2024-2025 Recommendations for Influenza Prevention and Treatment in Children: An Update for Pediatric Providers

Clinician Outreach and Communication Activity (COCA) Call

Thursday, November 14, 2024

Free Continuing Education

- Free continuing education is offered for this webinar.
- Instructions for how to earn continuing education will be provided at the end of the call.

Continuing Education Disclosure

- In compliance with continuing education requirements, all planners, presenters, and moderators must disclose all financial relationships, in any amount, with ineligible companies over the previous 24 months as well as any use of unlabeled product(s) or products under investigational use.
- CDC, our planners, and presenters/moderators wish to disclose they have no financial relationship(s) with ineligible companies whose primary business is producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients with the exception of Dr. Kristina Bryant who would like to disclose that she is an investigator on multicenter vaccine trials with Enanta, receives an honoraria for a column in *Pediatric News*, and receives royalties from Oxford University Press. All of the relevant financial relationships listed for this individual have been mitigated.
- Content will not include any discussion of the unlabeled use of a product or a product under investigational use with the exception of Dr. Kristina Bryant's discussion about the American Academy of Pediatrics (AAP) recommendation that the use of HD influenza vaccine could be considered in children aged 3-17 years who have undergone hematopoietic cell transplantation.
- CDC did not accept financial or in-kind support from ineligible companies for this continuing education.

Objectives

At the conclusion of today's session, the participant will be able to accomplish the following:

1. Highlight key recommendations in the AAP influenza policy statement, "Recommendations for Prevention and Control of Influenza in Children, 2024-2025" and in the CDC Advisory Committee on Immunization Practices' document, "Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices—United States, 2024-2025 Influenza Season."
2. Review strategies pediatric healthcare providers may implement to increase influenza vaccination rates and highlight current health disparities in vaccination coverage.
3. Describe considerations and best practices for co-administering influenza vaccines and other childhood immunizations.
4. List recommendations for influenza testing in outpatient and hospitalized pediatric patients with suspected influenza and describe test limitations.
5. Review antiviral medications for influenza and CDC recommendations for antiviral treatment of children with suspected or lab-confirmed influenza.

To Ask a Question

- Using the Zoom Webinar System
  - Click on the “Q&A” button
  - Type your question in the “Q&A” box
  - Submit your question

- If you are a patient, please refer your question to your healthcare provider.

- If you are a member of the media, please direct your questions to CDC Media Relations at 404-639-3286 or email media@cdc.gov.

Today's Presenters

- **Tim Uyeki, MD, MPH, MPP, FAAP**
  Chief Medical Officer
  Influenza Division
  National Center for Immunization and Respiratory Diseases
  Centers for Disease Control and Prevention
- **Kristina Bryant, MD, FAAP, FPIDS**
  Member, Committee on Infectious Diseases, American Academy of Pediatrics
  Professor of Pediatrics, University of Louisville School of Medicine
  Hospital Epidemiologist at Norton Children's Hospital
  Medical Director, System Pediatric Epidemiology and Infectious Diseases
  Norton Children's Medical Group, Louisville, KY

2024–2025 Recommendations for Influenza Prevention and Treatment in Children: An Update for Pediatric Providers

November 14, 2024

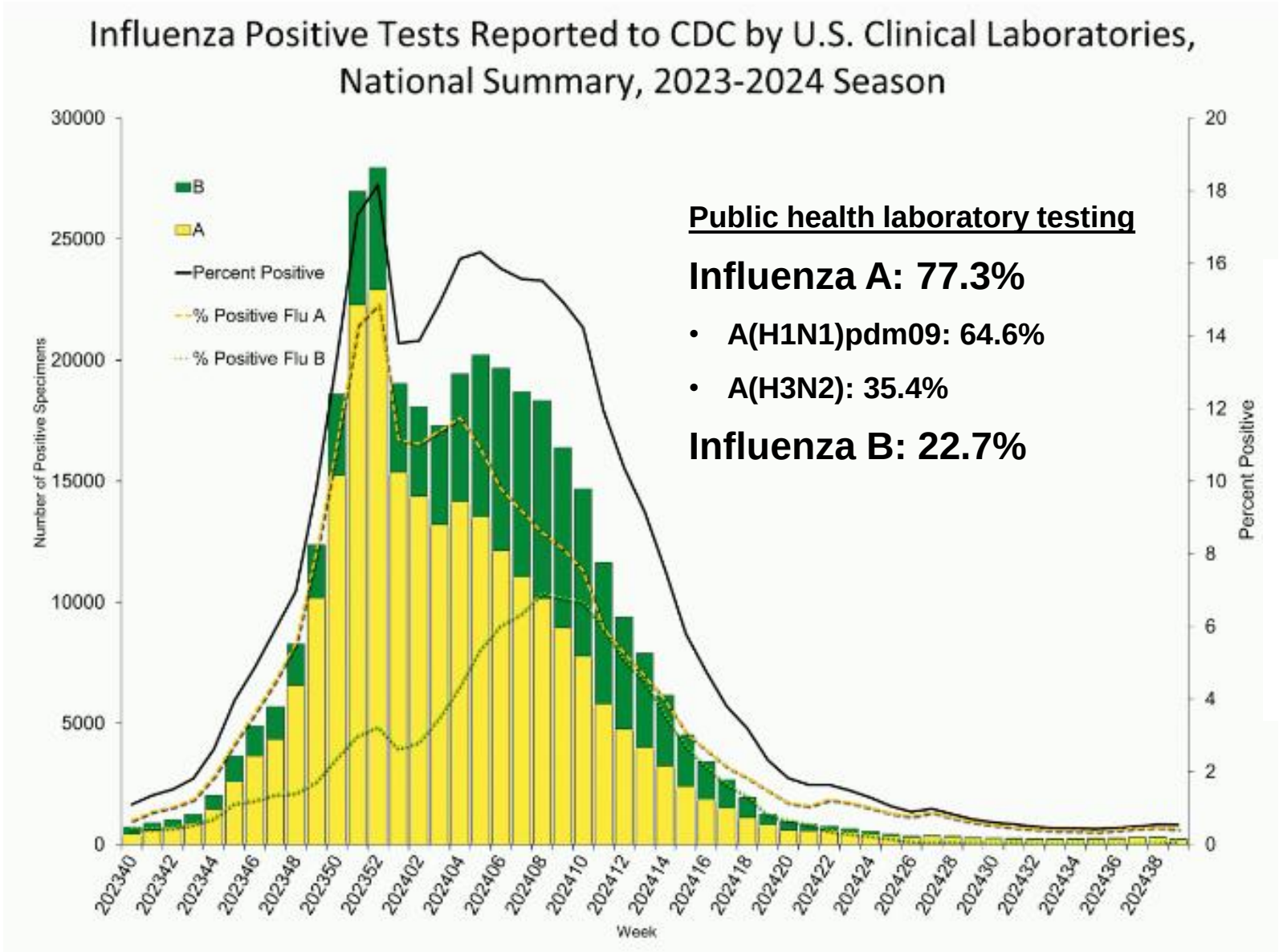
Tim Uyeki, MD, MPH, MPP, FAAP
Chief Medical Officer
Influenza Division
National Center for Immunization and Respiratory Diseases

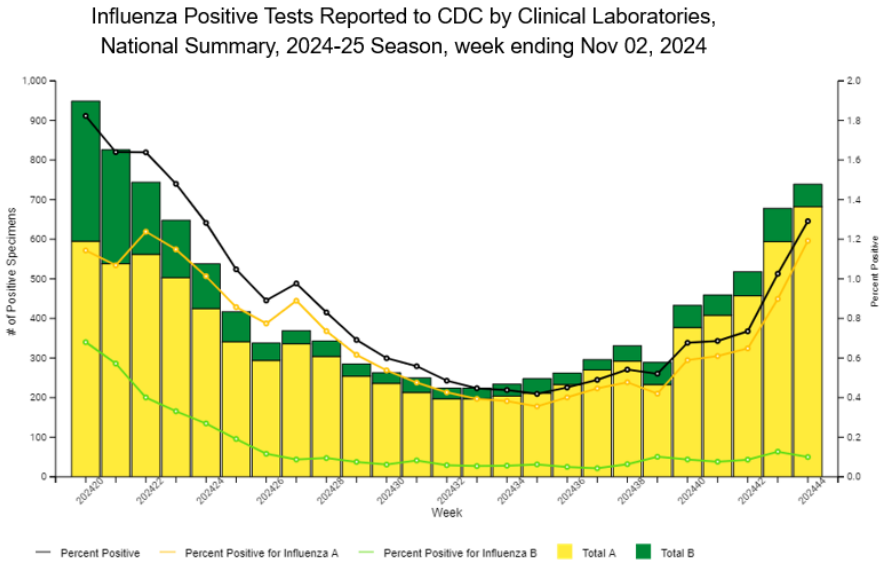
Kristina Bryant, MD, FAAP
Member, Committee on Infectious Diseases
American Academy of Pediatrics
University of Louisville

Overview

- Influenza activity and burden of disease
- Influenza vaccine coverage and vaccine effectiveness
- Influenza testing and antiviral treatment

Influenza Activity and Disease Burden





https://www.cdc.gov/fluview/surveillance/2024-week-40.html

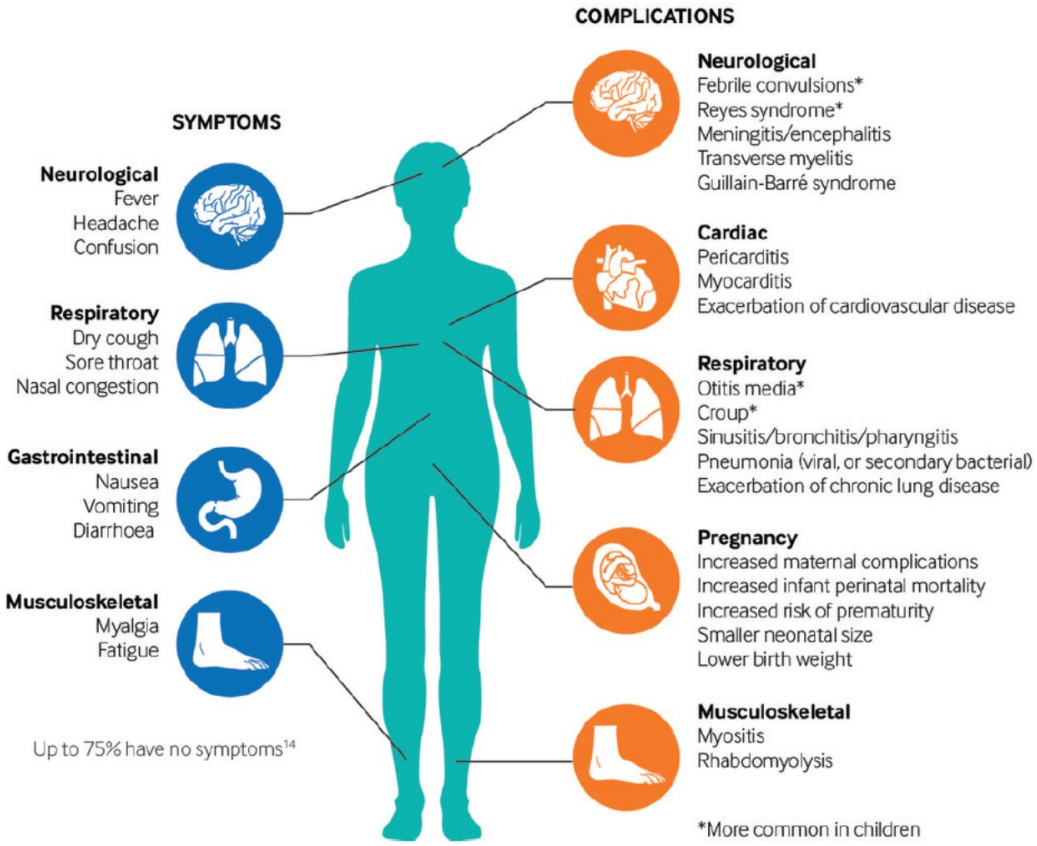
Spectrum of Influenza Virus Infection

- Disease severity and clinical manifestations vary by age, host factors, immunity, influenza virus type/subtype
  - **Asymptomatic infection**
  - **Uncomplicated illness** [incubation period: 1-2 days (range 1-3)]
    - Upper respiratory tract illness (with or without fever)
    - Fever may not be present (e.g., elderly, immunosuppressed)
    - Typical: abrupt onset of fever, cough, chills, myalgia, fatigue, headache, sore throat, runny nose
    - Gastrointestinal symptoms (more common in young children)
    - Infants can have fever alone, irritability, may not have respiratory symptoms
  - **Complicated illness**

Uyeki Clin Infect Dis 2019; Uyeki Lancet 2022

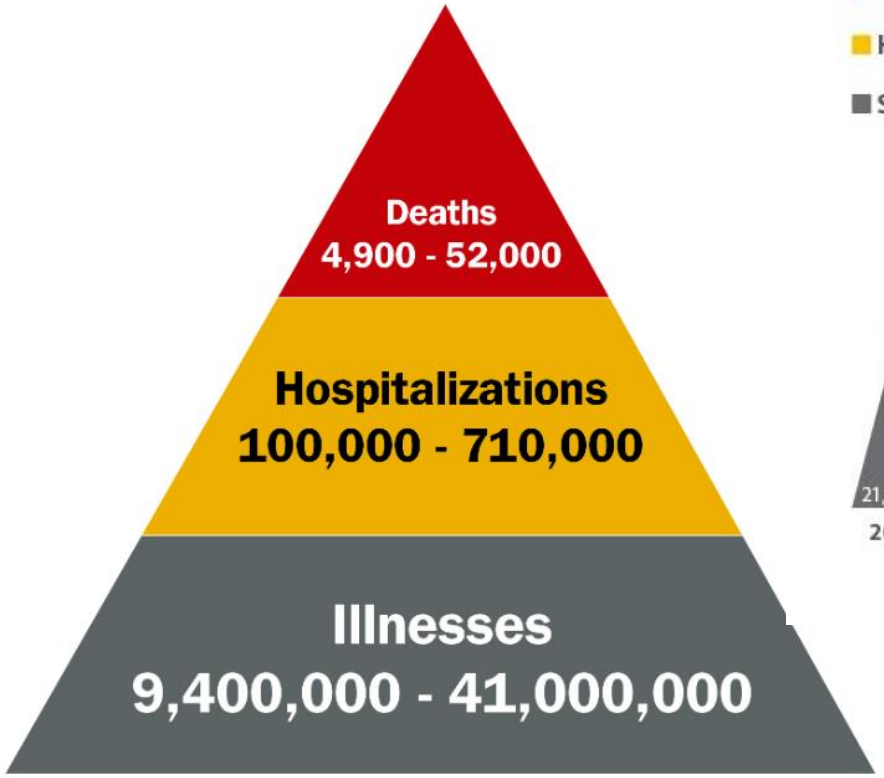
Influenza Complications

- **Moderate Illness**:
  - Otitis media in young children, sinusitis
  - Exacerbation of chronic disease
- **Severe to Critical Illness:**
  - **Exacerbation of chronic disease**
  - **Respiratory:** viral pneumonia, croup, status asthmaticus, bronchiolitis, tracheitis, acute respiratory distress syndrome (ARDS)
  - **Cardiac:** myocarditis, pericarditis, myocardial infarction
  - **Neurologic:** encephalopathy & encephalitis, cerebrovascular accident, Guillain-Barre syndrome (GBS), acute disseminated encephalomyelitis (ADEM), Reye syndrome
  - **Bacterial co-infection:** invasive bacterial infection (e.g., community-acquired pneumonia)
    - *Staphylococcus aureus* (MSSA, MRSA), *Streptococcus pneumoniae*, group A *Streptococcus*
  - **Musculoskeletal:** myositis, rhabdomyolysis
  - **Multi-organ failure** (respiratory, renal failure, septic shock)
  - **Healthcare-associated infections** (e.g. bacterial or fungal ventilator-associated pneumonia)



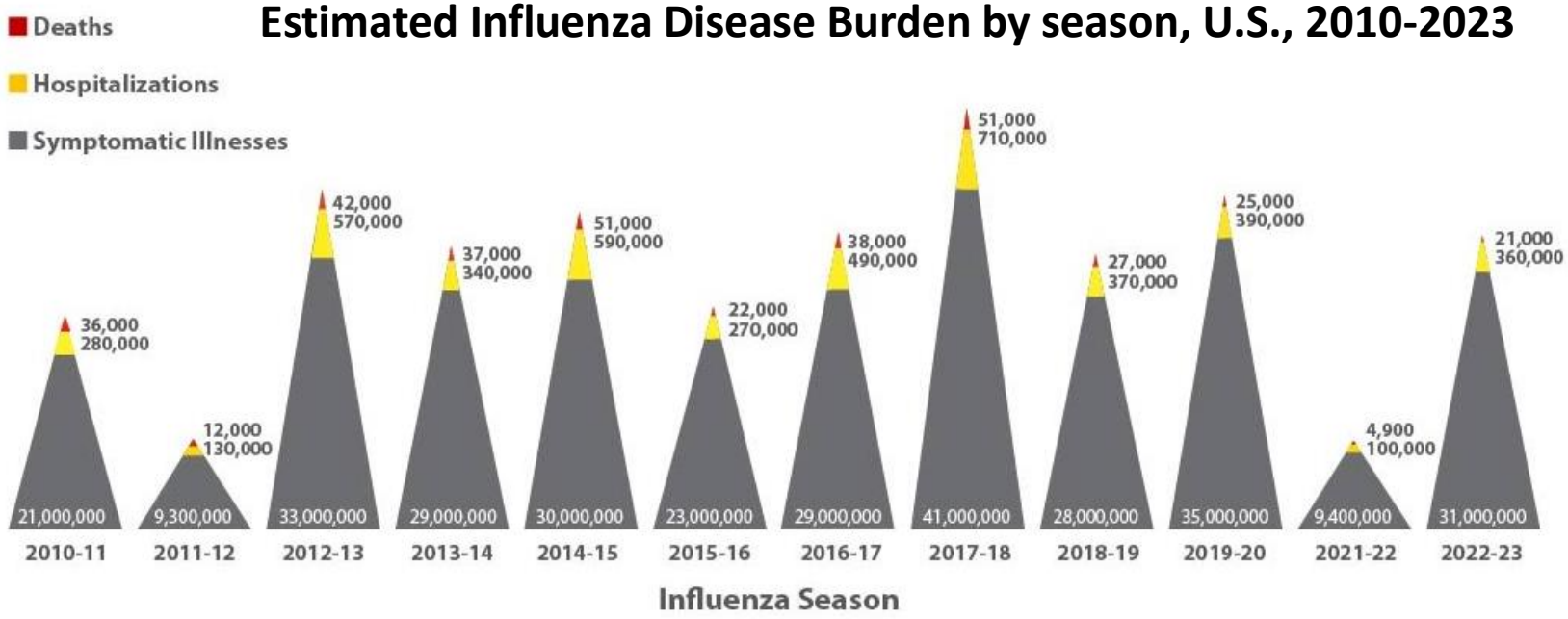
Ghebrehewet BMJ 2016

Estimated Influenza Disease Burden



Estimated Influenza Disease Burden 2010 - 2023

Estimated Influenza Disease Burden by season, U.S., 2010-2023



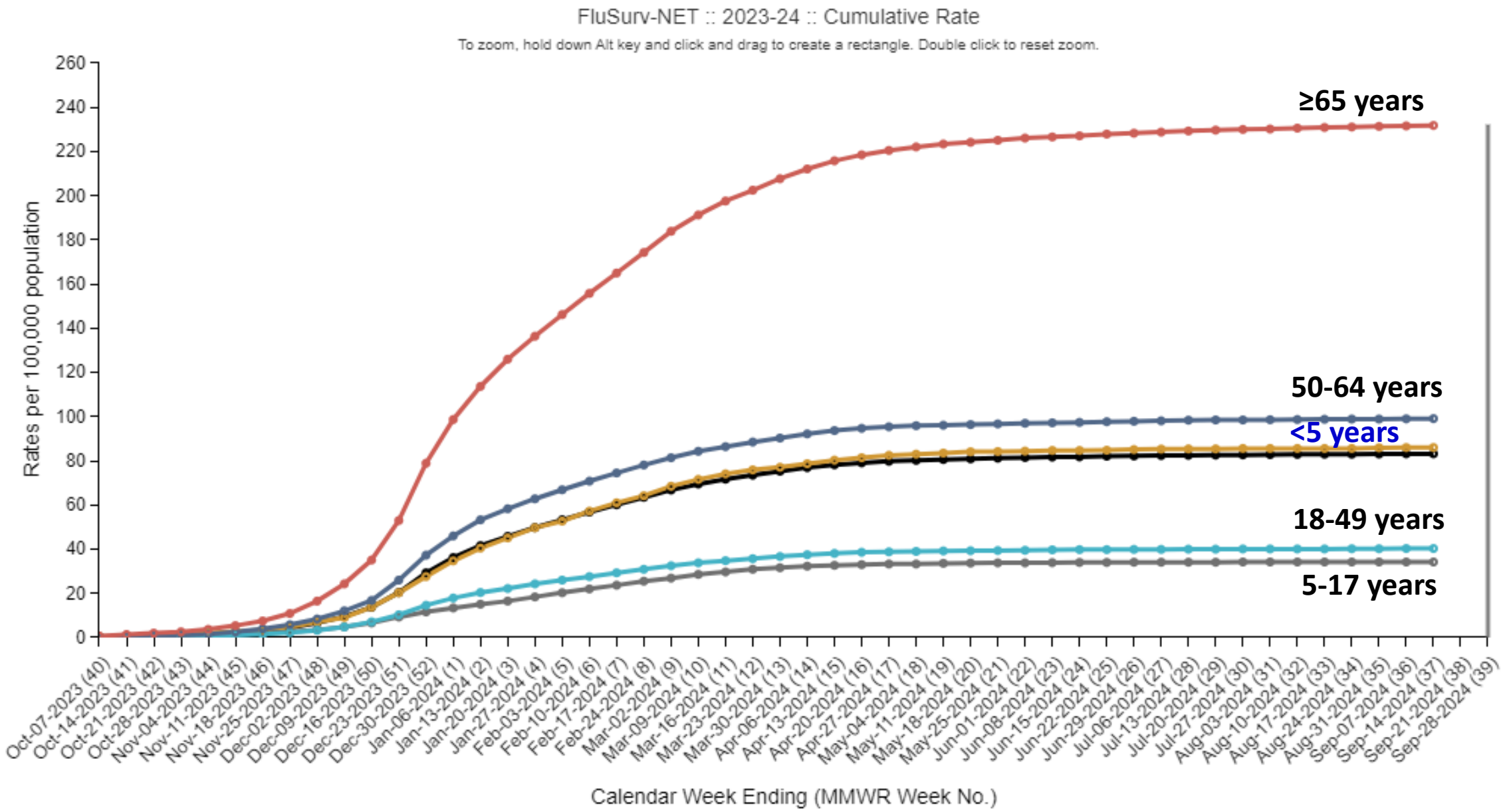
- **Seasonal influenza epidemics vary in severity**

2023-2024 (preliminary estimates as of January 20, 2024):

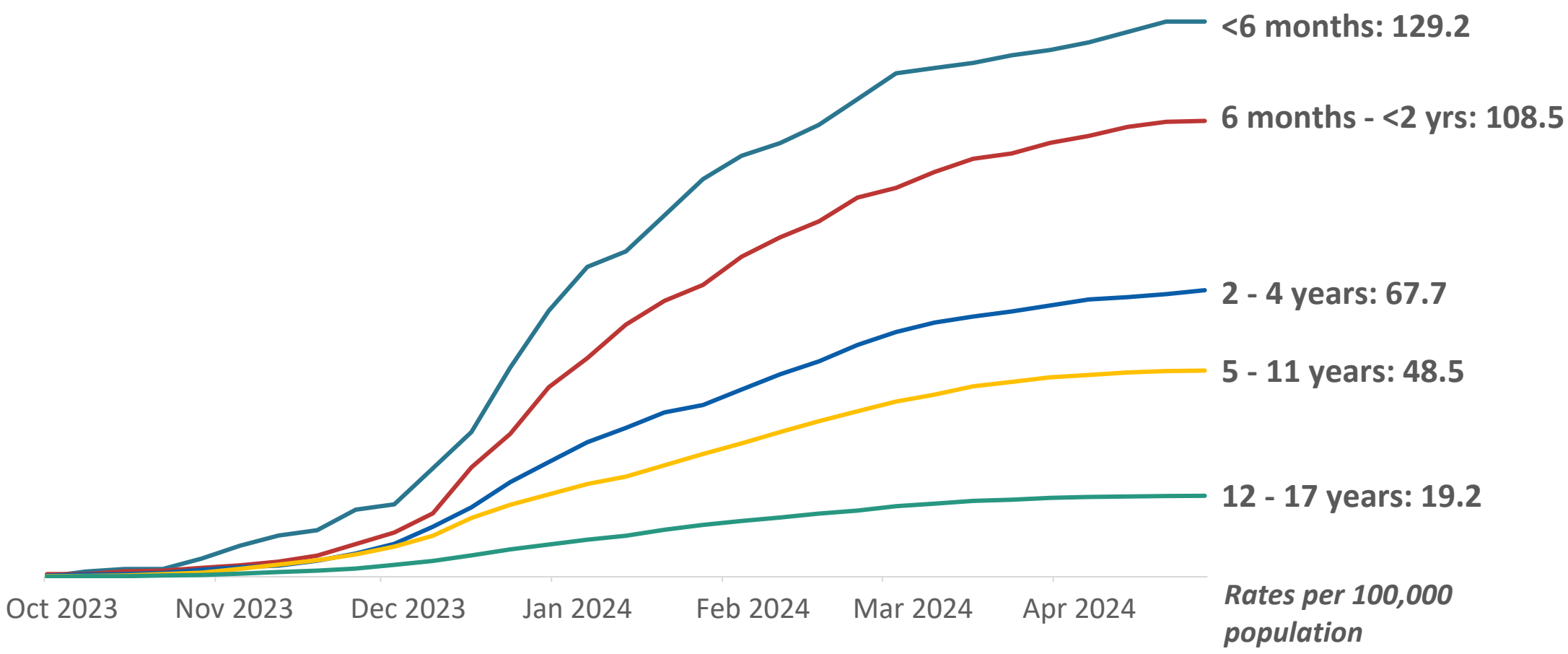
* 34-75 million illnesses
* 15-33 million medical visits
* 380,000 to 900,000 hospitalizations
* 17,000 to 100,000 deaths

https://www.cdc.gov/flu-burden/php/about/index.html; https://www.cdc.gov/flu-burden/php/data-vis/index.html

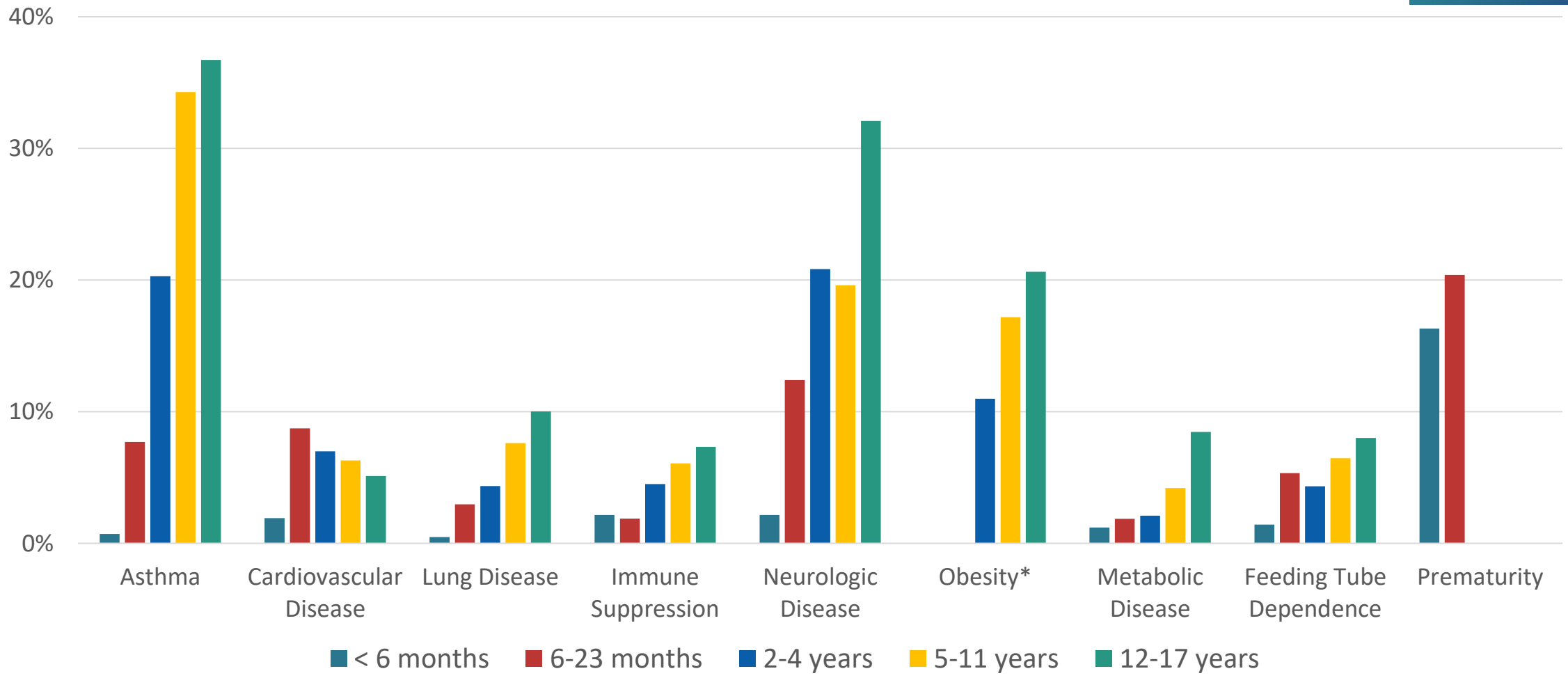
Lab-confirmed Influenza Hospitalization Rates by Age Group, U.S., 2023-2024



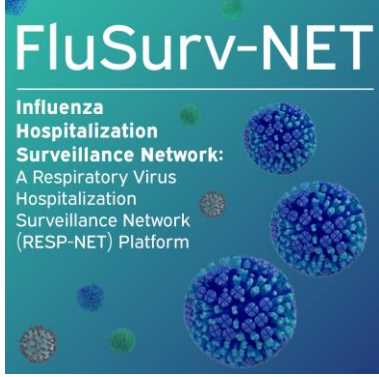
Cumulative Pediatric Laboratory-Confirmed Influenza Hospitalization Rates, U.S. 2023-2024



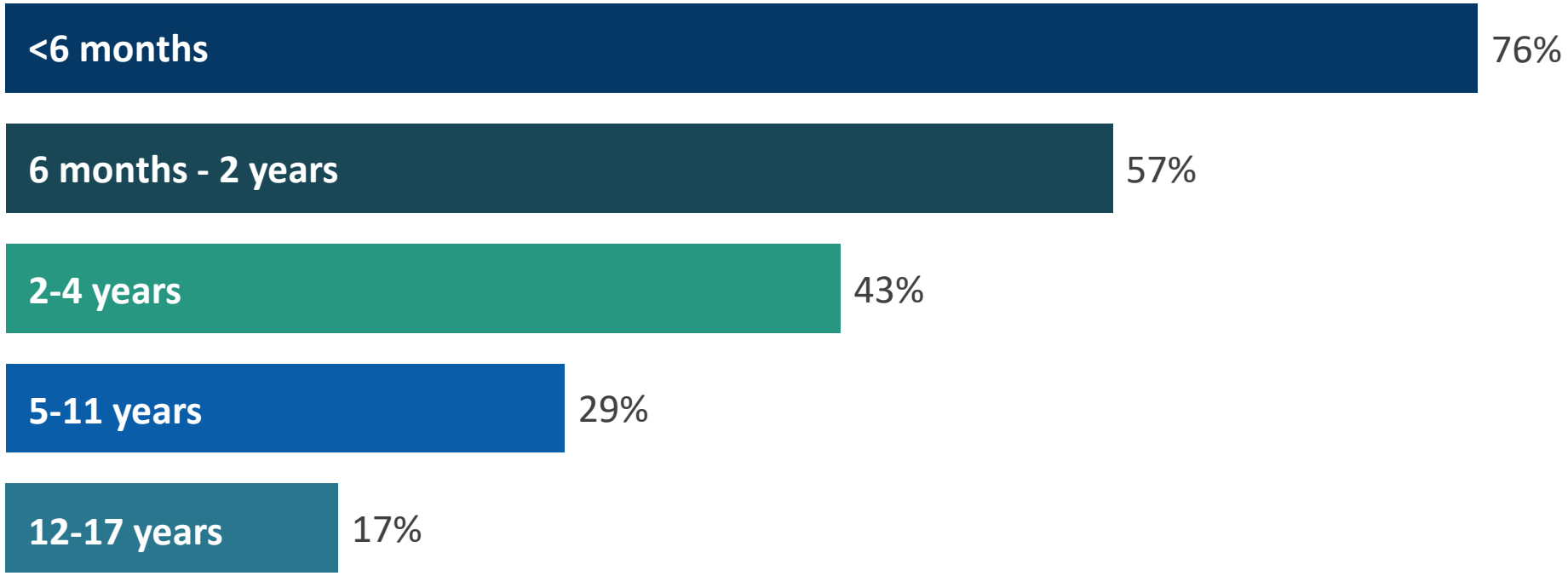
Underlying Medical Conditions in Pediatric Influenza Associated Hospitalizations, U.S., 2023-2024



Percentage of Children Without Underlying Medical Conditions Hospitalized with Influenza by Age Group, U.S., 2023-2024



Percent of children with influenza-associated hospitalization without underlying medical conditions, 2023-2024 season



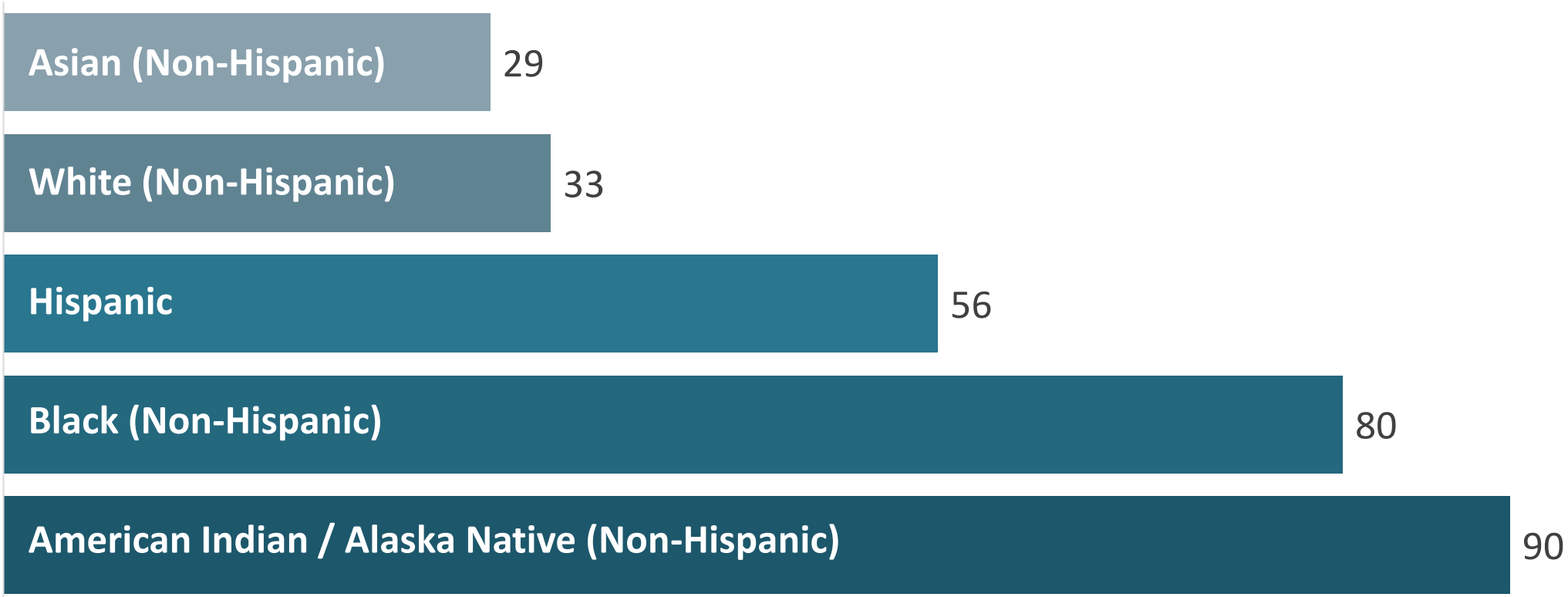
Underlying medical conditions include asthma/reactive airway disease, cardiovascular disease, chronic lung disease, neurologic disorders, obesity, blood disorders, immunocompromising condition

Lab-confirmed influenza hospitalizations by age group, Influenza Hospital Surveillance Network, U.S., 2010-2023

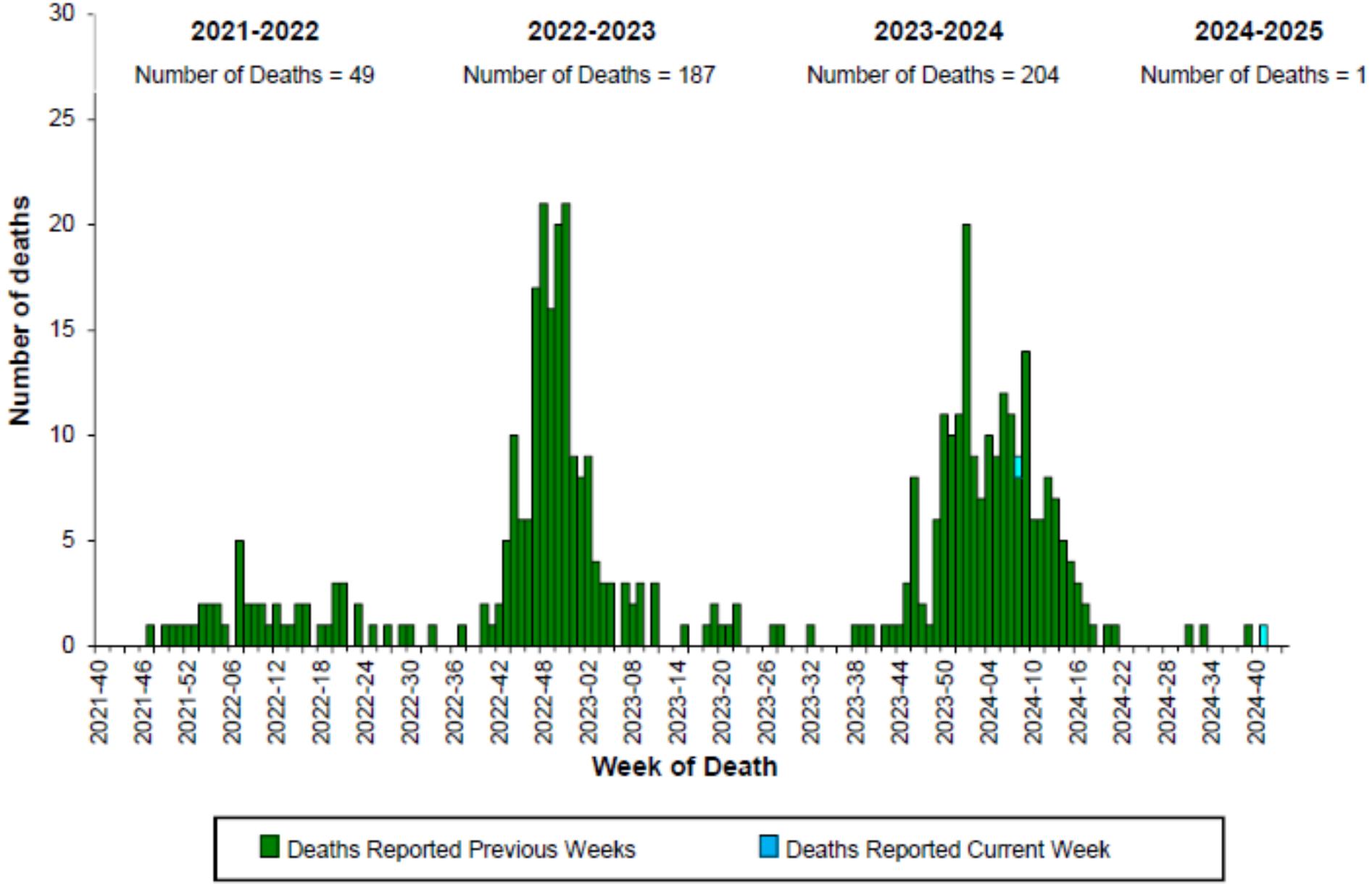
Intervention and outcome	Influenza season 2010–11 No. (%)	2011–12 No. (%)	2012–13 No. (%)	2013–14 No. (%)	2014–15 No. (%)	2015–16 No. (%)	2016–17 No. (%)	2017–18 No. (%)	2018–19 No. (%)	2019–20 No. (%)	2021–22 No. (%)	2022–23 No. (%)
Pneumonia**												
Age group, yrs												
All ages	1,098 (20.0)	540 (24.5)	2,485 (21.9)	2,677 (30.3)	3,591 (22.3)	2,320 (29.2)	3,628 (22.5)	4,498 (22.9)	3,836 (25.7)	1,604 (26.6)	604 (20.7)	1,679 (25.3)
0–4	119 (18.0)	35 (16.2)	190 (22.0)	174 (28.4)	155 (25.2)	148 (28.7)	100 (21.6)	220 (25.9)	226 (28.1)	244 (28.6)	25 (18.8)	192 (30.8)
5–17	79 (24.3)	38 (25.2)	102 (19.6)	113 (32.9)	103 (20.6)	86 (29.1)	108 (22.3)	169 (27.8)	176 (27.1)	179 (28.5)	27 (15.6)	178 (29.2)
Intensive care unit admission												
Age group, yrs												
All ages	1,128 (17.9)	3,99 (16.5)	1,956 (15.7)	2,141 (22.3)	2,661 (15.0)	1,663 (18.9)	2,751 (15.7)	3,639 (15.4)	3,047 (17.8)	1,531 (17.2)	552 (14.1)	1,403 (15.1)
0–4	146 (15.3)	43 (14.8)	212 (17.4)	157 (19.1)	207 (20.8)	140 (18.9)	161 (22.6)	277 (22.1)	250 (20.1)	284 (20.1)	56 (20.9)	182 (17.1)
5–17	77 (16.9)	51 (26.6)	131 (18.7)	108 (24.9)	182 (23.7)	103 (22.8)	159 (22.1)	229 (24.9)	212 (22.5)	214 (21.3)	71 (22.3)	198 (18.9)
Mechanical ventilation												
Age group, yrs												
All ages	533 (8.5)	146 (6.0)	743 (6.0)	1,068 (11.1)	1075 (6.1)	696 (7.9)	951 (5.4)	1,295 (5.4)	1,095 (6.3)	604 (6.1)	191 (4.9)	549 (5.4)
0–4	63 (6.6)	12 (4.1)	63 (5.2)	51 (6.2)	56 (5.6)	34 (4.6)	37 (5.2)	71 (5.7)	65 (5.2)	73 (5.2)	13 (4.9)	38 (3.6)
5–17	30 (6.6)	9 (4.7)	39 (5.6)	29 (6.7)	52 (6.8)	20 (4.4)	45 (6.3)	46 (5.0)	49 (5.2)	52 (5.2)	14 (4.4)	55 (5.5)
Died in hospital												
Age group, yrs												
All ages	197 (3.1)	58 (2.4)	313 (2.5)	336 (3.5)	535 (3.0)	246 (2.8)	529 (3.0)	857 (2.9)	505 (2.7)	433 (2.7)	88 (2.2)	506 (2.8)
0–4	3 (0.3)	0 (—)	5 (0.4)	2 (0.2)	11 (1.1)	3 (0.4)	3 (0.4)	3 (0.2)	7 (0.6)	9 (0.6)	0 (—)	5 (0.4)
5–17	1 (0.2)	0 (—)	12 (1.7)	1 (0.2)	8 (1.0)	2 (0.4)	2 (0.3)	10 (1.1)	4 (0.4)	4 (0.4)	0 (—)	7 (0.5)

Naquin MMWR Surveillance Summaries Oct. 31, 2024

Pediatric Age-Adjusted Cumulative Rates of Laboratory-Confirmed Influenza Hospitalizations per 100,000 population by Race/Ethnicity, U.S., 2023-2024 Season



Number of Influenza-Associated Pediatric Deaths by Week of Death, 2021-2022 season to 2024-2025 season



Demographic and clinical characteristics of patients with laboratory-confirmed influenza-associated hospitalizations who died, stratified by age group and whether they died during hospitalization or within 30 days post-discharge, FluSurv-NET, U.S., 2010-2019

	All Deaths	Deaths by Age Group			Deaths by Hospital Discharge Status		
	N=6,687	<65 years N=1,579	≥65 years N=5,108		In-hospital N=3,472	Within 30 days post-discharge N=3,215	
	n (%)	n (%)	n (%)	p-value [a]	n (%)	n (%)	p-value [b]
Age, categorized				**<.001**			**<.001**
0-4 years	**40 (0.6%)**	**40 (2.5%)**	**--**		**35 (1.0%)**	**5 (0.2%)**	
5-17 years	**45 (0.7%)**	**45 (2.5%)**	**--**		**39 (1.1%)**	**6 (0.2%)**	
18-49 years	404 (6.0%)	404 (25.6%)	--		307 (8.8%)	97 (3.4%)	
50-64 years	1090 (16.3%)	1090 (69.0%)	--		753 (21.7%)	337 (10.5%)	
≥65 years	5108 (76.4%)	--	5108 (100.0%)		2338 (67.3%)	2770 (86.2%)	
65-74 years	1128 (16.9%)	--	1128 (22.1%)		609 (17.5%)	519 (16.1%)	
75-84 years	1596 (23.9%)	--	1596 (31.2%)		769 (22.1%)	827 (25.7%)	
≥85 years	2384 (35.7%)	--	2384 (46.7%)		960 (27.6%)	1424 (44.3%)	

O'Halloran Clin Infect Dis 2024

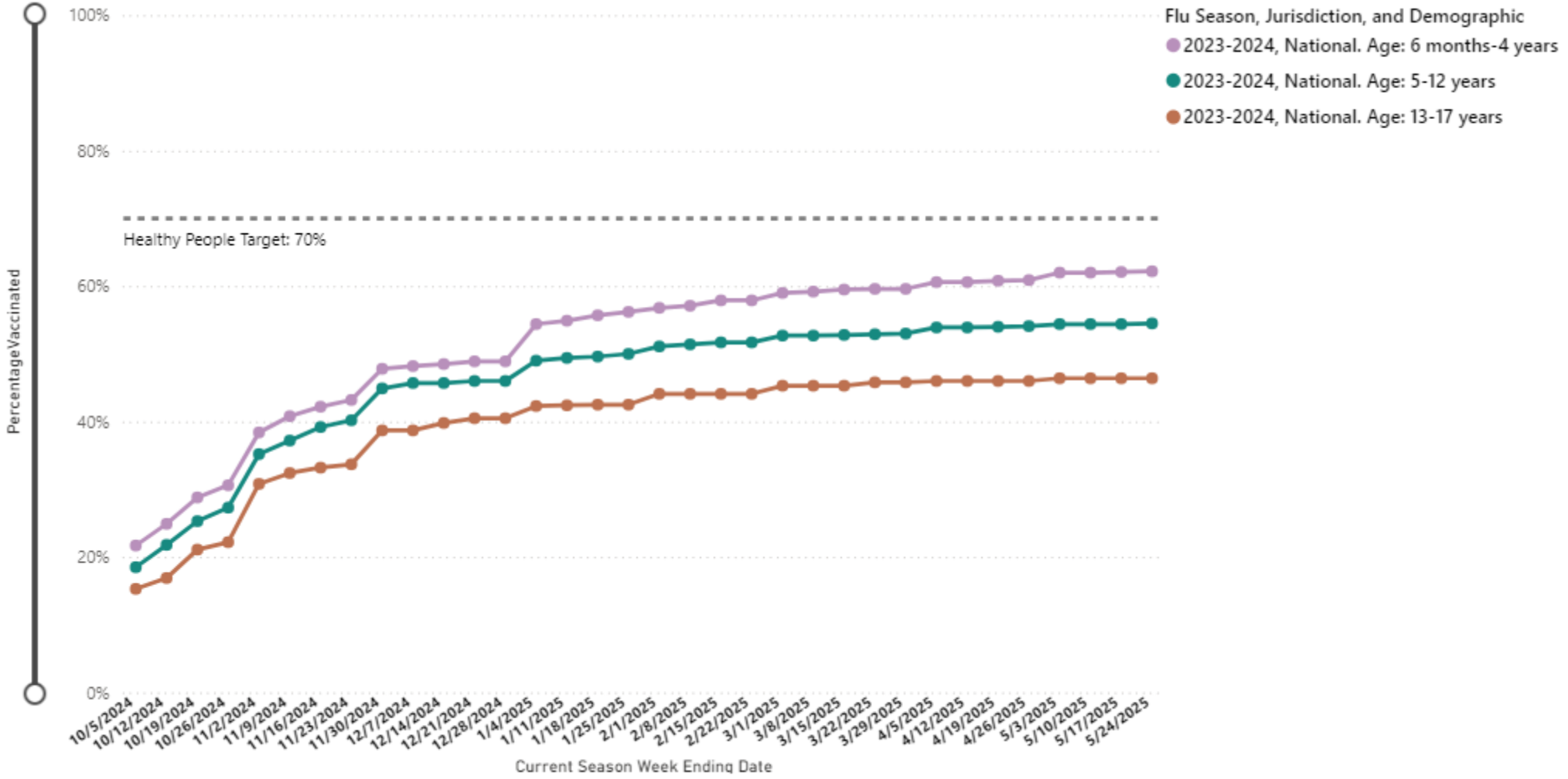
Groups at Increased Risk for Influenza Complications and Severe Illness

- **Children <2 years and adults ≥65 years**
- **Persons with chronic medical conditions**, including pulmonary (including asthma) or cardiovascular (excluding isolated hypertension), renal, hepatic, neurologic (including persons who have had a stroke) and neurodevelopmental, hematologic, metabolic or endocrine disorders (including diabetes mellitus)
- **Persons who are immunocompromised**
- **Persons with extreme obesity (BMI ≥40)**
- **Children and adolescents who are receiving aspirin-or salicylate-containing medications** (who might be at risk for Reye's syndrome after influenza virus infection)
- **Residents of nursing homes and other long-term care facilities**
- **Pregnant persons and people up to 2 weeks postpartum**
- **People from certain racial and ethnic minority groups, including non-Hispanic Black, Hispanic or Latino, and American Indian or Alaska Native persons**

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

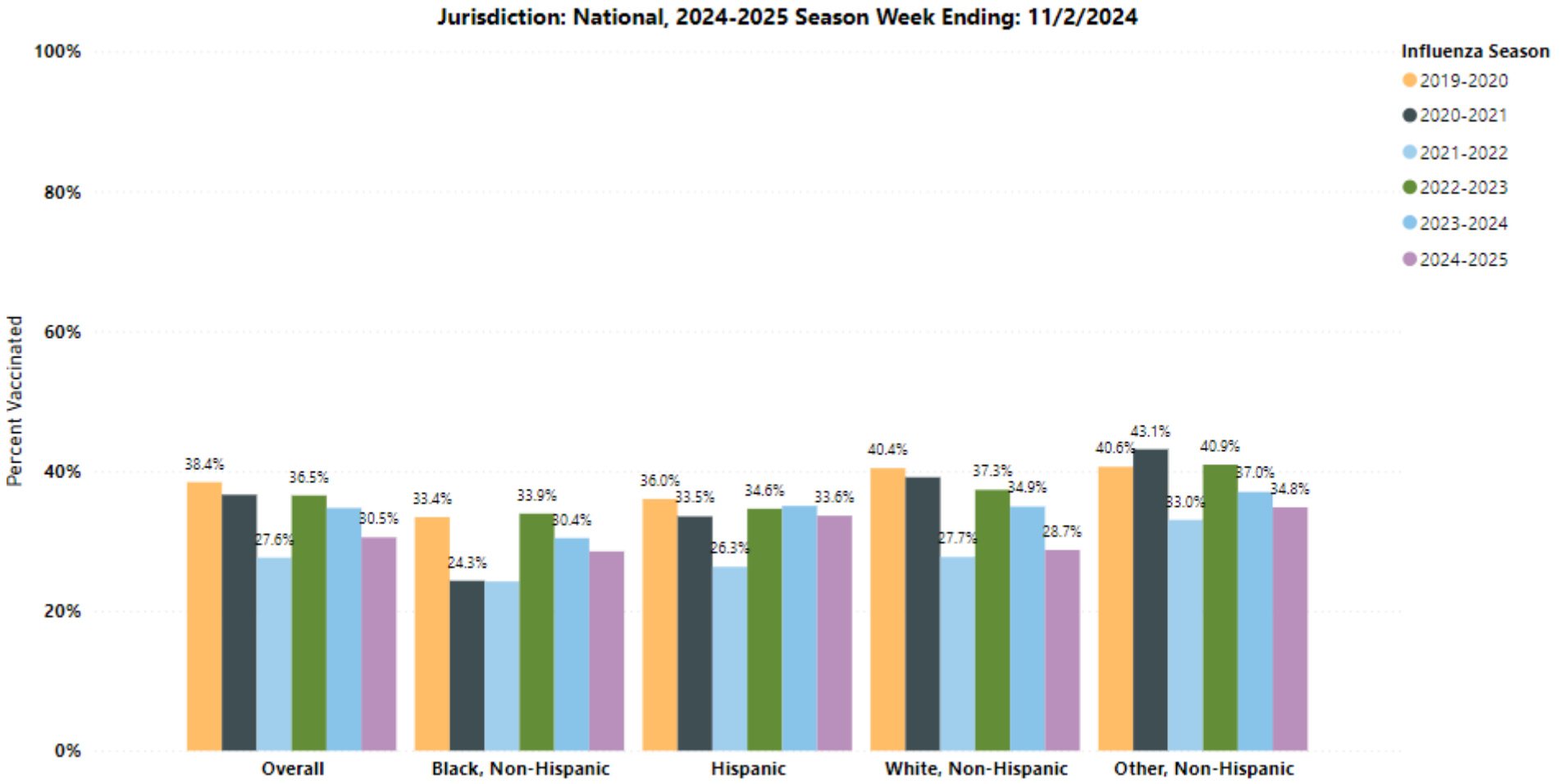
Influenza Vaccine Coverage and Influenza Vaccine Effectiveness

Weekly Cumulative Influenza Vaccination Coverage by Flu Season and Selected Demographics, Children 6 Months–17 Years, United States. Data Source: National Immunization Survey–Flu (2023-2024)



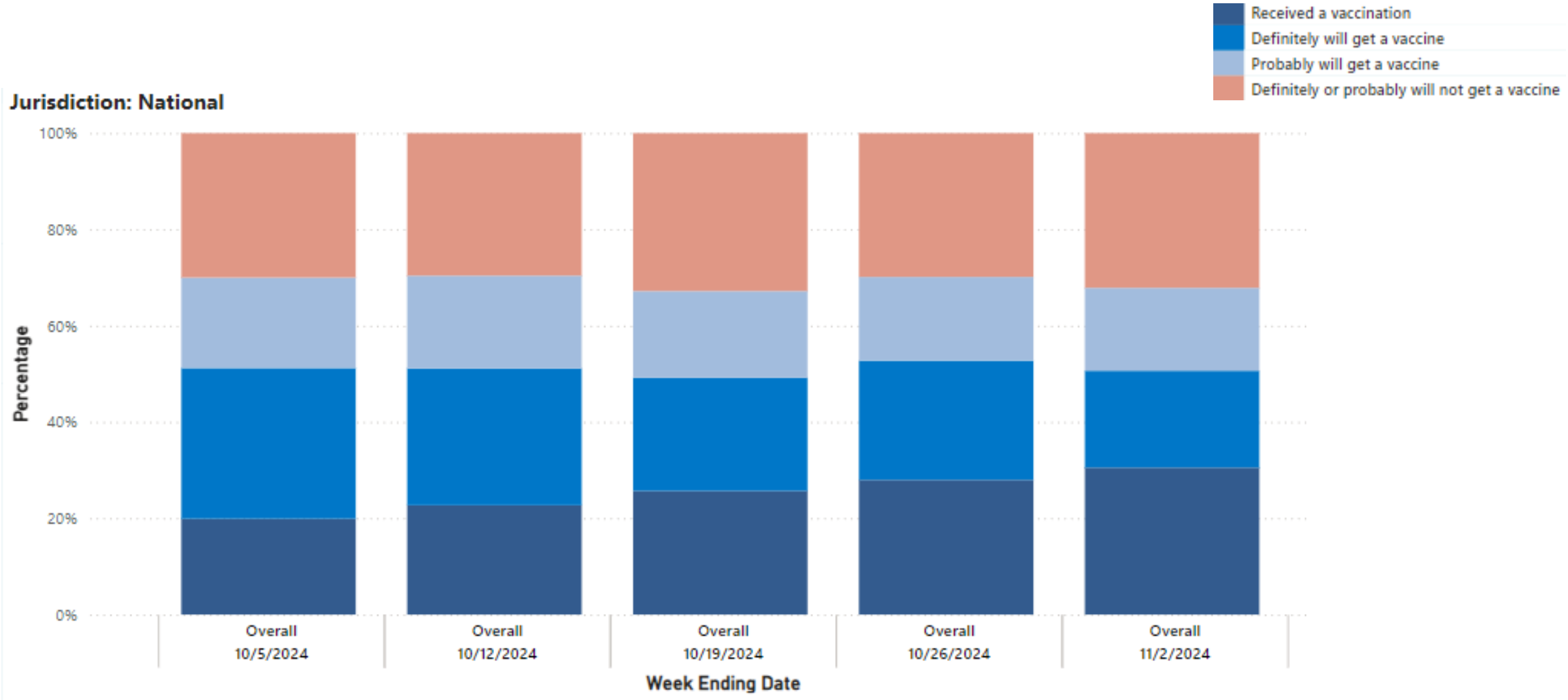
https://www.cdc.gov/fluvaxview/dashboard/children-vaccination-coverage.html

Cumulative Influenza Vaccination Coverage by Week of vaccine receipt, Flu Season, and Race and Ethnicity, Children 6 Months–17 Years, United States. Data Source: National Immunization Survey–Flu (2019-2020 to 2024-2025)



https://www.cdc.gov/fluvaxview/dashboard/children-vaccination-coverage.html

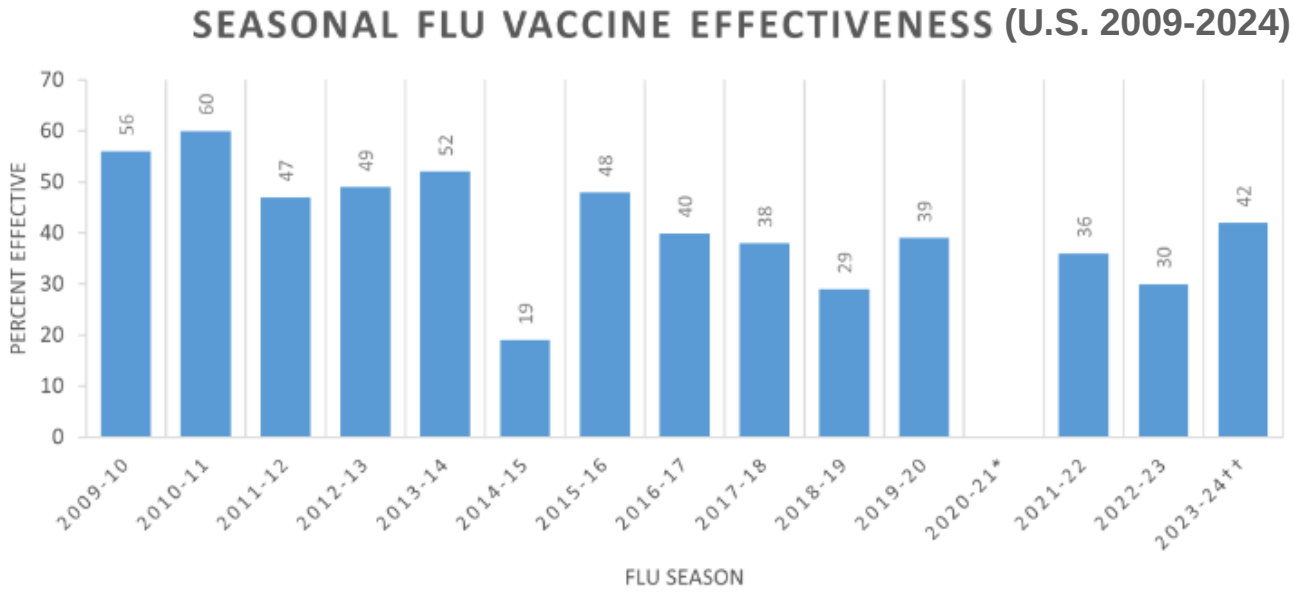
Weekly Influenza Vaccination Status and Intent for Vaccination, Overall, by Selected Demographics, and Jurisdiction, Children 6 Months–17 Years, 2024–2025, United States. Data Source: National Immunization Survey–Flu.



https://www.cdc.gov/fluvaxview/dashboard/children-vaccination-coverage.html

Influenza Vaccine Effectiveness (VE)

- **Influenza vaccine effectiveness varies by virus antigen and match to circulating virus strains**
  - VE against medically attended influenza illness has ranged from low to moderate (19-60%) since 2009
  - **Interim 2024 Southern Hemisphere influenza vaccine effectiveness in young children:**
    - **Adjusted VE = 39% (95% CI, 25.6-50%)**



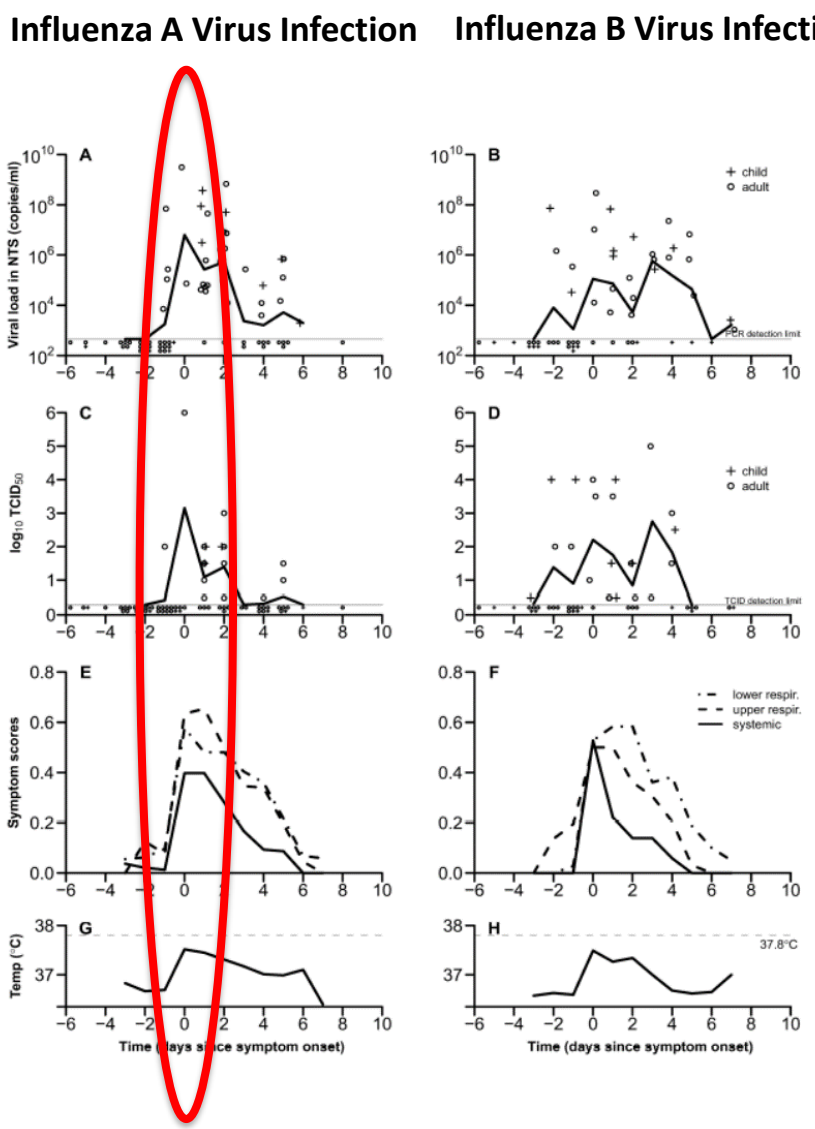
https://www.cdc.gov/flu-vaccines-work/php/effectiveness-studies/index.html

- **Influenza vaccination can prevent severe influenza**
  - VE **(65%)** against ICU admission for influenza in children (2019-2020)
  - VE **(65%)** against influenza-related death in children (2010-2014)

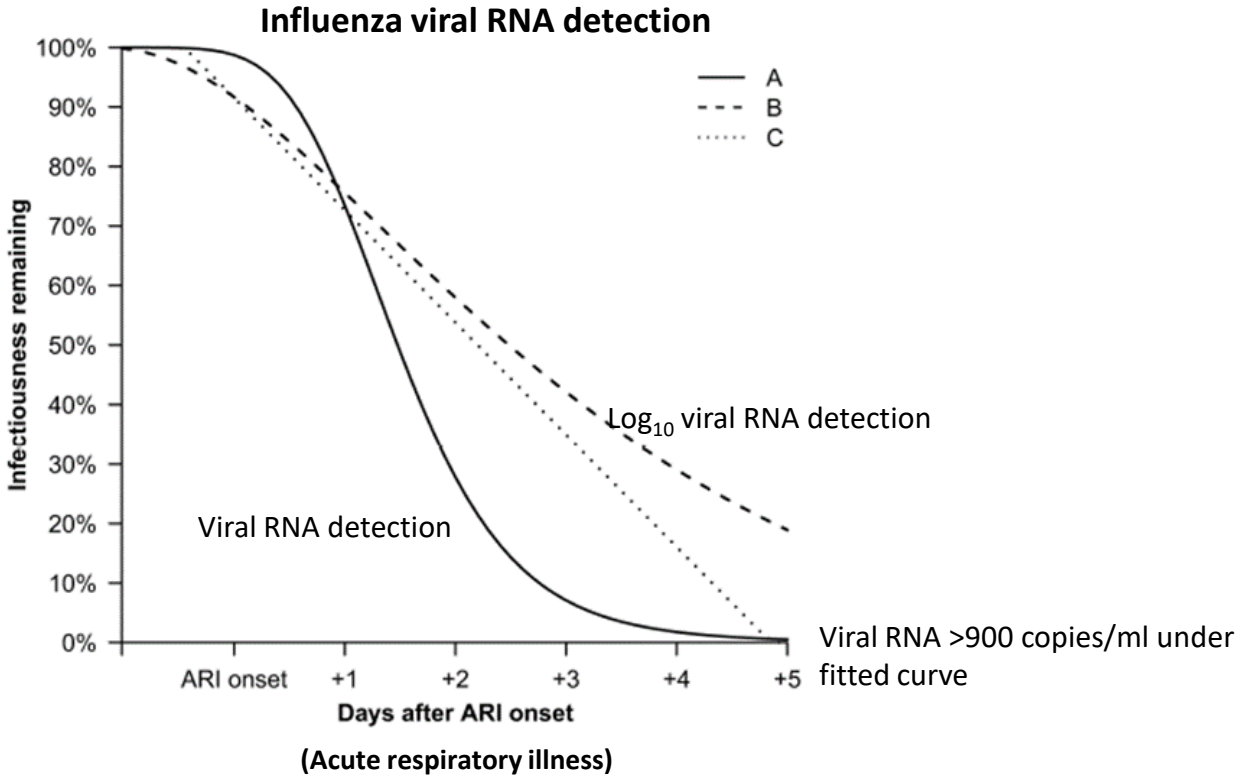
Zeno MMWR Oct. 3, 2024; Ferdinands JM et al., JID 2021; Olson SJ et al., CID 2022; Flannery B et al., Pediatrics 2017

Influenza Testing

Influenza Viral Shedding Typically Peaks Within 24 Hours of Illness Onset



- **Influenza viruses can be detected in the upper respiratory tract one day before illness onset; virus levels peak within 24 hours after onset**
- **Highest infectious period is within 3 days after onset**
  - **Young children can be infectious for longer periods**
  - **Critically ill patients might have longer influenza viral replication in the lower respiratory tract**



Lau J Infect Dis 2010; Ip Clin Infect Dis 2017

Respiratory Specimens for Detecting Influenza Viruses

- **Upper respiratory tract**
  - **Influenza viruses are generally detectable for 3-4 days by antigen detection; and 5-6 days by nucleic acid detection in uncomplicated disease, longer in infants and immunosuppressed**
    - ***Highest yield: Nasopharyngeal (NP) swabs (ideally collected within 3-4 days of illness onset)***
      - Other acceptable specimens: nasal swabs, NP aspirates, nasal aspirates, combined nasal and throat swabs
  - **Slower clearance of influenza viruses in severe disease**
  - ***Influenza viral replication and viral RNA detection may be prolonged with corticosteroids, immunosuppression***
- **Lower respiratory tract**
  - **Higher, prolonged viral replication in severe lower respiratory tract (LRT) disease**
    - ***Influenza viruses may be detectable in LRT specimens when cleared from the upper respiratory tract***
      - **RT-PCR was negative in 10-19% of patients in upper respiratory tract specimens versus lower respiratory tract (BAL specimens) for influenza A(H1N1)pdm09 viral RNA**

Rello Crit Care 2009; Fleury Eurosurveillance 2009; Blyth NEJM 2009

Influenza Tests Available

- **Variety of diagnostic tests available to clinicians to detect influenza viruses in respiratory specimens**
  - Differ by time to produce results, information provided, approved respiratory specimens, approved clinical settings, and **accuracy**
    - **Antigen detection** (FDA-cleared/EUA/authorized single-plex, multiplex)
      - FDA-EUA multiplex assays, includes home tests (e.g., also detects SARS-CoV-2)
        - One FDA-authorized multi-plex OTC/home test (e.g., also detects SARS-CoV-2)
    - **Nucleic acid detection** (FDA-cleared/EUA/authorized single-plex, multiplex)
      - Multiplex assays (e.g., also detects SARS-CoV-2, some detect RSV)
        - OTC/Home test (self-collected anterior nasal swabs (≥14 years) or adult-collected (≥2 years)
    - **Point-of-care assays** (CLIA-waived)
    - **Moderately complex** (requires clinical laboratory)
    - **Highly complex** (large clinical laboratories, public health labs)

https://www.fda.gov/medical-devices/in-vitro-diagnostics/influenza-diagnostic-tests

Influenza Tests Available in Clinical Settings*

Test	Method	Time to Results	Performance	Notes†
Rapid diagnostic test	Antigen detection	10 min	Low to moderate sensitivity; high specificity	Negative results may not rule out influenza; most assays are approved for point-of-care use; multiplex assays can identify and distinguish among influenza A, influenza B, and SARS-CoV-2
Rapid molecular assay	Viral RNA detection	15–30 min	Moderately high to high sensitivity; high specificity	Negative results may not rule out influenza; some assays are approved for point-of-care use; multiplex assays can identify and distinguish among influenza A, influenza B, and SARS-CoV-2
Immunofluorescence assay	Antigen detection	2–4 h	Moderate sensitivity; high specificity	Negative results may not rule out influenza; requires trained laboratory personnel with fluorescent microscope in a clinical laboratory
Molecular assay	Viral RNA detection	60–80 min for some assays; up to 4–6 h for others	High sensitivity; high specificity	Negative results may not rule out influenza; multiplex assays can identify and distinguish among influenza A, influenza B, and SARS-CoV-2

Multiplex Antigen detection 15 min
(Influenza A/B, SARS-CoV-2)

Multiplex Viral RNA detection 36-45 min
(Influenza A/B, SARS-CoV-2, RSV)

Multiplex Viral RNA detection ≥60 min
(e.g., Influenza A/B, SARS-CoV-2, RSV, other viral targets)

***Proper interpretation of test results is very important, especially interpreting negative results**

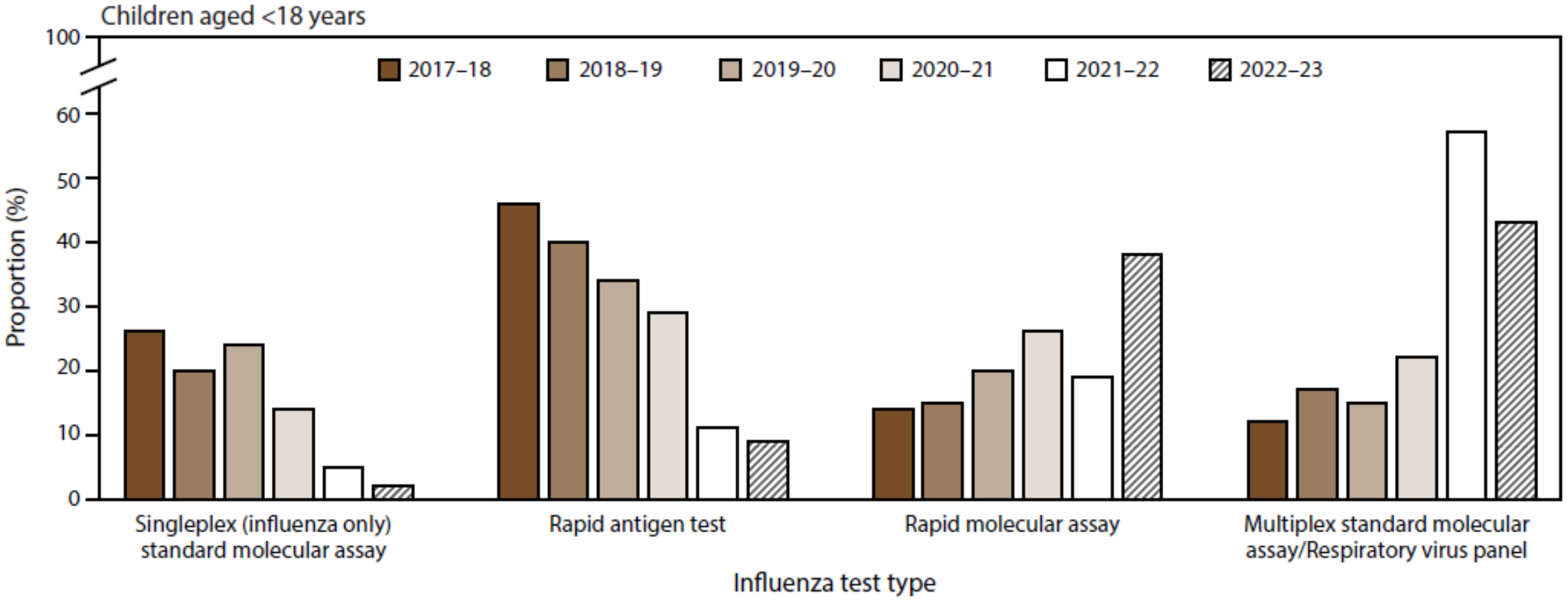
Uyeki Annals of Int Med 2021

Recommended Influenza Tests

- **Outpatients:**
  - **Rapid influenza molecular assays are recommended over rapid influenza antigen tests**
- **Hospitalized patients:**
  - **RT-PCR or other influenza molecular assays are recommended**
    - Rapid antigen detection tests and immunofluorescence assays are not recommended and should not be used unless molecular assays are not available
  - **Immunocompromised patients: Multiplex RT-PCR assays targeting a panel of respiratory pathogens, including influenza viruses are recommended**
- ***Do not order viral culture for initial or primary diagnosis of influenza***
- ***Do not order serology for influenza***
  - **Results from a single serum specimen cannot be reliably interpreted, and collection of paired acute and convalescent sera 2-3 weeks apart are needed; testing at specialized laboratories**

Uyeki IDSA 2018 Influenza Clinical Practice Guidelines Clin Infect Dis 2019

Trends of most frequently performed influenza test types in Influenza Hospitalization Surveillance Network hospitals among children aged <18 years and adults aged ≥18 years — United States, 2017–18 through 2022–23 influenza seasons



Naquin MMWR Surveillance Summaries October 31, 2024

Influenza Antiviral Treatment

Recommended Antivirals for Treatment of Influenza, U.S. 2024-2025

Four FDA-approved antivirals are recommended (no evidence of resistance among circulating seasonal influenza A and B viruses)

- All demonstrated efficacy in RCTs, FDA-approved for early treatment (<2 days of illness onset) in outpatients with uncomplicated influenza
- Neuraminidase inhibitors (NAIs): block release of influenza viruses from infected cells
  - Oseltamivir, Zanamivir, Peramivir
- Cap-dependent endonuclease inhibitor: inhibit influenza viral replication
  - Baloxavir marboxil

Antiviral Drug	Route of Administration	Recommended Ages for Treatment
Oseltamivir	Oral (twice daily x 5d)	All ages
Zanamivir	Inhaled (twice daily x 5d)	≥7 years
Peramivir	Intravenous (single infusion)	≥6 months
Baloxavir	Oral (single dose)	≥5 years (otherwise healthy) ≥12 years (high-risk)

https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm

Antiviral Treatment

Focused on prompt treatment of persons with severe disease and those at increased risk of influenza complications:

- **Antiviral treatment is recommended and has the greatest clinical benefit when started *as soon as possible* for patients with confirmed or suspected influenza who are:**
  - **Hospitalized*** (without waiting for testing results) **(oral/enteric oseltamivir)**
  - **Outpatients with complicated or progressive illness of any duration (oral oseltamivir)**
  - **Outpatients at high risk for influenza complications (oral oseltamivir or oral baloxavir)**

- Antiviral treatment can be considered for any previously healthy, non-high-risk outpatient with confirmed or suspected influenza (e.g. with influenza-like illness) on the basis of clinical judgment, if treatment can be initiated within 48 hours of illness onset; including empiric treatment (e.g. in-person visit or via telemedicine) **(e.g. oral oseltamivir or oral baloxavir)**

**Based on Observational studies*

https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm

Oseltamivir Treatment Efficacy and Effectiveness

Oseltamivir treatment has significant clinical benefit (in RCTs) when started within 48 hours after symptom onset versus placebo in pediatric outpatients with influenza

- Pooled meta-analysis of 5 RCTs in children (oseltamivir n=770 vs. placebo n=838)
  - **Powered for Mild Disease Outcomes: Treatment started ≤48 hours of onset:**
    - **Reduced illness duration by 18 hours overall and by 30 hours in children without asthma** (-29.9 hours; 95% CI: -53.9 to -5.8 hours; **Increased risk of vomiting** RR 1.63; 95% CI 1.3-2.04)
    - **Reduced risk of otitis media by 34%** (RR 0.66; 95% CI: 0.47-0.95)

Oseltamivir treatment has significant clinical benefit (in observational studies) when started as soon as possible in hospitalized pediatric patients with influenza

- (N=309; hospitalized children, U.S.; 2012-2013) **Starting oseltamivir treatment ≤2 days after symptom onset was significantly associated with shorter hospital length of stay** (adjusted HR 1.37, p=0.02)
- (N=299; ICU children, U.S.; 2010-2013) **Starting NAI treatment (nearly all oseltamivir) ≤2 days after symptom onset was significantly associated with shorter ICU length of stay** (adjusted HR: 1.46, p=0.007)
- (N=55,799 hospitalized children, U.S.; 2007-2020); median age 3.6 years; 59.5% were treated with oseltamivir within one day of admission.
  - **Children treated with oseltamivir <2 days after admission had shorter length of stay** (median 3 vs. 4 days), **lower odds of 7-day hospital readmission** (3.5%vs 4.8%; adjusted odds ratio [aOR], 0.72; 95%CI, 0.66-0.77), **fewer late ICU transfers** (2.4%vs 5.5%; aOR, 0.41; 95%CI, 0.37-0.46), and **lower odds of the composite outcome of death or ECMO use** (0.9%vs 1.4%; aOR, 0.63; 95%CI, 0.54-0.73).

Malosh Clinical Infect Dis 2018; Campbell Pediatrics 2021; Walsh JAMA Pediatrics 2022

Baloxavir Treatment RCTs

RCTs: Baloxavir treatment has similar clinical benefit to oseltamivir and significant clinical benefit versus placebo when started within 48 hours after symptom onset

- Children not at high-risk (aged 1 to <12 yrs) (outpatients)
  - **Treatment started ≤48 hours of onset (oseltamivir vs. baloxavir):**
    - **Single-dose baloxavir** (n=115) **had similar median time to alleviation of influenza signs and symptoms** (138 hours) **versus 5 days of oseltamivir** (150 hours) (n=58)

- RCTs in adolescents and adults (aged ≥12 yrs) (outpatients)
  - **Treatment started ≤48 hours of onset (baloxavir vs. placebo vs. oseltamivir):**
    - **Single-dose baloxavir** (n=456) **significantly reduced influenza illness duration by a median of 26.5 hours vs. placebo** (n=231) **in *persons not at high-risk*** (95% CI, 72.6 to 87.1 hours; p<0.001)
      - **Median time to alleviation of symptoms was similar for baloxavir and oseltamivir** (n=377)
      - **Baloxavir significantly reduced influenza viral RNA levels at 24 hours, and reduced infectious virus detection versus oseltamivir (24 hours vs. 72 hours, p<0.001)**
    - **Single-dose baloxavir** (n=388) **significantly reduced influenza illness duration by a median of 29 hours vs. placebo** (n=386) **in *persons with ≥1 high-risk condition*** (95% CI 14·6 to 42·8; p<0.0001)
      - **Median time to improvement of symptoms was similar for baloxavir and oseltamivir**
      - **Baloxavir significantly reduced median time to improvement of influenza B symptoms by 27 hours versus oseltamivir** (95% CI: 6.9 to 42.3 hours; p=0.025)

Baker Ped Infect Dis J 2020; Hayden NEJM 2018; Ison Lancet Infect Dis 2020

Special Populations

CDC Recommendations

- **Pregnant People**
  - **Oseltamivir is recommended for treatment of pregnant people and up to 2 weeks postpartum**
    - **Baloxavir is *not recommended*** for treatment of pregnant people or breastfeeding mothers
      - No efficacy or safety data for baloxavir in pregnant or lactating people
      - Substantial evidence of oseltamivir safety for pregnancy and birth outcomes
- **Immunocompromised Persons**
  - **Prolonged influenza viral replication is a possibility, with emergence of antiviral resistant viruses during/after treatment**
    - Monitoring for antiviral resistance is advised
    - Infection prevention and control precautions recommended to reduce nosocomial transmission risk
  - **Neuraminidase inhibitor treatment is recommended (e.g., oseltamivir)**
  - **Baloxavir is *not recommended* (greater risk of resistance emergence than oseltamivir)**

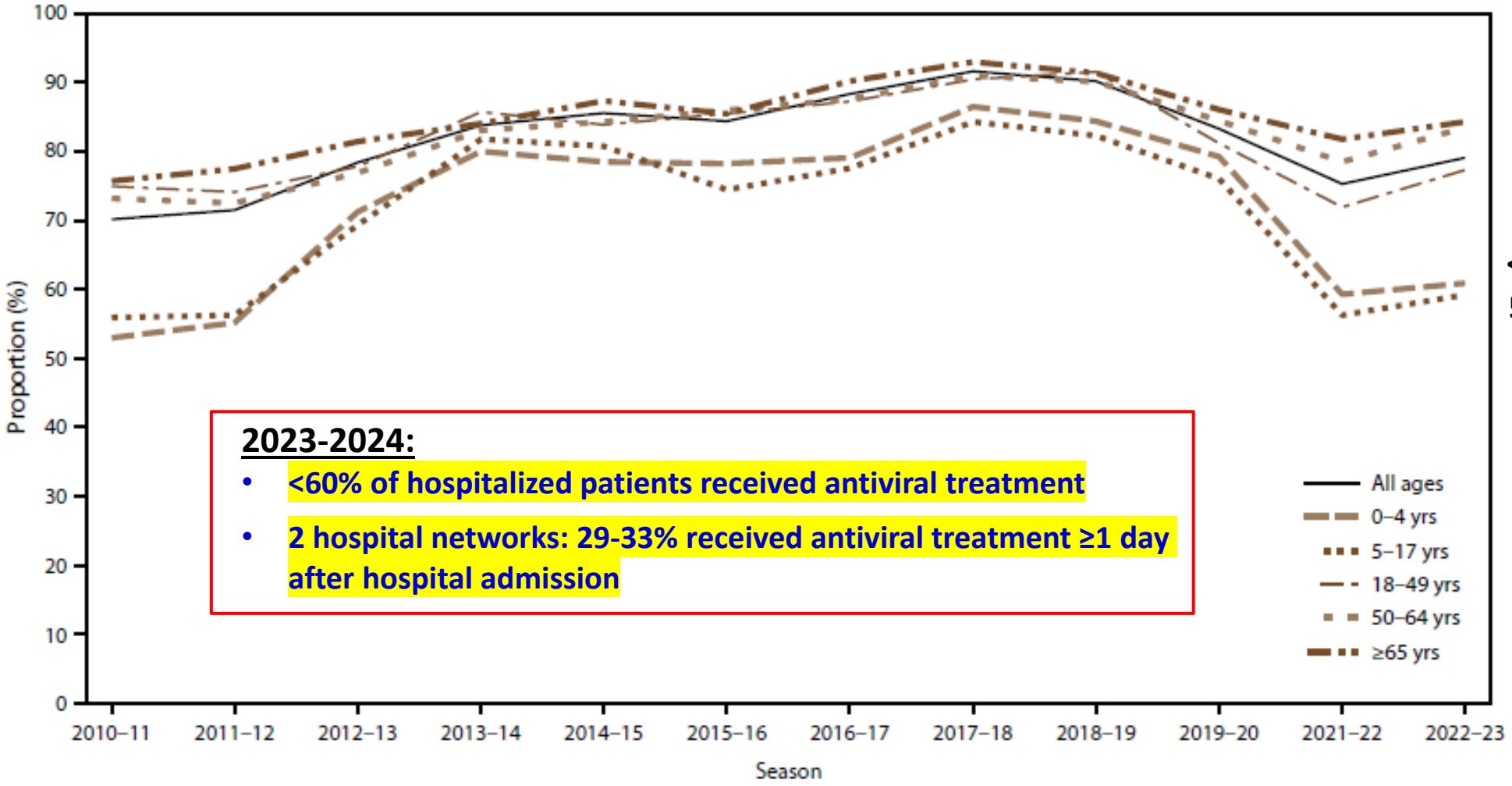
https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm

High-Risk Pediatric Outpatients with Medically Attended Laboratory-confirmed Influenza Who Received Antiviral Treatment, New Vaccine Surveillance Network, U.S., 2023-2024 (7 sites)

High-Risk Group	Receipt of Antiviral Treatment [n/N, (%)]
Children aged <5 years	**101/362 (28%)**
Children with a high-risk medical condition	**57/162 (35%)**
Children aged <5 years and a high-risk medical condition	**19/79 (39%)**
Asthma/reactive airway disease	41/122 (34%)
Chronic lung disease	45/128 (35%)
Chronic metabolic disease	8/11 (73%)
Blood disorders	5/17 (29%)
Cardiovascular disease	7/14 (50%)
Neurologic disorders	13/33 (39%)
Immunocompromised	2/3 (67%)
Prematurity (aged <24 months)	5/11 (45%)

Frutos MMWR November14, 2024

Proportions of antiviral use among laboratory-confirmed influenza-associated hospitalizations overall and by age group — Influenza Hospitalization Surveillance Network, United States, 2010–11 through 2022–23 influenza seasons



<5 years

5-17 years

2023-2024:

- **<60% of hospitalized patients received antiviral treatment**
- **2 hospital networks: 29-33% received antiviral treatment ≥1 day after hospital admission**

Naquin MMWR Surveillance Summaries October 31, 2024; Frutos MMWR Nov. 14, 2024

Self-knowledge check: A 4-year-old child with cystic fibrosis presents with a 2-day history of fever, cough, myalgia, sore throat, and tests positive for influenza A by rapid molecular assay. What is the recommended antiviral treatment for this outpatient?

A. Intravenous peramivir (single dose).
B. Inhaled zanamivir (twice daily x 5 days)
C. Baloxavir (single oral dose)
D. Oseltamivir (oral dose twice daily x 5 days)
E. A, B, C, or D are all recommended
F. Only C or D

Answer: A 4-year-old child with cystic fibrosis presents with a 2-day history of fever, cough, myalgia, sore throat, and tests positive for influenza A by rapid molecular assay. What is the recommended antiviral treatment for this outpatient?

A. Intravenous peramivir (single dose).
B. Inhaled zanamivir (twice daily x 5 days)
C. Baloxavir (single oral dose)
D. Oseltamivir (oral dose twice daily x 5 days)
E. A, B, C, or D are all recommended
F. Only C or D

Rationale: Oseltamivir is recommended for children of any age, and for high-risk children. Baloxavir is recommended for otherwise healthy children aged ≥5 years, and children with high-risk medical conditions aged ≥12 years. Inhaled zanamivir is recommended for otherwise healthy children aged ≥7 years. Peramivir can be given for otherwise healthy children aged ≥6 months but requires intravenous administration in a healthcare facility.

Recommendations for Influenza Prevention and Treatment in Children

An Update for Pediatric Providers

Kristina Bryant, MD, FAAP

Member, Committee on Infectious Diseases

American Academy of Pediatrics

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®

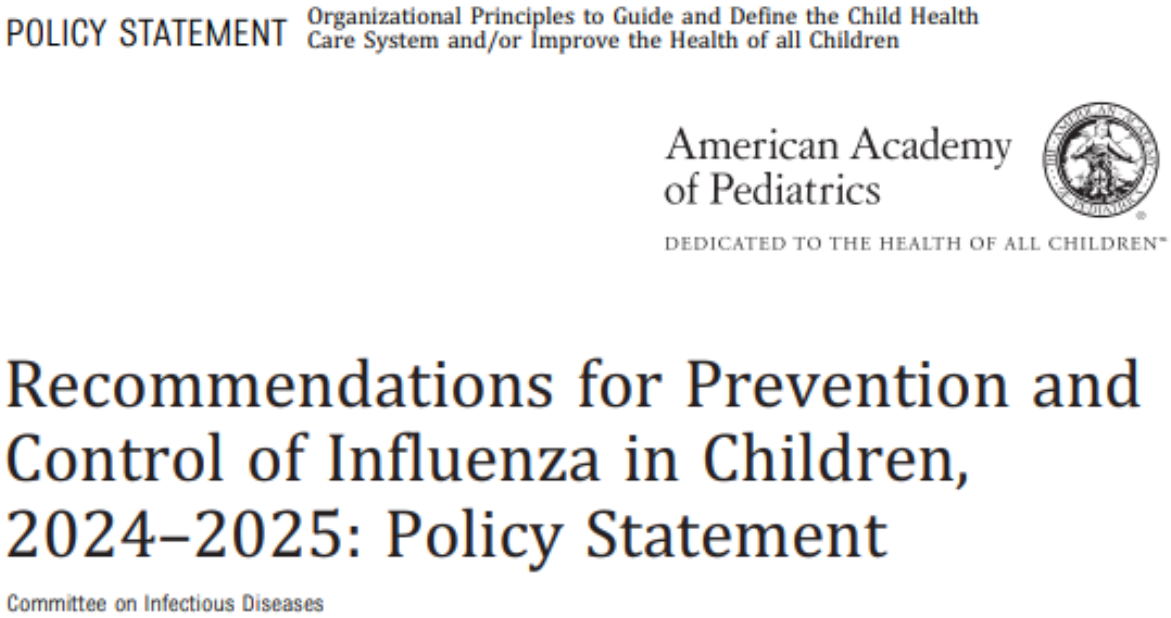
Learning Objectives

In this presentation, participants will:

- Understand AAP recommendations for influenza immunization
- Learn strategies to increase immunization rates
- Practice the presumptive format of vaccine communication

AAP Recommendations

Influenza Season 2024-2025



POLICY STATEMENT Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

Recommendations for Prevention and Control of Influenza in Children, 2024–2025: Policy Statement

Committee on Infectious Diseases

https://doi.org/10.1542/peds.2024-068507

American Academy of Pediatrics, Committee on Infectious Diseases. Recommendations for Prevention and Control of Influenza in Children, 2024–2025: Policy Statement. *Pediatrics*. 2024;154(4):e2024068507

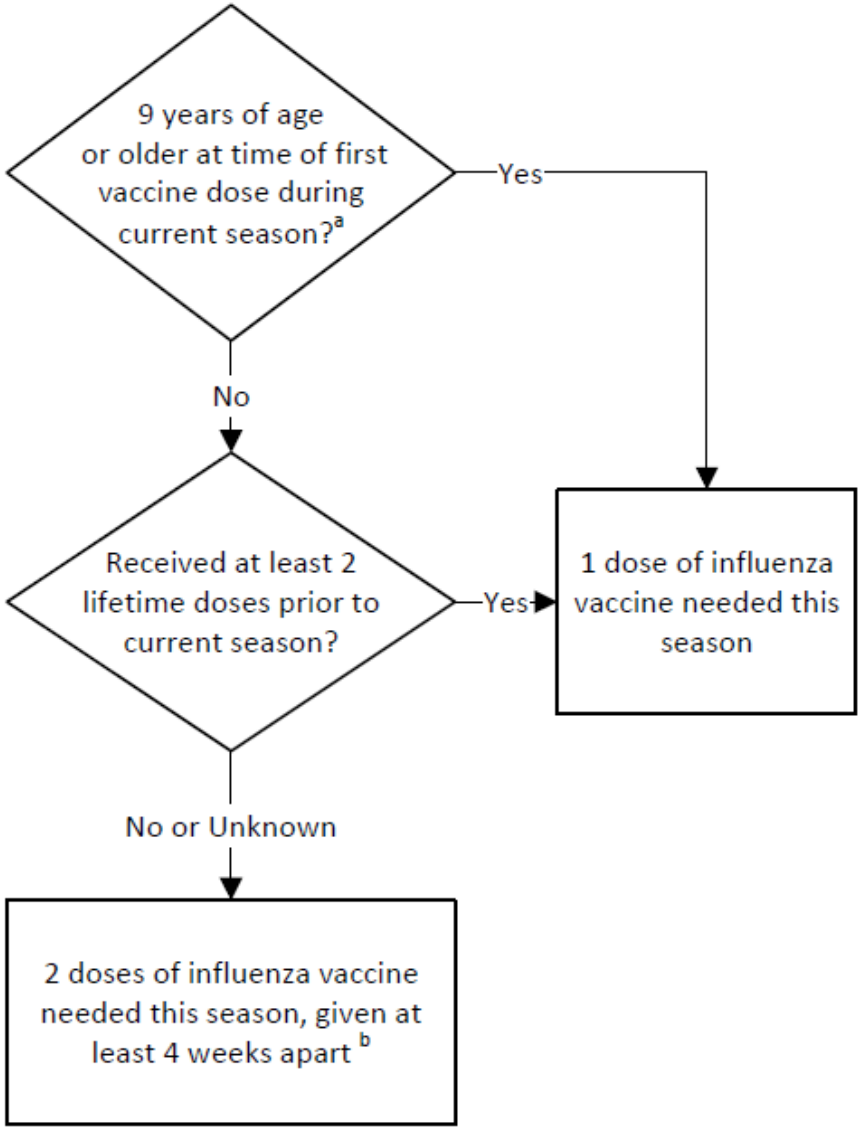
What's New for 2024-2025?

- Vaccine **composition updated** and all vaccines available in US are **trivalent**
- **Coadministration** with other recommended immunizations, **including nirsevimab**, is emphasized
- Recommendations for influenza **treatment and prophylaxis** have been simplified
- Recommendations for immunization of **immunocompromised hosts** have been updated
- Recommendations for **improving access** to influenza vaccine are emphasized.

What's The Same for 2024-2025?

- Influenza continues to cause **morbidity and mortality in children**
- Annual influenza **vaccination is recommended for all persons 6 months and older,** but immunization rates continue to fall
- **Any vaccine** appropriate for age and health status can be used
- **Antiviral treatment** is recommended for **certain children** with influenza

Seasonal Influenza Vaccine for Children: Number of Doses



- Must be at least 6 months of age to be eligible for influenza vaccine
- Second dose still required for children who turn 9 between first and second dose
- When two doses are required in a season, use of the same brand or type is **not required**.

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

Administration Pearls

For Influenza Vaccination

- The **maximum number of doses** drawn from a multidose vial is specified in the package insert and should not be exceeded.
- Residual product **must be discarded** regardless of the remaining volume in the vial.
- A 0.5-mL unit dose of any IIV **should not be split** into 2 separate 0.25-mL doses.

Administration Pearls

For Influenza Vaccination Continued

- IIV may be administered simultaneously with or at any time before or after other inactivated or live vaccines **(including COVID-19 vaccines and nirsevimab)**.
- LAIV may be administered simultaneously with other live or inactivated vaccines.
  - If not administered simultaneously, ≥4 weeks should pass between the administration of LAIV and other non-oral live vaccines.

Frequently Asked Questions

For Influenza Vaccination

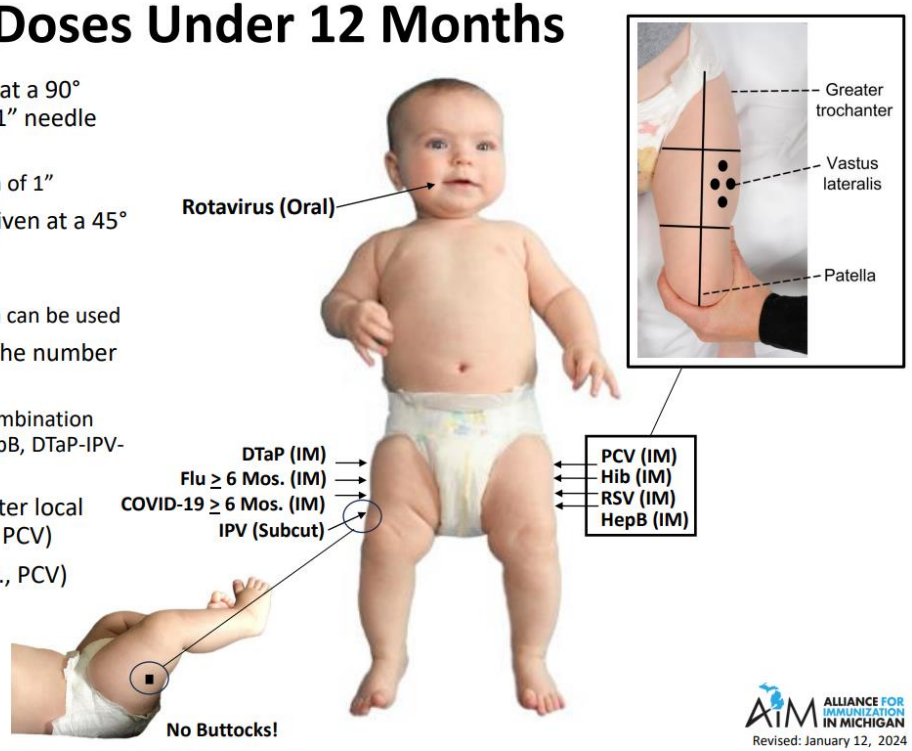
- Are there maximum volumes of injectable vaccine, antibiotic or other products that can be administered into each muscle group for different ages? For example, at the 6-month well-child visit, could an infant receive nirsevimab, COVID-19, **influenza,** PCV, and DTaP-IPV-HepB-Hib?

Frequently Asked Questions

For Influenza Vaccination

Giving All the Doses Under 12 Months

- **Intramuscular (IM)** injections are given at a 90° angle in the anterolateral thigh using a 1" needle (see ● to the right for placement)
  - Separate IM injection sites by a minimum of 1"
- **Subcutaneous (Subcut)** injections are given at a 45° angle in the thigh using a 5/8'' needle (see ■ below for placement)
  - If necessary, the upper outer triceps area can be used
- Using combination vaccines decreases the number of injections
  - IPV must be given IM when given as a combination vaccine (e.g., DTaP-IPV/Hib, DTaP-IPV-HepB, DTaP-IPV-HIB-HepB)
- Administer vaccines likely to cause greater local reaction into separate limbs (e.g., DTaP, PCV)
- Give the most painful injections last (i.e., PCV)



Additional vaccines may be needed. This handout only displays routine vaccines. For additional vaccine administration information see: "Administering Vaccines: Dose, Route, Site, and Needle Size" at www.immunize.org/catg.d/p3085.pdf

AIM ALLIANCE FOR IMMUNIZATION IN MICHIGAN
Revised: January 12, 2024

In accordance with the CDC's **General Best Practice Guidelines for Immunization**, simultaneous administration of nirsevimab with age-appropriate vaccines is recommended. CDC does not address the issue of maximum volumes that can be injected into each muscle group in different age groups. CDC has created **job aids** for healthcare providers to help address the issue and offers the suggested volumes as follows:

•Deltoid:

- Average 0.5 mL (range 0.5–2 mL)

•Vastus Lateralis:

- Average 1–4 mL (range 1–5 mL)

Infants and toddlers would fall at the lower end of the range, whereas adolescents and adults would generally fall on the higher end of the range.

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

https://www.aimtoolkit.org/docs/Giving%20All%20the%20Doses%20Under%2012%20Months%20FINAL.pdf;
https://www.aap.org/en/patient-care/respiratory-syncytial-virus-rsv-prevention/nirsevimab-frequently-asked-questions

Immunocompromised Hosts

For Influenza Vaccination

- Malignant neoplasms: In general, administer influenza vaccine ≥ 2 weeks before cytotoxic chemotherapy
- Anti-B cell therapies in previous 6 months: defer IIV until B cell recovery
- Hematopoietic stem cell: IIV beginning 4 to 6 months after transplantation
- Solid organ transplant (SOT): IIV beginning 3 months after transplant
  - considered ≥1 month after transplant during the influenza season

High-dose Influenza Vaccine

Option for Pediatric Hematopoietic-Cell Transplant (HCT) Recipients

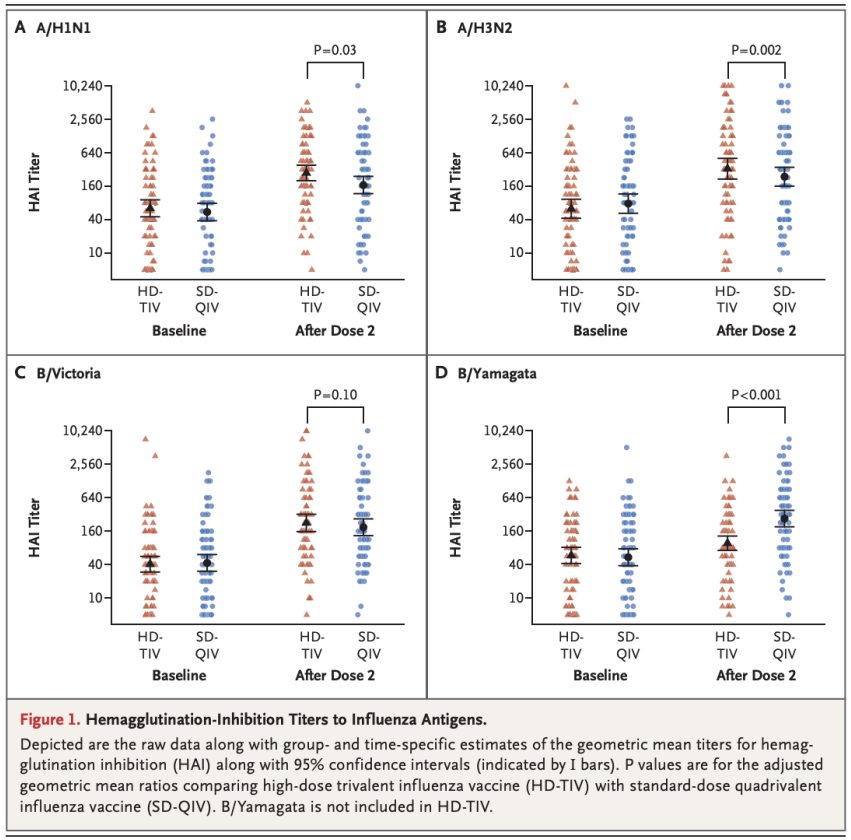


Figure 1. Hemagglutination-Inhibition Titers to Influenza Antigens.

Depicted are the raw data along with group- and time-specific estimates of the geometric mean titers for hemagglutination inhibition (HAI) along with 95% confidence intervals (indicated by I bars). P values are for the adjusted geometric mean ratios comparing high-dose trivalent influenza vaccine (HD-TIV) with standard-dose quadrivalent influenza vaccine (SD-QIV). B/Yamagata is not included in HD-TIV.

From Schuster JE, et al. *N Engl J Med*. 2023 Jan 26;388(4):374-376 Copyright © 2024 Massachusetts Medical Society. Reprinted with permission from Massachusetts Medical Society.

Although high-dose IIV is not approved for use in children, clinicians could consider administering 2 doses of high-dose trivalent inactivated (non-live) influenza vaccine (IIV3) 28 to 42 days apart in pediatric HCT recipients 3 to 17 years of age.

Timing of Influenza Vaccination

- Offer influenza vaccine **as soon as it becomes available**, especially to children who require 2 doses.
- Administer recommended dose(s) ideally **by the end of October**.
- **Continue offering** vaccine to unvaccinated children and families throughout the season.

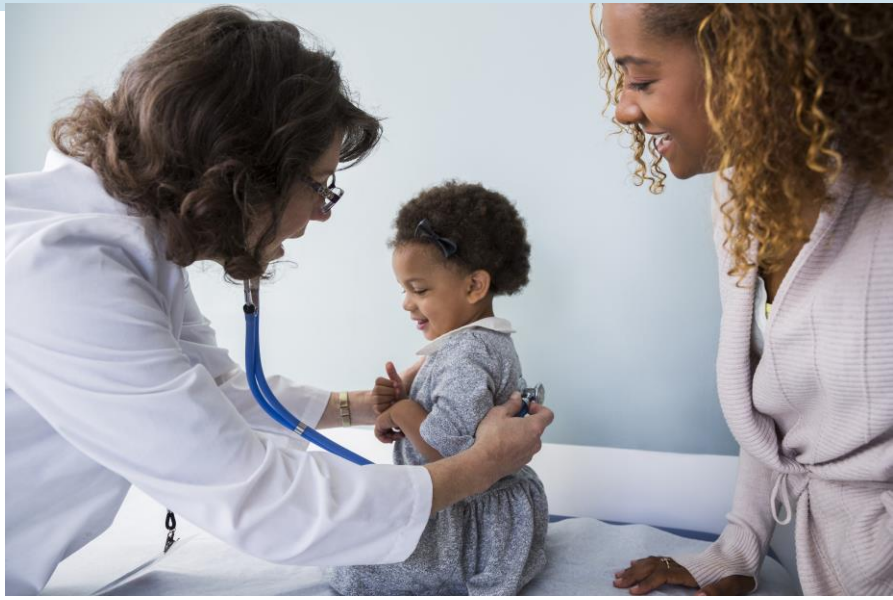
Children at High Risk for Influenza Complications

- Any child < 5 years
  - Especially < 2 years
- Residents of chronic care facilities or nursing homes

Underlying Condition or Treatment	
Chronic pulmonary disease	Metabolic disorders
Cardiovascular disease	Neurologic and neurodevelopmental conditions
Kidney disease	Extreme obesity[2]
Hepatic disease	Immunosuppression
Hematologic disease	Pregnancy and post-partum
Receipt of aspirin or salicylate-containing therapies[1]	[1]<19 years who may be at increased risk of Reye syndrome [2]Could consider BMI ≥99% for age

Strategies for Increasing Influenza Immunization Rates

Provider/Care Team



- Offer a **strong, presumptive** recommendation
- **Bundle recommendation** for influenza vaccine with recommendations for other needed vaccines
- Use **consistent messaging** across care team members
- Identify influenza vaccine **champions**

AAP Resources Can Facilitate Communication about Influenza Vaccine

CLINICAL REPORT Guidance for the Clinician in Rendering Pediatric Care

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

Strategies for Improving Vaccine Communication and Uptake

Sean T. O'Leary, MD, MPH, FAAP,[a] Douglas J. Opel, MD, MPH,[b] Jessica R. Cataldi, MD, FAAP,[a] Jesse M. Hackell, MD, FAAP,[c]
COMMITTEE ON INFECTIOUS DISEASES; COMMITTEE ON PRACTICE AND AMBULATORY MEDICINE; COMMITTEE ON BIOETHICS

https://doi.org/10.1542/peds.2023-065483

O'Leary ST, Opel DJ, Cataldi JR, Hackell JM; American Academy of Pediatrics, Committee on Infectious Diseases, Committee on Practice and Ambulatory Medicine, Committee on Bioethics. Strategies for Improving Vaccine Communication and Uptake. *Pediatrics*. 2024;153(3):e2023065483

Practice the Presumptive Recommendation

Start the vaccine conversation with parents by presuming that shots will be given at the visit
Example: "Today we're going to do 2 shots." *Example*: "Sara gets 2 shots today." *or* "I know you had some concerns last time, but Sara is due for 3 shots today." *Example*: "Johnny's due for 2 shots today."

Practice the Presumptive Recommendation

Continued

- Tone and body language matter.
- Square shoulders and make eye contact.
- Don’t make the presumptive format sound like a question.
- Don’t be distracted.
- Know what vaccines the child is due for before you go in the room.

O'Leary ST, et al. *Pediatrics*. 2024 Mar 1;153(3):e2023065483

Presumptive Pearls

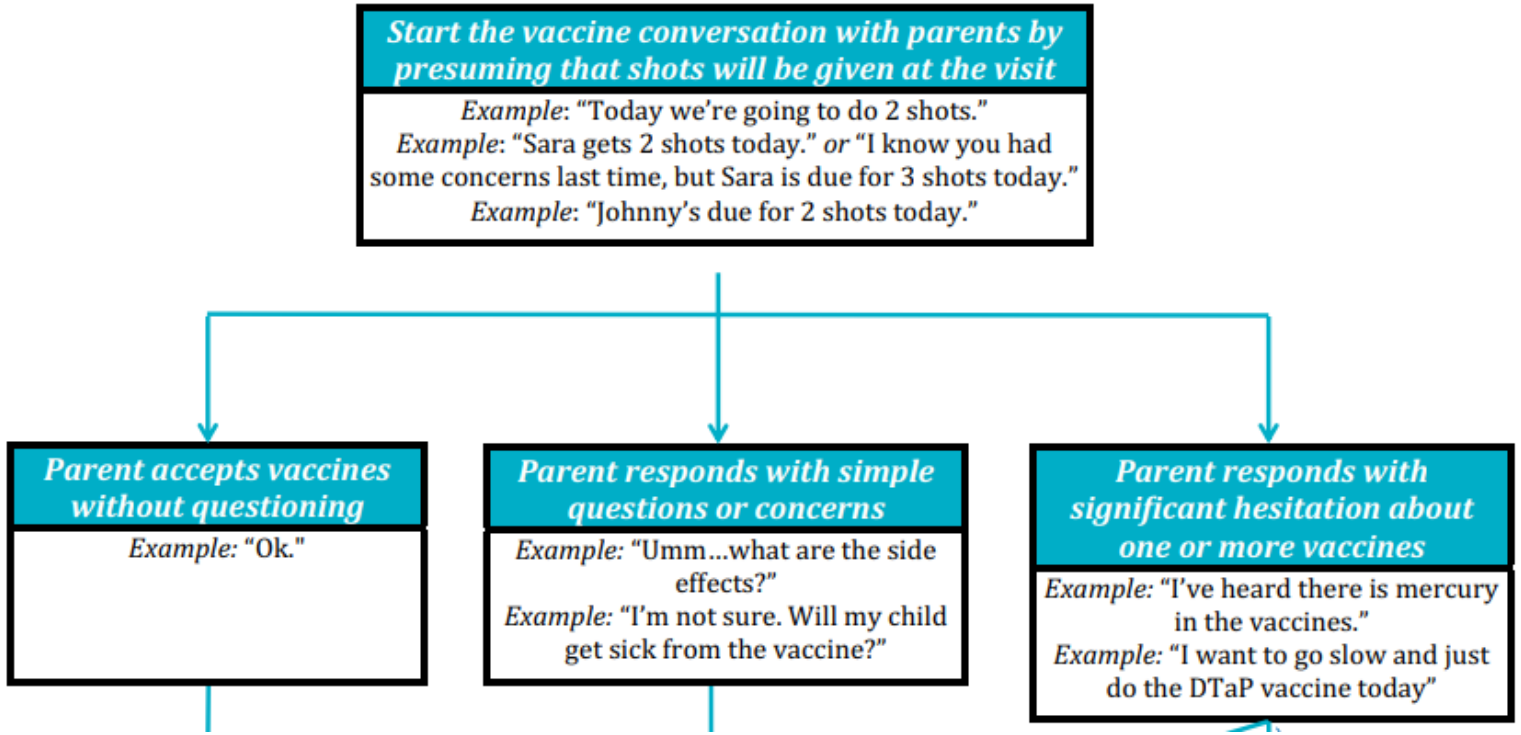
Are these part of your practice?

- You can use a presumptive format even if a parent has voiced resistance at a previous visit.
- You can use a presumptive format even if an MA or another staff member tells you that the parent is hesitant.
- Don’t undermine the presumptive format by quickly reverting to the participatory format.
- Allow the parent time to respond (be comfortable with some silence).

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

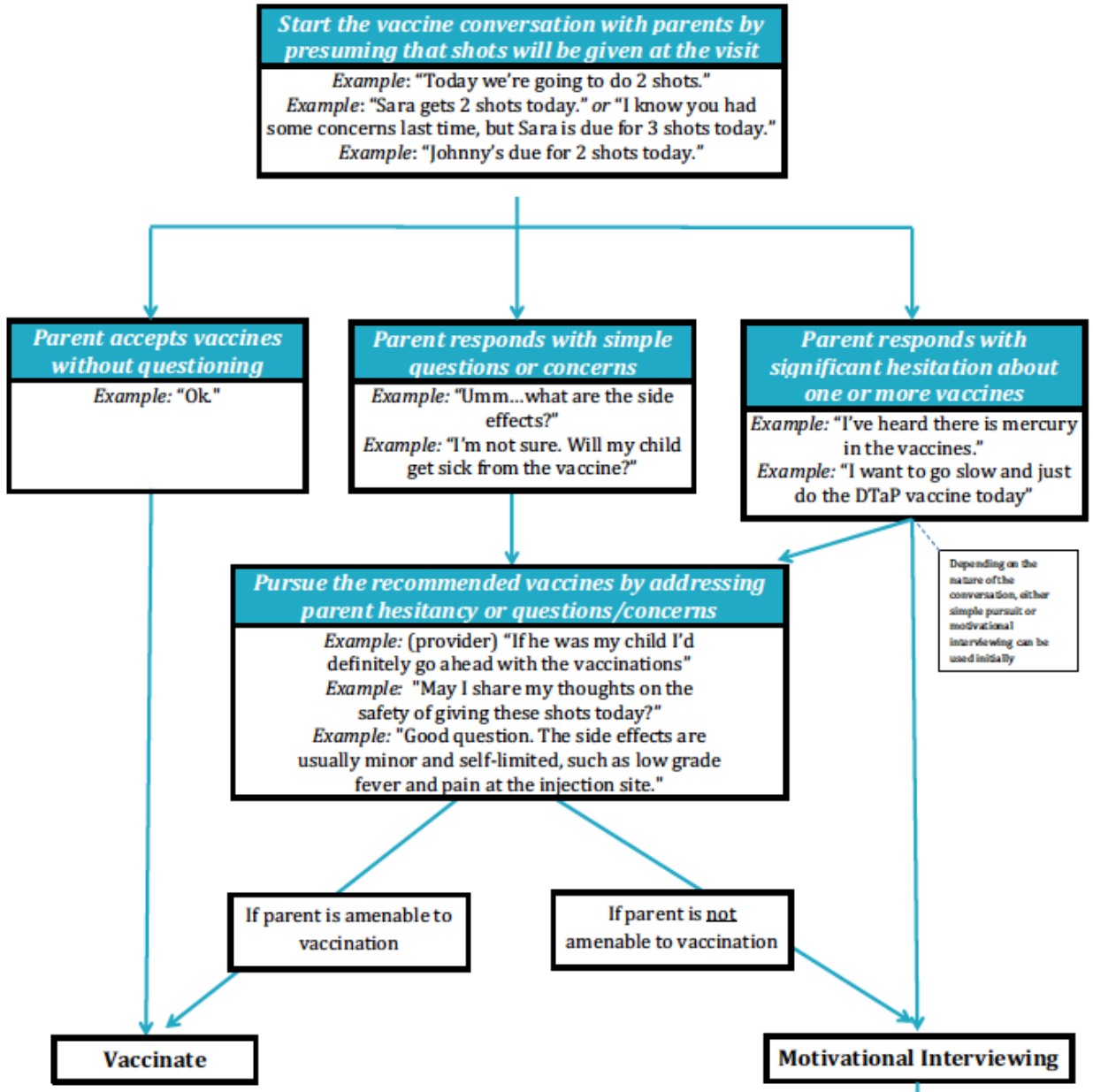
O'Leary ST, et al. *Pediatrics*. 2024 Mar 1;153(3):e2023065483

After the Presumptive Recommendation



After the Presumptive Recommendation

Continued



American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

Reprinted from: *Vaccine*, 41(10), O'Leary ST, Spina CI, Spielvogle H, et al. Development of PIVOT with MI: a motivational interviewing-based vaccine communication training for pediatric clinicians. Pages 1763–1764, © 2023, with permission from Elsevier.

Strategies for Increasing Influenza Immunization Rates

Practice/Health System

- Review influenza vaccination status at all visits
- Bundle influenza vaccine with other needed vaccines
- Vaccinate at all visit types
- Vaccinate in all healthcare settings
- Increase access to influenza vaccine (eg, expanded hours, vaccine-only clinic)
- Provide evidence-based information to patients and families
- Offer scripting for staff to address common questions

Don't let the flu stop you!

You've come this far keeping everyone healthy—**let's keep it going!**

Schedule your child's flu vaccination today.

healthychildren.org
Powered by pediatricians. Trusted by parents.
from the American Academy of Pediatrics

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

Strategies for Increasing Influenza Immunization Rates

Practice/Health System Continued

- Send influenza vaccine reminder/recall messages
- Use electronic health records (EHR)-based tools to identify and classify high-risk patients for targeted outreach
- Utilize standing orders
- Implement influenza vaccine provider prompts/clinical decision support
- Perform audits or share feedback reports
- Integrate EHR with regional or state immunization

Strategies for Increasing Influenza Immunization Rates

Community/Public Health

- Partner with stakeholders to support vaccine initiatives within the community, including school-based programs and pharmacies.
- Engage with communities affected by health disparities to develop tailored strategies that promote trust, encourage dialogue, and increase access to preventative services.

New Opportunity to Partner with Pharmacies in 2025-2026

U.S. FOOD & DRUG ADMINISTRATION

← Home / News & Events / FDA Newsroom / Press Announcements / FDA Approves Nasal Spray Influenza Vaccine for Self- or Caregiver-Administration

FDA NEWS RELEASE

FDA Approves Nasal Spray Influenza Vaccine for Self- or Caregiver-Administration

First Influenza Vaccine That Does Not Need to be Administered by a Health Care Provider

Share | Post | Linkedin | Email | Print

More Press Announcements

For Immediate Release: September 20, 2024

[FDA Approves Nasal Spray Influenza Vaccine for Self- or Caregiver-Administration | FDA]

[FDA approves first flu vaccine for at-home use | AAP News | American Academy of Pediatrics]

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

Testing for Influenza

Photo Credit: Healthychildren.org

- Test children with signs and symptoms of influenza when test results are anticipated to impact clinical management.
- When influenza is circulating, test hospitalized patients with signs and symptoms of influenza with a molecular assay with high sensitivity and specificity (eg, RT-PCR).
- Use of at-home test results to inform treatment decisions should be informed by the sensitivity and specificity of the test, the prevalence of influenza in the community, the presence and duration of compatible signs and symptoms, and individual risk factors and comorbidities.

AAP Influenza Resources

- Influenza Resources: www.aap.org/influenza
- Red Book Online: https://publications.aap.org/redbook
- Pediatric Professional Tools & Resources: www.aap.org/immunization
- Promoting Vaccine Confidence: www.aap.org/vaccinecommunication
- Parenting Website: www.healthychildren.org
- Infection Prevention and Control Resources: www.aap.org/projectfirstline

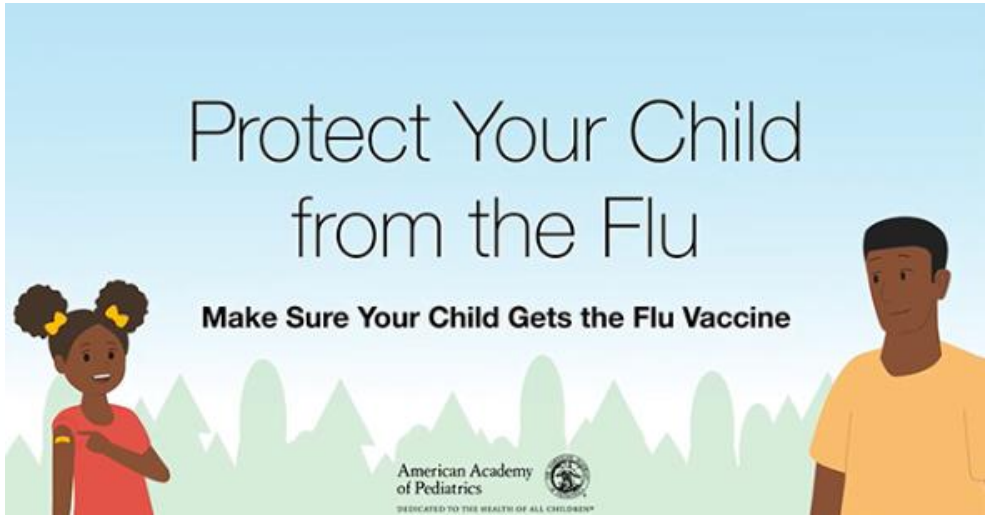
AAP Influenza Toolkits

Flu Vaccine Communication Campaign:

https://www.aap.org/en/news-room/campaigns-and-toolkits/flu-campaign-toolkit/

How to Set Up a Flu Vaccination Clinic:

https://www.aap.org/en/patient-care/influenza/how-to-set-up-a-flu-clinic/



Self Knowledge Check #2

Influenza vaccination should only occur in the medical home.

A. True

B. False

Self Knowledge Check #2

Answer

Influenza vaccination should only occur in the medical home.

A. True

B. False

Rationale: Although vaccination in the medical home is optimal, administering influenza vaccine in diverse locations, such as subspecialty practices, urgent care clinics, emergency departments, schools, and pharmacies, may increase uptake among patients who do not have or cannot readily access their medical home and those at high risk for influenza-related complications. When influenza vaccination takes place in a nontraditional setting, appropriate documentation should be provided to patients and to the medical home. Settings that offer influenza vaccination should submit details about the vaccination to the appropriate IISs, including all content needed to support communication of this information to the patient's medical home.

To Ask a Question

- Using the Zoom Webinar System
  - Click on the “Q&A” button
  - Type your question in the “Q&A” box
  - Submit your question

- If you are a patient, please refer your question to your healthcare provider.

- If you are a member of the media, please direct your questions to CDC Media Relations at 404-639-3286 or email media@cdc.gov.

TRAIN

- **January 1, 2024**: Move from Training and Continuing Education Online (TCEO) to CDC TRAIN (https://www.train.org/cdctrain).

- **Existing Activities**: Continue to use TCEO for existing activities that have CE set to expire in 2024, since these courses will not move to CDC TRAIN. You may also use TCEO for existing activities with CE set to expire in 2025, before the courses transition to CDC TRAIN sometime next year. If you begin one of these courses in TCEO, we will let you know when the course will move to CDC TRAIN.

- **Transcripts & Certificates**: You can access and download CE transcripts and certificates in TCEO through the end of 2025.

- Instructions will be available on both platforms and a learner support team will be available to answer questions.

Continuing Education

- All continuing education for COCA Calls is issued online through CDC TRAIN at CDC TRAIN (https://www.train.org/cdctrain).

- Those who participate in today's COCA Call and wish to receive continuing education please complete the online evaluation by **December 16, 2024,** with the **course code WC4520R-111424.** The **registration code** is **COCA111424.**

- Those who will participate in the on-demand activity and wish to receive continuing education should complete the online evaluation between **December 17, 2024,** and **December 17, 2026,** and use **course code WD4520R-111424.** The **registration code** is **COCA111424.**

Today's COCA Call will be Available to View On-Demand

- **When:** ~One week after live session
- **What:** Closed-captioned video and transcript
- **Where:** On the COCA Call webpage
  - https://emergency.cdc.gov/coca/calls/2024/callinfo_111424.asp

Additional Resources

- Continue to visit https://emergency.cdc.gov/coca/ to get more details about upcoming COCA Calls.

- Subscribe to receive notifications about upcoming COCA calls and other COCA products and services at emergency.cdc.gov/coca/subscribe.asp.

Thank you for joining us today!

http://emergency.cdc.gov/coca

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.