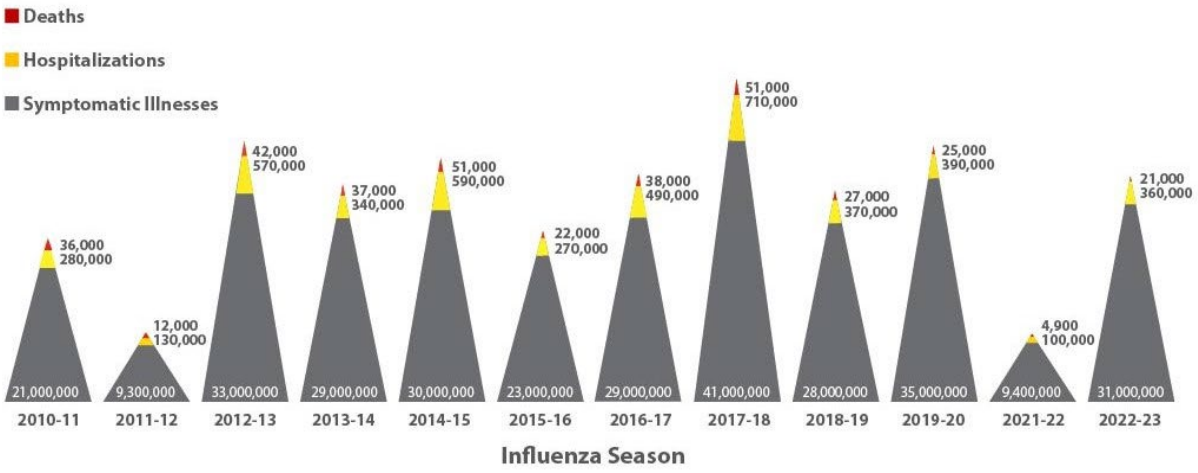
- **Antigenic drift**
  - Small mutations over time
    - Result in novel strains
    - Drift occurs in all types
  - Reason people can get influenza more than once
  - Requires that changes in the viruses represented in the vaccine be considered each year

- **Antigenic shift**
  - Abrupt, major change in influenza A virus surface antigen(s):
    - Hemagglutinin (H)
    - Neuraminidase (N)
  - May lead to pandemic (rare)

Chapter 12: Influenza | Pink Book | CDC, How Flu Viruses Can Change: "Drift" and "Shift" | CDC

Estimated Annual Burden of Flu in the United States, 2010–2023

- **Burden varies widely from year to year**
- **Public health impact always substantial**



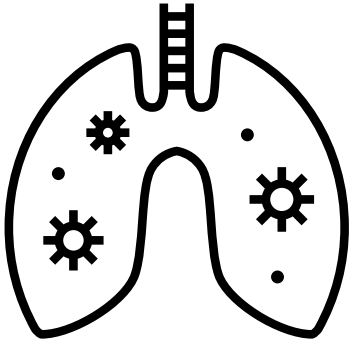
About Estimated Flu Burden | Flu Burden | CDC

Influenza Virus Transmission

Chapter 12: Influenza | Pink Book | CDC Image: 11162 - Public Health Image Library (PHIL) | CDC, How Flu Spreads | CDC

Influenza Pathogenesis

- **Following inhalation, influenza viruses can**
  - Attach to and penetrate respiratory epithelial cells in trachea and bronchi.
  - Replicate, destroying host cells.
- **Regeneration of epithelium takes about 3 to 4 weeks**
- **Viremia (presence of virus in the blood) rarely seen**
- **Virus is shed in respiratory secretions for 5 to 7 days, peaking 1 to 3 days after illness onset.**



Chapter 12: Influenza | Pink Book | CDC, Key Facts About Influenza (Flu) | CDC

Influenza Temporal Pattern

Northern hemisphere:
October through April or May, most often peaks in February

Southern hemisphere:
April through September

Chapter 12: Influenza | Pink Book | CDC

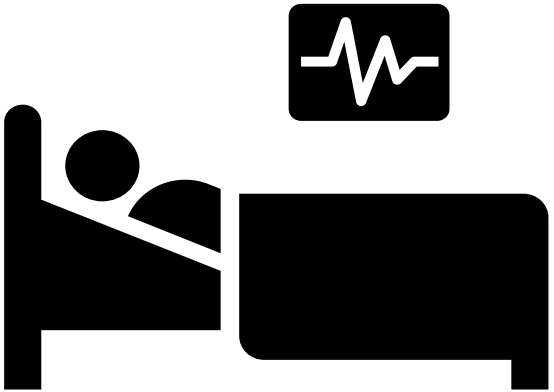
Influenza Clinical Features

- **Incubation period 2 days (range 1–4 days)**
- **50% of infected persons develop classic symptoms:**
  - Fever
  - Feeling feverish/chills
  - Cough
  - Sore throat
  - Runny or stuffy nose
  - Muscle or body aches
  - Headaches

Flu Symptoms & Complications | CDC

Influenza Complications

- **Pneumonia**
  - Secondary bacterial pneumonia
  - Primary influenza pneumonia
- **Myocarditis, myositis, encephalitis**
- **Multi-organ failure**
- **Reye syndrome**
- **Worsening of chronic medical conditions**



Chapter 12: Influenza | Pink Book | CDC; Flu Symptoms & Complications | CDC

Populations at Higher Risk for Medical Complications Attributable to Severe Influenza

- Children younger than 5 years of age
- Adults 65 years of age and older
- People with certain chronic medical conditions
- People younger than 19 years of age who are receiving aspirin- or salicylate-containing medications
- People who are immunocompromised
- Women who are or will be pregnant during the influenza season
- Residents of nursing homes and other long-term care facilities
- American Indian or Alaska Native persons

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Chronic Medical Conditions That Increase Risk for Influenza Complications

- Chronic lung disease, including asthma
- Neurologic and neurodevelopmental conditions
- Blood disorders, including sickle cell disease
- Chronic heart disease
- Severe obesity (BMI of 40 or greater)
- Kidney diseases
- Endocrine disorders, including diabetes
- Liver disorders
- Inherited metabolic disorders
- Immune suppression
- History of stroke

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Influenza Antiviral Medications

- **Recommended when patients with suspected or confirmed influenza are:**
  - Hospitalized
  - Severely ill
  - At higher risk for complications
- **Recommended options effective against influenza A and B viruses:**
  - Neuraminidase inhibitors: oseltamivir, zanamivir, peramivir
  - Endonuclease inhibitor: baloxavir
- **Adamantanes (amantadine and rimantadine) *not recommended* due to documented resistance among circulating influenza A viruses.**

Influenza Antiviral Medications: Summary for Clinicians | CDC, Antiviral Drugs for Seasonal Influenza: Additional Links and Resources | CDC

2

Influenza Vaccine

Influenza Vaccine Abbreviations

- **Main influenza vaccine types**
  - **IIV** = **I**nactivated **I**nfluenza **V**accine
  - **RIV** = **R**ecombinant **I**nfluenza **V**accine
  - **LAIV** = **L**ive-**A**ttenuated **I**nfluenza **V**accine

- **Prefixes identify specific IIVs**
  - **a** = **adjuvanted**: aIIV
  - **cc** = **cell culture-based**: ccIIV
  - **HD** = **High-Dose**: HD-IIV
  - **SD** = **Standard-Dose**: SD-IIV

- **Numeric suffixes indicate valency**
  - **3** = **trivalent**: e.g., aIIV3
  - **4** = **quadrivalent**: e.g., HD-IIV4

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

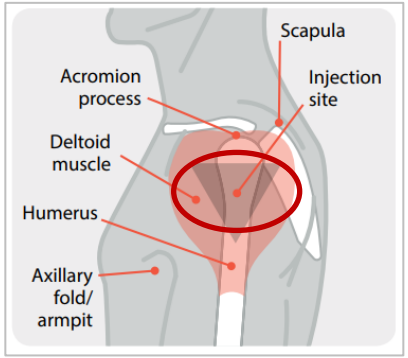
Transition to Only Trivalent Vaccines in 2024–2025

- **Quadrivalent influenza vaccines had been available since 2013–2014.**
- **In March 2024, FDA's Vaccines and Related Biological Products Advisory Committee (VRBPAC) recommended that all 2024–2025 influenza vaccines be trivalent vaccines.**
  - One influenza A(H1N1), one influenza A(H3N2), and one influenza B/Victoria-lineage vaccine virus
  - Influenza B/Yamagata-lineage viruses have not been detected in global virologic surveillance since March 2020.
- **In June 2024, ACIP recommendations included this decision.**

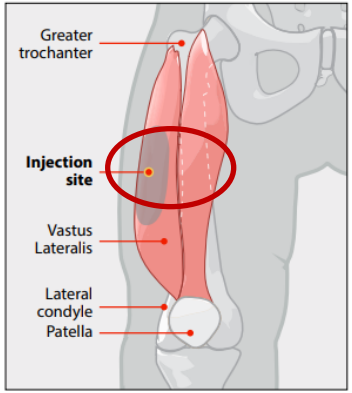
Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Inactivated Influenza Vaccines (IIVs)

- **Non-live vaccine**
- **Standard-dose or high-dose**
- **Most egg-based**
  - Vaccine viruses incubated in chicken eggs prior to inactivation
- **One cell-culture based**
- **One adjuvanted**
- **Intramuscular (IM) administration**



Deltoid muscle for adults and older children



Anterolateral thigh for infants and younger children

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov) ; How Influenza (Flu) Vaccines Are Made | CDC

Standard-dose Nonadjuvanted Egg-Based IIV3s

Vaccine	Age Indication and Approved Dose Volume
Afluria Trivalent	• Children ages 6 through 35 months: 0.25 mL per dose • All persons ages 36 months and older: 0.5 mL per dose
Fluarix Trivalent	• All persons ages 6 months and older: 0.5 mL per dose
FluLaval Trivalent	• All persons ages 6 months and older: 0.5 mL per dose
Fluzone Trivalent	• Children ages 6 through 35 months: 0.25 mL or 0.5 mL per dose • All persons ages 36 months and older: 0.5 mL per dose

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

High-Dose Egg-Based IIV3

Vaccine	Age Indication and Approved Dose Volume
Fluzone High-Dose Trivalent (HD-IIV)	• For persons 65 years of age and older • 0.5 mL per dose

Contains four times the antigen as standard dose influenza vaccines

Can be used in persons 19 through 64 years with a solid organ transplant on immunosuppressive medications

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Adjuvanted Egg-Based IIV3

Vaccine	Age Indication and Approved Dose Volume
Fluad Trivalent (aIIV)	• For persons 65 years of age and older • 0.5 mL per dose

Standard dose with M59 adjuvant

Can be used in persons 19 through 64 years with a solid organ transplant on immunosuppressive medications

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Cell Culture-based IIV3

Vaccine	Age Indication and Approved Dose Volume
Flucelvax (ccIIV)	• For persons 6 months of age and older • 0.5 mL per dose

- **Manufactured without use of eggs**
- **Grown in cell culture prior to inactivation**

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Recombinant Influenza Vaccine (RIV3)

Vaccine	Age Indication and Approved Dose Volume
Flublok Trivalent	• For persons 18 years of age and older • 0.5 mL per dose

- **Non-live vaccine**
- **Manufactured without use of influenza viruses or eggs**
- **Contains recombinant hemagglutinin antigen produced using genetic sequences**
- **IM administration**

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Live, Attenuated Influenza Virus Vaccine (LAIV3)

Vaccine	Age Indication and Approved Dose Volume
FluMist Trivalent	• For persons ages 2 through 49 years • 0.1 mL each nostril (0.2 mL total)

- **Live vaccine**
- **Egg-based manufacturing**
- **Intranasal (NAS) administration**
  - Replicates in the nasopharynx; necessary for immune response

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Intranasal (NAS) Administration for LAIV

- **LAIV the only vaccine administered by the intranasal route.**
- **Administration:**
  - 0.2mL divided between both nostrils

Live, Attenuated Influenza Vaccine (LAIV) (youtube.com)

ACIP Vaccine Administration Guidelines for Immunization | CDC

2024–2025 Influenza Vaccine Composition

Egg-based IIVs and LAIV3:

- A/Victoria/4897/2022 (H1N1)pdm09-like
- A/Thailand/8/2022 (H3N2)-like virus (updated)
- B/Austria/1359417/2021 (Victoria lineage)-like virus

Cell Culture-based IIV3 and RIV3:

- A/Wisconsin/67/2022 (H1N1)pdm09-like virus
- A/Massachusetts/18/2022 (H3N2)-like virus (updated)
- B/Austria/1359417/2021 (Victoria lineage)-like virus

All 2024–2025 influenza vaccines are trivalent.

ACIP Recommendations: Influenza (Flu) Vaccine | ACIP Recommendations | CDC
Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Vaccine Effectiveness: How Well Do Flu Vaccines Work?

- **Varies from season to season, depending on factors such as:**
  - Characteristics of the recipient (such as their age and health)
  - How well the viruses represented in the vaccine match those circulating in the community
- **Flu vaccine has been shown to reduce the risk of having to go to the doctor with flu by 40% to 60%**
  - During seasons when flu vaccine viruses are similar to circulating flu viruses

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov), Benefits of the Flu Vaccine | Flu Vaccines Work | CDC

Vaccine Effectiveness: How Well Do Flu Vaccines Work?

- Flu vaccination has been shown in several studies to reduce severity of illness in people who get vaccinated but still get sick.
- Flu vaccination can reduce the risk of flu-associated hospitalization.

Benefits of the Flu Vaccine | Flu Vaccines Work | CDC

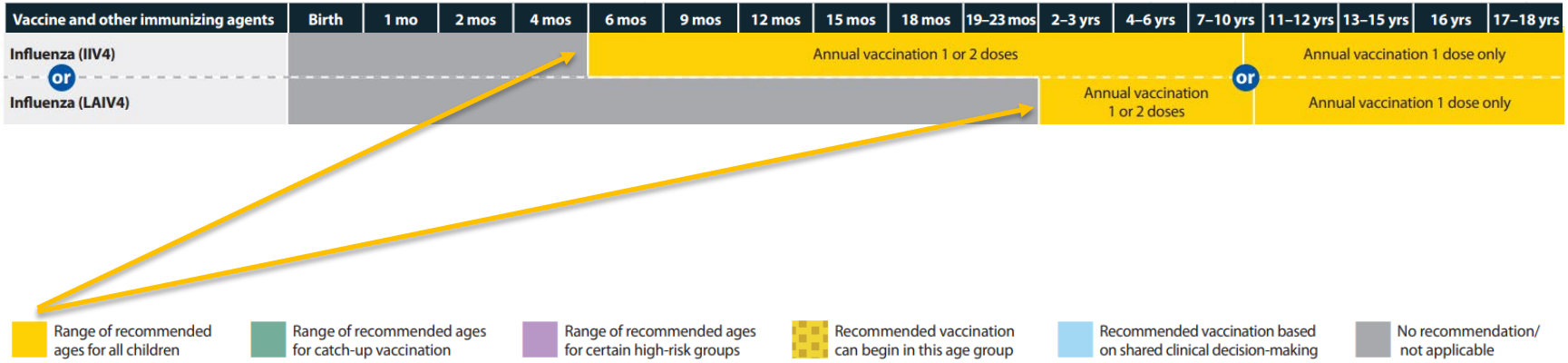
3

Clinical Considerations

Influenza Vaccine Recommendations: Children and Adolescents

Table 1 Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2024

These recommendations must be read with the notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars.
To determine minimum intervals between doses, see the catch-up schedule (Table 2).



Child and Adolescent Immunization Schedule by Age (Addendum updated June 27, 2024) | Vaccines & Immunizations | CDC

Influenza Vaccine Dosing for Children 6 Months Through 8 Years of Age, 2024–2025

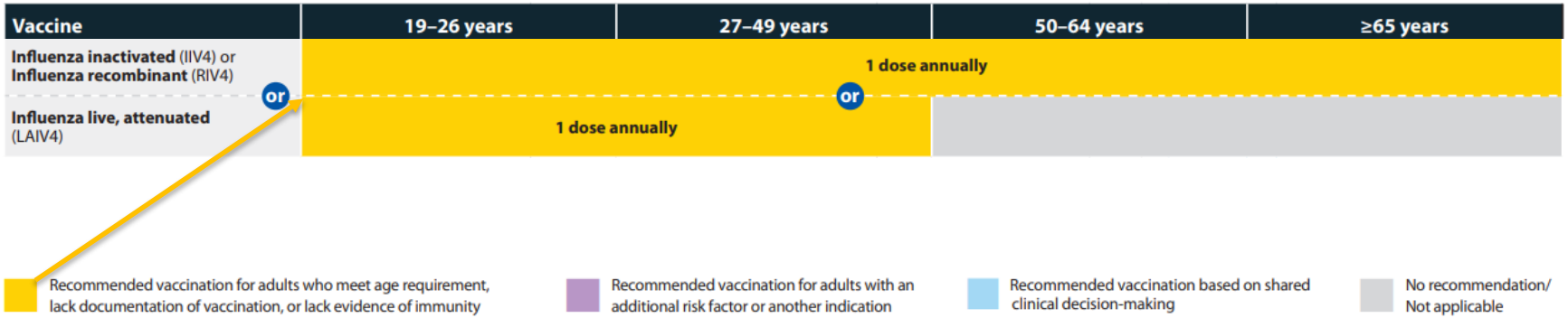
- **During first influenza vaccination season:**
  2 doses of influenza vaccine administered a minimum of 4 weeks apart
  - Children requiring 2 influenza vaccine doses who receive their first dose at age 8 years should receive a second dose even if they turn 9 before getting it.

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Influenza Vaccine Recommendations: Adults

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

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
Influenza inactivated (IIV4) or **Influenza recombinant** (RIV4)	1 dose annually			
Influenza live, attenuated (LAIV4)	1 dose annually			



Adult Immunization Schedule by Age (Addendum updated June 27, 2024) | Vaccines & Immunizations | CDC

Groups Recommended for Vaccination

- **Routine annual influenza vaccination is recommended for all persons 6 months of age or older with no contraindications.**
- **Influenza vaccination particularly important for:**
  - People 6 months of age and older who are at risk of complications and severe illness
  - Contacts and caregivers of people at risk of complications and severe illness
  - Contacts and caregivers of infants younger than 6 months
  - Women who are or will be pregnant during the influenza season.

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Timing of Vaccination

- **Vaccination should occur before onset of influenza activity.**
- **Vaccination should ideally be offered during September or October.**
- **Organized campaigns should continue throughout the season so long as influenza viruses are circulating.**
- **To avoid missed opportunities for vaccination, offer vaccination during routine health care visits and hospitalizations when vaccine is available.**
- **Vaccination in July and August might result in suboptimal immunity later in influenza season.**
  - Not recommended for those 65 years old and older, or for women in the first or second trimester of pregnancy in July or August.

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Vaccination Timing:
May Consider Early Vaccination in July and August

Children 6 months–8 years who need 2 doses should get first dose as soon as vaccine is available.

May be considered for children of any age who need only 1 dose for the season

May be considered for women in 3rd trimester of pregnancy during July–August

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Influenza Vaccination is Recommended for Pregnant Women

- **Includes women who are pregnant, might be pregnant, or postpartum**
- **Higher risk of flu complications during 2nd and 3rd trimesters**
- **Protects infants during first few months of life when too young for vaccination**
- **Influenza vaccine can be administered during any trimester.**
- **Age-appropriate IIV3 or RIV3 may be used.**

LAIV3 should *NOT* be given during pregnancy.

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Age-Appropriate IIV3 or RIV3 Recommended for Immunocompromised Persons

- **Includes but is not limited to people:**
  - With congenital and acquired immunodeficiency states
  - Who are immunocompromised due to medications
    - Additional flexibility for solid organ transplant recipients
  - With anatomic or functional asplenia

✘ LAIV3 should ***NOT*** be given to people with compromised immunity, or with anatomic or functional asplenia.

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

High-dose, Adjuvanted, or Recombinant Influenza Vaccines Preferentially Recommended for Persons 65 Years of Age and Older

- **Includes Fluzone High-Dose (HD-IIV), Fluad (aIIV), and Flublok (RIV)**
  - No preference between these three
- **Persons 65 years of age and older do not mount as strong of an immune response, so they benefit from one of these three vaccines.**
- **If none of the three are available, vaccinate with another age-appropriate influenza vaccine.**

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

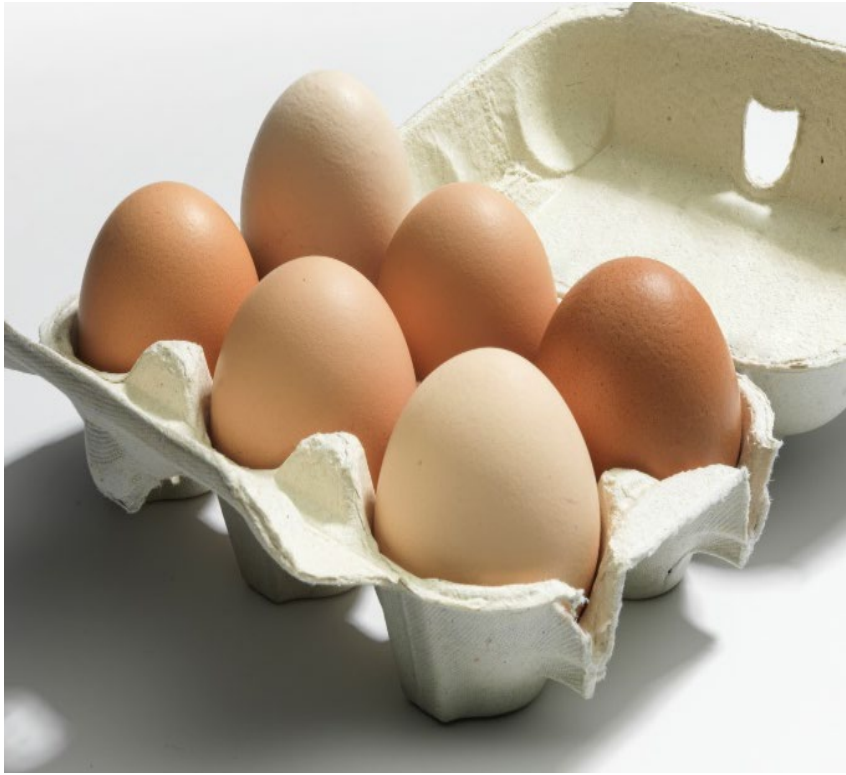
Vaccine Options for Solid Organ Transplant Recipients on Immunosuppressive Therapy

- **A new recommendation beginning in 2024-2025**
- **High-dose or adjuvanted influenza vaccines are acceptable options for solid organ transplant recipients aged 18 through 64 years who are receiving immunosuppressive medication regimens.**
  - No preference over other age-appropriate IIVs or RIV3
  - This is an off-label ACIP recommendation.
- **Persons who receive solid organ transplants on immunosuppressive therapy mount a lower immune response to vaccination and so will benefit from high-dose or adjuvanted vaccines.**

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Influenza Vaccination Recommended for All Persons with Egg Allergy

- **Any appropriate influenza vaccine (egg-based or non-egg) can be used.**
- **Egg allergy alone necessitates no additional safety measures.**
- **All vaccines should be administered in settings with trained personnel and needed equipment needed for recognizing and managing acute hypersensitivity reactions.**



Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Coadministration of Influenza and Other Vaccines

- **IIV3s and RIV3 can be administered with other inactivated or live vaccines.**
- **LAIV3 can be administered simultaneously with other live or inactivated vaccines.**
  - *Reminder*: allow at least 4 weeks between doses when two or more live vaccines are given non-simultaneously.
- **Limited data regarding coadministration with newer nonaluminum adjuvanted vaccines**
  - If aIIV is indicated, another non-adjuvanted influenza vaccine may be considered, but do not delay if a specific vaccine is not available.

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)


ERROR

Influenza Vaccine Administration Errors – Example 1

- **What if a smaller dose (e.g., 0.25 mL) is inadvertently administered to a person 36 months or older?**
- **What steps should be taken?**
  - Remaining volume needed to make a full dose should be administered during the same vaccination visit

    or

  - If measuring the remaining volume is a challenge, administering a repeat dose at the full volume is acceptable.

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Influenza Vaccine Administration Errors – Example 2

- **What if the error is discovered later, after the recipient has left the vaccination setting?**
- **What steps should be taken?**
  - A full dose should be administered as soon as the recipient can return.

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

4

Safety

Adverse Reactions: IIV

Local reactions (soreness, redness)	15–20%
Fever, malaise, myalgia	Less than 1%
Allergic reactions (hives, angioedema, anaphylaxis)	Rare
Guillain-Barré syndrome	1–2 per million

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Adverse Reactions

- **RIV3, like all injectable vaccines, can cause:**
  - Pain, redness, and swelling at the injection site
  - Fever, malaise, and myalgia
- **Some side effects more common with HD-IIV and aIIV compared to SD-IIV, but are mild and temporary:**
  - Pain, redness at injection site
  - Headache, myalgia, malaise

Seasonal Influenza Vaccine Safety: A Summary for Clinicians | CDC, Fluzone High-Dose Seasonal Influenza Vaccine | CDC, Adjuvanted Flu Vaccine | CDC; Flublok | FDA

Adverse Reactions: LAIV

- **Children**
  - Rhinitis (runny nose), fever greater than 100˚F, and nasal congestion
  - Increased risk of wheezing in children 6–23 months of age
- **Adults**
  - Rhinitis (runny nose), nasal congestion, headache, sore throat, tiredness/weakness, muscle aches, cough, chills, sinusitis
  - No increase in the occurrence of fever

Live Attenuated Influenza Vaccine [LAIV] (The Nasal Spray Flu Vaccine) | CDC, Seasonal Influenza Vaccine Safety: A Summary for Clinicians | CDC

Contraindications: IIV

- **Severe allergic reaction (e.g., anaphylaxis) after previous dose of any influenza vaccine or to vaccine component**

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Contraindications: ccIIV and RIV

- **ccIIV**
  - Severe allergic reaction (e.g., anaphylaxis) after a previous dose of ccIIV of any valency or to any component of ccIIV3
- **RIV**
  - Severe allergic reaction (e.g., anaphylaxis) after a previous dose of RIV of any valency or to any component of RIV3

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Precautions: IIV

- **GBS less than 6 weeks after a previous dose of influenza vaccine**
- **Moderate or severe acute illness with or without fever**

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Precautions: ccIIV and RIV

- **ccIIV**
  - GBS less than 6 weeks after previous dose of influenza vaccine
  - Moderate or severe acute illness with or without fever
  - Severe allergic reaction (e.g., anaphylaxis) after previous dose of any other influenza vaccine (any egg-based IIV, RIV, or LAIV)
- **RIV**
  - GBS less than 6 weeks after previous dose of influenza vaccine
  - Moderate or severe acute illness with or without fever
  - Severe allergic reaction (e.g., anaphylaxis) after previous dose of any other influenza vaccine (any egg-based IIV, ccIIV, or LAIV)

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Contraindications: LAIV

- **All ages**
  - Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component
  - Pregnancy
  - Active communication between cerebrospinal fluid/oropharyngeal communications/leaks
  - Cochlear implants
  - Altered immunocompetence
  - Anatomic or functional asplenia (e.g., sickle cell disease)
  - Close contact or caregiver of severely immunosuppressed persons who require a protected environment
  - Recent receipt of antivirals: oseltamivir or zanamivir (48 hours), peramivir (5 days), baloxavir (17 days)
- **Children and adolescents**
  - Concomitant use of aspirin or salicylate-containing medication
  - Ages 2 through 4 years: diagnosed asthma or a recorded wheezing episode in the preceding 12 months

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Precautions: LAIV

- GBS less than 6 weeks after previous dose of influenza vaccine
- Asthma in persons aged 5 years old or older
- Other medical conditions that might predispose to higher risk of complications attributable to influenza
- Severe or moderate acute illness with or without fever

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

Knowledge Check

A child just turned 9 years old yesterday. One month ago, he received his first ever dose of influenza vaccine. Should he receive another dose of influenza vaccine this season?

A. Yes

B. No

Knowledge Check

A child just turned 9 years old yesterday. One month ago, he received his first ever dose of influenza vaccine. Should he receive another dose of influenza vaccine this season?

A. Yes ⟵

B. No

Knowledge Check

Which condition is a contraindication to LAIV for a 10-year-old?

A. Asthma

B. Cognitive impairment

C. Cochlear implant

D. History of influenza infection this year

Knowledge Check

Which condition is a contraindication to LAIV for a 10-year-old?

A. Asthma

B. Cognitive impairment

C. **Cochlear implant** 

D. History of influenza infection this year

5 Storage and Handling

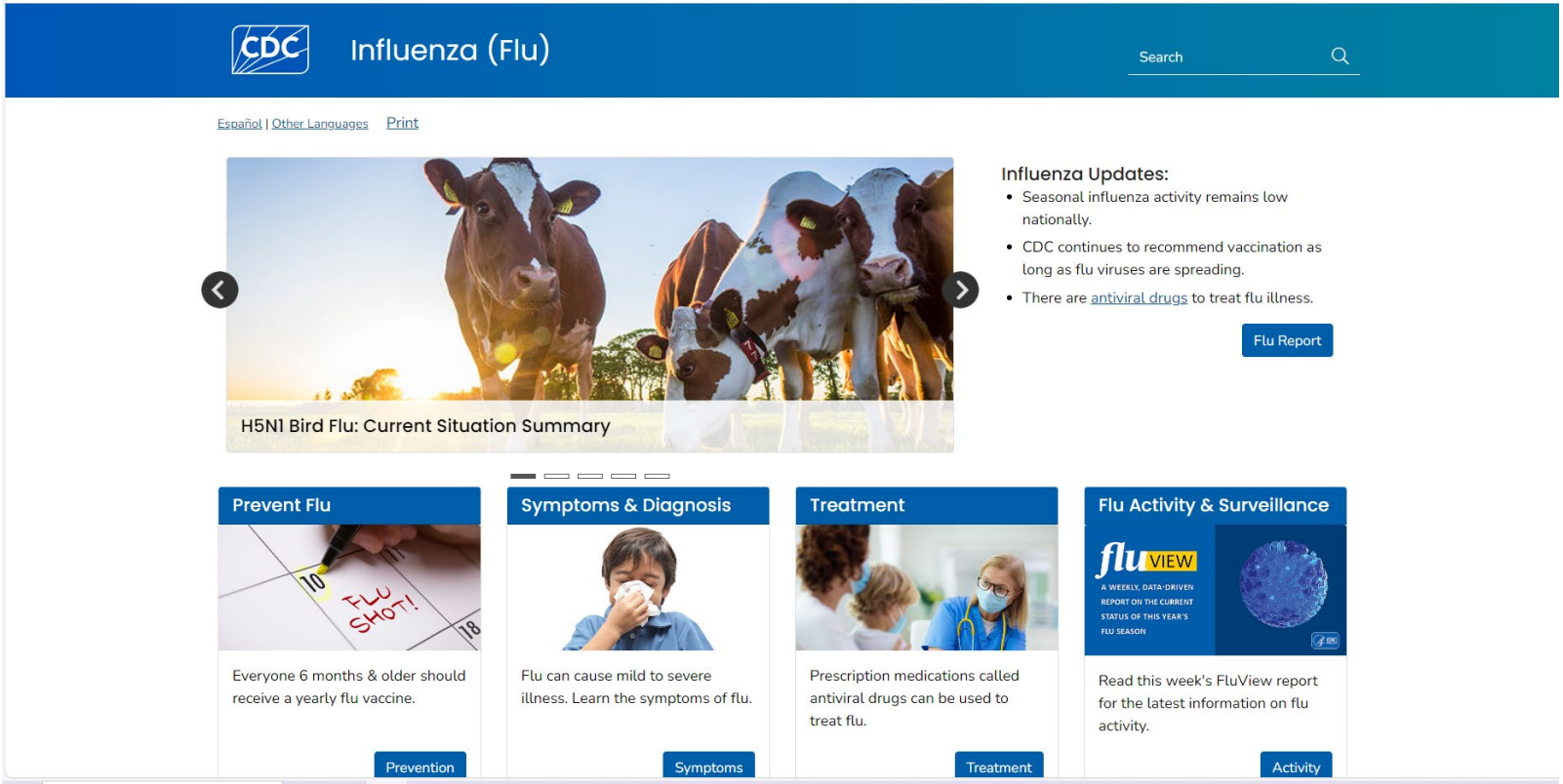
Influenza Vaccine Storage and Handling

- **IIV and LAIV**
  - Store between 2°C and 8°C (36°F and 46°F)
  - No diluent
- **Never expose vaccine to freezing temperatures.**
- **General rule for all vaccines:**
  Never store vaccine in the door of the refrigerator or freezer.

Vaccine Storage and Handling Resources | CDC

6 Resources

Influenza Resources



Influenza (Flu) | CDC

Influenza Vaccine Resources

- **ACIP's influenza vaccine recommendations web page**
  - https://www.cdc.gov/acip-recs/hcp/vaccine-specific/flu.html
- **Immunize.org influenza web page**
  - https://www.immunize.org/influenza/
- **Children's Hospital of Philadelphia Vaccine Education Center influenza web page**
  - https://www.chop.edu/vaccine-education-center/vaccine-details/influenza-vaccine

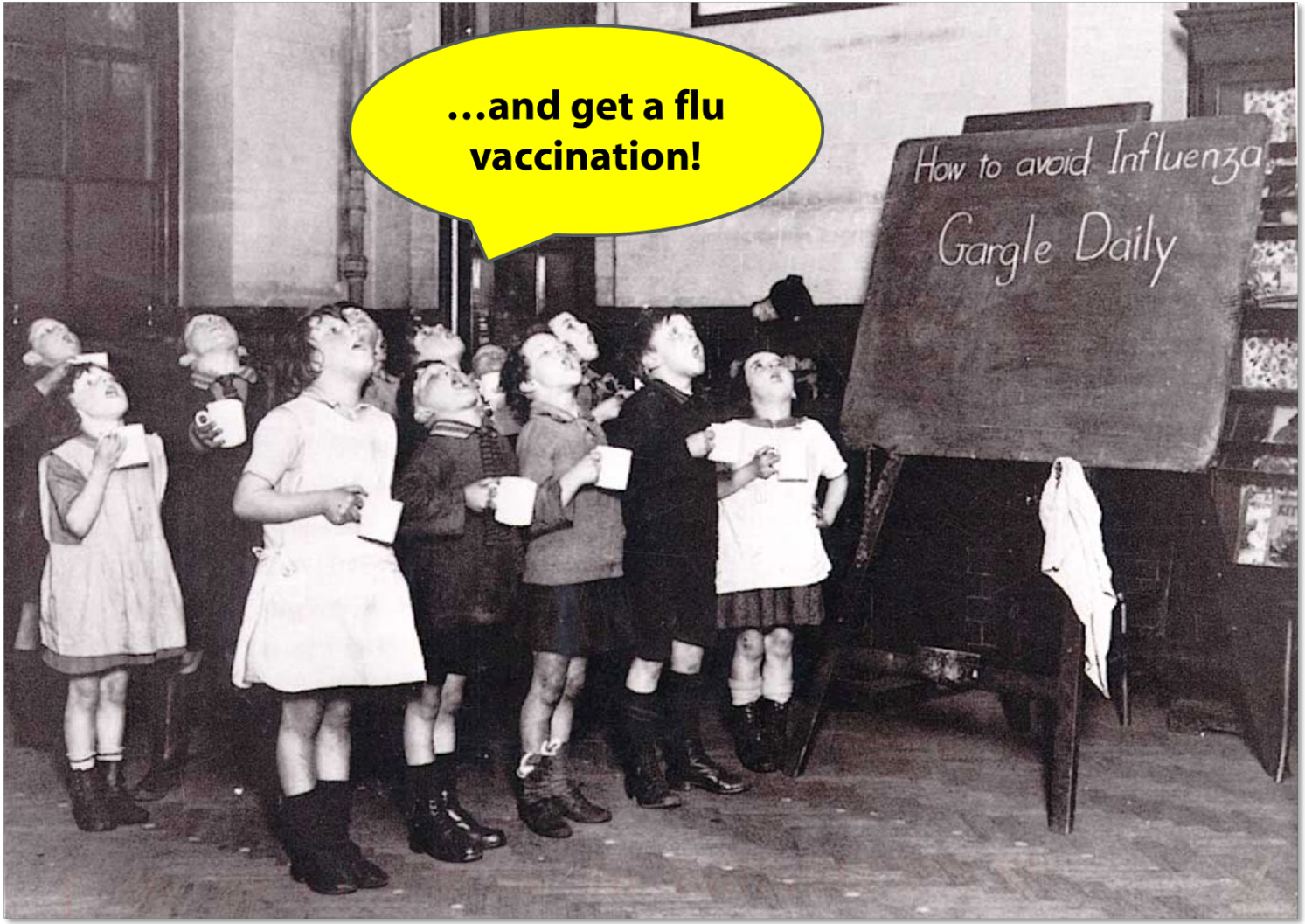
Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices — United States, 2024–25 Influenza Season | MMWR (cdc.gov)

CDC Clinical Resources

- www.cdc.gov/vaccines/
  - Advisory Committee on Immunization Practices (ACIP) Vaccine Recommendations and Guidelines
  - Recommended Immunization Schedules
  - Vaccine Storage and Handling Toolkit
  - Vaccine Information Statements

Pink Book Training Materials


How to avoid Influenza
Gargle Daily


…and get a flu vaccination!
How to avoid Influenza
Gargle Daily

Continuing Education Information

- To claim continuing education (CE) for this course, please follow the steps below by July 1, 2026.
- Search and register for course WD4810-082224 in CDC TRAIN.
- Pass the post-assessment at 80%.
- Complete the evaluation.
- Visit “Your Learning” to access your certificates and transcript.
- If you have any questions, contact CDC TRAIN at train@cdc.gov or CE Coordinator, Melissa Barnett, at MBarnett2@cdc.gov

https://www.train.org/cdctrain/welcome

Email Us Your Immunization Questions

nipinfo@cdc.gov

Thank You From Atlanta!

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

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.