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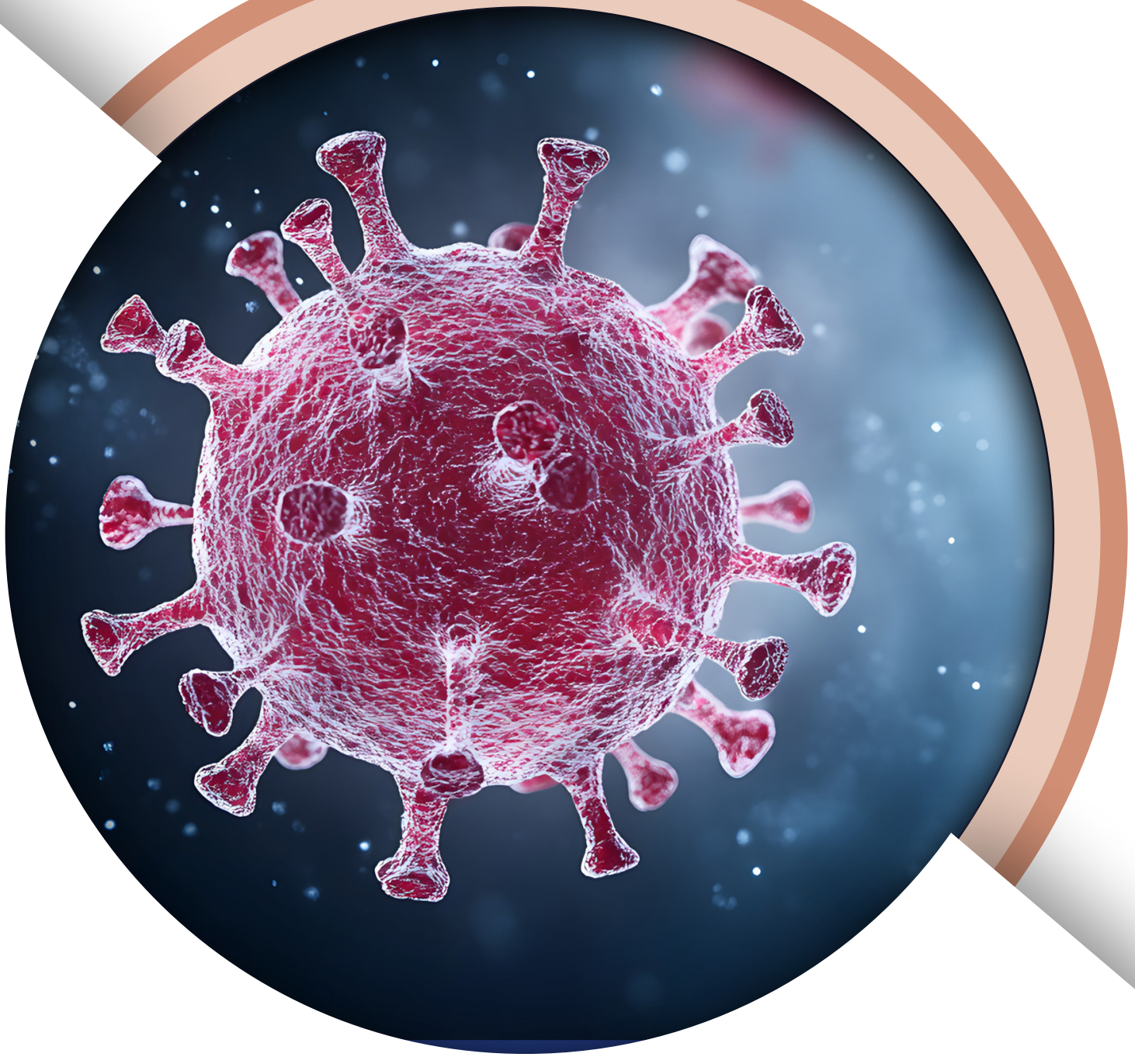

BIOTHERAPEUTICS QUARTERLY

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Diagnostic and Pharmaceutical News for You and Your Medical Practice

BIOTHERAPEUTICS QUARTERLY

Diagnostic and Pharmaceutical News for You and Your Medical Practice

2025/Summer/Volume 60

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New DRUG APPROVALS

OMLYCLO® (omalizumab-igec) Injection
Date of Approval: March 7, 2025
Companyc Celltrion USA
Treatment for: Asthma, Maintenance, Chronic Rhinosinusitis With Nasal Polyps, Food Allergies, Urticaria Omlyclo (omalizumab-igec) is an anti-IgE antibody interchangeable biosimilar to Xolair for the treatment of asthma, chronic rhinosinusitis with nasal polyps, IgE-mediated food allergy, and urticaria.

Arbli™ (losartan potassium) Oral Suspension
Date of Approval: March 13, 2025
Company: Scienture Holdings, Inc.
Treatment for: High Blood Pressure, Diabetic Kidney Disease
Arbli (losartan potassium) is an oral liquid formulation of the approved angiotensin II receptor blocker losartan for use in the treatment of hypertension and diabetic nephropathy.

Conexxence® (denosumab-bnht) Injection
Date of Approval: March 25, 2025
Company: Fresenius Kabi USA, LLC
Treatment for: Osteoporosis
Conexxence (denosumab-bnht) is a RANK ligand (RANKL) inhibitor biosimilar to Prolia (denosumab) used in the treatment of osteoporosis.

VANRAFIA® (atrasentan) Tablets
Date of Approval: April 2, 2025
Company: Novartis Pharmaceuticals Corporation
Treatment for: Immunoglobulin A Nephropathy
Vanrafia (atrasentan) is an endothelin A receptor antagonist used for proteinuria reduction in primary immunoglobulin (IgA) nephropathy.

IMAAVY™ (nipocalimab-aahu) Injection
Date of Approval: April 29, 2025
Treatment for: Myasthenia Gravis
Imaavy (nipocalimab-aahu) is a neonatal Fc receptor (FcRn) blocker used for the treatment of generalized myasthenia gravis.

ZEVASKYN™ (prademagene zamikeracel) Gene-Modified Cellular Sheets
Date of Approval: April 28, 2025
Company: Abeona Therapeutics Inc.
Treatment for: Epidermolysis Bullosa
Zevaskyn (prademagene zamikeracel) is an autologous, cell sheet-based gene therapy for the treatment of recessive dystrophic epidermolysis bullosa.

National Institutes of Health
Turning Discovery Into Health

May 6, 2025

Smoking cessation pill may help youth quit vaping

At a Glance

- Teens and young adults who took a smoking cessation drug called varenicline were more likely toquit vaping nicotine than those who got a placebo pill.
- The results suggest that this existing treatment for nicotine addiction could help combat e-cigarette use among young people.

Vaping devices have become the most commonly used form of nicotine among youth in the United States. Diego Cervo / Shutterstock

About 1 in 4 young adults between the ages of 18 and 25 regularly use e-cigarettes to vape nicotine, as well as 7% of U.S. high school students. The growing popularity of vaping has reversed earlier progress in curbing nicotine addiction, which primes young brains for other forms of substance use and comes with its own health risks. While many young people who vape say they want to quit or cut back, studies hadn't tested treatments that might help them succeed.

NIH-funded researchers led by Dr. A. Eden Evins at Massachusetts General Hospital wanted to know if an FDA-approved smoking cessation drug called varenicline could help youth quit nicotine vaping. The drug, which is approved for smoking cessation in adults, works by blocking some effects of nicotine in the brain. As a result, it can ease quitting by both reducing craving and making nicotine less enjoyable. Earlier studies have shown mixed results for the medication in helping youth who want to stop smoking.

To test its use for vaping, the researchers enrolled 261 participants who ranged in age from 16 to 25, with an average age of about 21. The participants reported nicotine vaping almost daily with no history of regular tobacco smoking. Trial results appeared in *JAMA* on April 23, 2025.

Participants were randomly assigned to one of three groups. All got referred to an intervention called This is Quitting, a free text messaging-based program to encourage vaping cessation. In addition, two groups received 20-minute, remote weekly sessions with a young, nonprofessional counselor trained to help youth stop vaping. One of these two groups took varenicline twice a day while the other took an inactive placebo pill.

After 12 weeks, 51% of those taking varenicline had stopped vaping. Only 14% of those taking the placebo pill and just 6% of those who received only a referral for text-based support stopped vaping. By six months, 28% of those who took varenicline still weren't vaping compared to 7% of those who took the placebo and 4% of those in the text-only group.

The researchers found that varenicline was well tolerated, causing no serious side effects. Only three participants dropped out of the study due to adverse events—two taking varenicline and one taking the placebo. Importantly, study participants who quit vaping didn't replace their vaping with smoking tobacco.

More long-term study is needed, including in young people who vape and smoke tobacco and in younger teens who vape nicotine. But the findings suggest that varenicline could help to address nicotine use and vaping among teens and young adults. Because varenicline is approved for smoking cessation, doctors can and do already prescribe it to children and teens.

"Vaping is extremely popular among kids, and we know that this early nicotine exposure can make drugs like cocaine more addictive down the line, yet ours is the first treatment study to look at this vulnerable population," Evins says. "We wanted to help teens and young adults quit, and we found that prescribing varenicline is the best way to do that."

—by Kendall K. Morgan, Ph.D.

Related Links

- E-cigarettes May Complicate Teen Attempts to Quit Nicotine
- Vaping Alters Mouth Microbes
- E-cigarette Use May Lead Some to Quit Traditional Cigarettes
- E-cigarettes May Affect Teen Tobacco Use
- Tobacco/Nicotine and Vaping
- Vaping Devices (Electronic Cigarettes) DrugFacts

References: Varenicline for Youth Nicotine Vaping Cessation: A Randomized Clinical Trial. Evins AE, Cather C, Reeder HT, Evohr B, Potter K, Pachas GN, Gray KM, Levy S, Rigotti NA, Iroegbulem V, Dufour J, Casottana K, Costello MA, Gilman JM, Schuster RM.. *JAMA*. 2025 Apr 23:e253810. doi: 10.1001/jama.2025.3810. Epub ahead of print. PMID: 40266580.

Funding: NIH's National Institute on Drug Abuse (NIDA).

Source: https://www.nih.gov/news-events/nih-research-matters/smoking-cessation-pill-may-help-youth-quit-vaping

National Institutes of Health
Turning Discovery Into Health

February 25, 2025

Therapy boosts peanut tolerance in allergic kids

At a Glance

- Peanut-allergic children who could tolerate eating at least a half peanut greatly boosted their tolerance by eating gradually increased daily doses of peanut butter.
- The simple and inexpensive treatment approach could fill an unmet need for the many kids who have a milder "high-threshold" type of peanut allergy.

Peanut is one of the most common food allergies. It often begins in childhood and usually lasts for life. NIH-supported studies over the past few decades have led to important advances and improved treatment options for many people with peanut allergies. Most such treatments were tested in kids who are highly sensitive to peanuts, unable to tolerate even the equivalent of a half peanut. These treatments can raise the safe threshold before a reaction, but peanut avoidance is still advised.

Researchers tested whether a simple strategy could help kids with high-threshold peanut allergy tolerate more peanut protein. Zoeytoja / Shutterstock

Less has been known about effective treatments for the estimated 800,000 children in the U.S. who have "high-threshold" peanut allergy. These children can tolerate eating half a peanut or more.

A research team led by Drs. Scott H. Sicherer and Julie Wang of the Icahn School of Medicine at Mount Sinai designed a clinical trial, funded by NIH, to assess whether a simple, low-cost, at-home treatment strategy could help kids with high-threshold peanut allergy tolerate more peanut protein. The study included 73 children, ages 4 to 14 years. They were randomly assigned to either test the new treatment strategy or continue avoiding peanut.

At the start, children in the treatment group received a minimum daily dose of 1/8 teaspoon of store-bought peanut butter. Doses were gradually increased and tested under medical supervision every eight weeks, followed by at-home dosing. By 8 to 17 months, daily doses had reached about the equivalent of 1 tablespoon of peanut butter.

Finally, participants in both the treatment and avoidance groups underwent a medically supervised feeding test to assess how much peanut they could eat without an allergic reaction. Results appeared on February 10, 2025, in *NEJM Evidence*.

The researchers found that all 32 treated children who participated in the oral food challenge could tolerate 9 grams of peanut protein. That's equivalent to about two and a half tablespoons of peanut butter. By contrast, only three of the 30 kids who underwent the oral food challenge in the avoidance group (10%) could tolerate that much peanut protein.

The treatment group's daily at-home doses of peanut butter were well tolerated. None of the treated children needed epinephrine to ease severe allergic reactions at home, although one needed it for a reaction during a medically supervised dose increase.

To assess the potentially lasting effects of treatment, kids in the treatment group continued to eat at least 2 tablespoons of peanut butter weekly for 16 weeks. They then avoided peanut for eight weeks and returned for a final food challenge. The researchers found that 26 of the 30 treated children (86.7%) were still able to tolerate 9 grams of peanut protein.

"Our study results suggest a safe, inexpensive, and effective pathway for allergists to treat children with peanut allergy who can already tolerate the equivalent of at least half a peanut, considered a high-threshold peanut allergy," Sicherer says. "My hope is that this study will eventually change practice to help these children and encourage additional research that includes this approach for more foods."

Related Links

- Providing Lasting Protection from Peanut Allergy
- Drug Cuts Risk of Allergic Reactions to Peanuts and Other Foods
- Oral Immunotherapy for Peanut Allergy in Young Children
- Peanut Allergy Protection Limited after Oral Immunotherapy
- Understanding Food Allergies: How to Prevent Peanut Allergy and More
- Food Allergy
- Addendum Guidelines for the Prevention of Peanut Allergy in the United States

References: Peanut Oral Immunotherapy in Children with High-Threshold Peanut Allergy. Sicherer SH, Bunyavanich S, Berin MC, Lo T, Groetch M, Schaible A, Perry SA, Wheatley LM, Fulkerson PC, Chang HL, Suárez-Fariñas M, Sampson HA, Wang J. *NEJM Evid*. 2025 Feb 10:EVIDoa2400306. doi: 10.1056/EVIDoa2400306. Online ahead of print. PMID: 39928078.

Funding: NIH's National Institute of Allergy and Infectious Diseases (NIAID) and National Center for Advancing Translational Sciences (NCATS).

Source: https://www.nih.gov/news-events/nih-research-matters/therapy-boosts-peanut-tolerance-allergic-kids

U.S. Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
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Interim Evaluation of Respiratory Syncytial Virus Hospitalization Rates Among Infants and Young Children After Introduction of Respiratory Syncytial Virus Prevention Products — United States, October 2024–February 2025

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Abstract

Maternal respiratory syncytial virus (RSV) vaccine and nirsevimab, a long-acting monoclonal antibody for infants aged 0–7 months and children aged 8–19 months who are at increased risk for severe RSV disease, became widely available for prevention of severe RSV disease among infants and young children during the 2024–25 RSV season. To evaluate the association between availability of these products and infant and child RSV-associated hospitalization rates, the rates among children aged <5 years were compared for the 2024–25 and 2018–20 RSV seasons using data from the RSV-Associated Hospitalization Surveillance Network (RSV-NET) and New Vaccine Surveillance Network (NVSN). Among infants aged 0–7 months (eligible for protection with maternal vaccination or nirsevimab), 2024–25 RSV-associated hospitalization rates were lower compared with 2018–20 pooled rates (estimated relative rate reductions of 43% [RSV-NET: 95% CI = 40%–46%] and 28% [NVSN: 95% CI = 18%–36%]). The largest estimated rate reduction was observed among infants aged 0–2 months (RSV-NET: 52%, 95% CI = 49%–56%; NVSN: 45%, 95% CI = 32%–57%) and during peak hospitalization periods (December–February). These findings support Advisory Committee on Immunization Practices' recommendations for maternal vaccination or nirsevimab to protect against severe RSV disease in infants and highlight the importance of implementing the recommendations to protect infants as early in the RSV season as possible, before peak transmission, and for infants born during the RSV season, within the first week of life, ideally during the birth hospitalization.

Introduction

Respiratory syncytial virus (RSV) is the leading cause of hospitalization among U.S. infants, with infants aged 0–2 months at the highest risk for hospitalization (*1*). Two effective products for preventing infant RSV hospitalizations, maternal RSV vaccine[§] (*2*) (administered during weeks 32–36 of pregnancy

* These authors contributed equally to this report.
† These senior authors contributed equally to this report.

§ Maternal RSV vaccine should be administered to pregnant women at 32–36 weeks' gestation during September–January in most of the continental United States to protect infants during their first months of life when maternal vaccination protection is highest and during the RSV season when RSV circulation is highest. Administering vaccine starting in September (1–2 months before anticipated RSV season start) through January (2–3 months before anticipated RSV season end) maximizes cost-effectiveness and benefits. In jurisdictions with RSV seasonality that differs from the continental United States, providers should follow state, local, or territorial guidance on timing.

Continuing Education examination available at https://www.cdc.gov/mmwr/mmwr_continuingEducation.html

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

during September–January in most of the United States) and nirsevimab[¶] (*3*) (a long-acting monoclonal antibody for all infants aged 0–7 months in their first RSV season and children aged 8–19 months in their second RSV season at increased risk for severe RSV disease) were introduced during the 2023–24 U.S. RSV season[**,††] (*2*–*5*). To assess a possible association between availability of these products and RSV-associated hospitalizations, this ecologic analysis compared pediatric RSV-associated hospitalization rates from two U.S. active surveillance systems, the RSV-Associated Hospitalization Surveillance Network (RSV-NET) and New Vaccine Surveillance Network (NVSN), during 2024–25 and 2018–20.

Methods

Data Sources

RSV-NET conducts active population-based surveillance for laboratory-confirmed[§§] RSV-associated hospitalizations identified through clinical testing among catchment-area residents of all ages in approximately 300 hospitals in 161 counties across 13 states.[¶¶,***] NVSN conducts active, population-based surveillance for acute respiratory illness (ARI) among hospitalized children aged <18 years at seven U.S. medical centers[†††] (*4*); respiratory specimens from all enrolled children are tested for RSV.[§§§] RSV-NET and NVSN have both used standardized case definitions and active case finding since 2016 and 2000, respectively (*4*,*6*), and both collect demographic data through medical record abstraction. NVSN also conducts parent interviews.

[¶] Beginning shortly before the RSV season starts, providers should administer nirsevimab to infants aged <8 months and to children aged 8–19 months at increased risk for severe RSV disease. Nirsevimab could be administered in most of the continental United States from October through the end of March. Because timing of onset, peak, and decline of RSV activity might vary geographically, providers can adjust administration schedules based on local epidemiology. Providers should consult state, local, or territorial guidance on timing of nirsevimab administration.

[**] Nirsevimab Coverage, Children 0 to 7 months, United States | RSVVaxView | CDC

[††] Infant Protection Against Respiratory Syncytial Virus (RSV) by Maternal RSV Vaccination or Receipt of Nirsevimab, and Intent for Nirsevimab Receipt, United States

[§§] RSV-associated hospitalizations are defined as those among persons who have received a positive RSV reverse transcription–polymerase chain reaction (RT-PCR) or rapid antigen detection test result ≤14 days before or after hospital admission.

[¶¶] RSV-NET population-based RSV-associated hospitalization rates were generated for the 2018–19 and 2019–20 seasons for residents in 65 and 72 selected counties and county equivalents, respectively, in California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Oregon, Tennessee, and Utah; for the 2024–25 season, rates were generated for residents from 161 selected counties and county equivalents in these states and North Carolina.

[***] RSV-NET | RSV | CDC

[†††] NVSN population-based RSV-associated hospitalization rates were generated using actively enrolled residents of defined catchment area counties for the seven sites that were included: Cincinnati (Hamilton County, Ohio); Houston (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties, Texas); Kansas City (Jackson County, Missouri); Nashville (Davidson County, Tennessee); Pittsburgh (Allegheny County, Pennsylvania); Rochester (Monroe County, New York); and Seattle (King County, Washington).

[§§§] Systematically collected respiratory specimens were tested by real-time RT-PCR.

The *MMWR* series of publications is published by the Office of Science, U.S. Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

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This analysis included RSV-NET and NVSN RSV-associated hospitalization data from children aged <5 years during the 2018–19 and 2019–20 RSV seasons (October–April, representing typical RSV seasons before the COVID-19 pandemic) and the 2024–25 season (October–February data); 2018–19 and 2019–20 data were pooled to generate 2018–20 data. The 2020–21 through 2023–24 RSV seasons were excluded because the COVID-19 pandemic resulted in atypical RSV seasonality and circulation (*7*).

Data Analysis

Hospitalization rates for three groups with varying eligibility for RSV prevention products were analyzed: 1) infants aged 0–7 months eligible for protection through maternal RSV vaccine or nirsevimab, overall and in prespecified subgroups of infants aged 0–2 months, who are at highest risk for RSV-associated hospitalization (*1*) and infants aged 3–7 months; 2) children aged 8–19 months entering their second RSV season, some of whom might have been nirsevimab-eligible based on risk conditions[¶¶¶]; and 3) children aged 20–59 months, who were ineligible for either product. Weekly (RSV-NET)[****] or monthly (NVSN)[††††] RSV-associated hospitalizations per 1,000 children aged <5 years were calculated using U.S. population denominators (*4*,*6*); cumulative rates for all seasons were estimated through February to ensure consistent comparisons. RSV-NET rates were adjusted to account for RSV underdetection related to testing practices and test sensitivity using an established multiplier approach[§§§§] (*6*,*8*). NVSN rates were adjusted for enrollment rates, weeks with <7 surveillance days, test sensitivity, and hospital market share[¶¶¶¶] (*4*). A sensitivity analysis excluding the Houston, Texas site from NVSN data (approximately 20% of overall enrolled children) was performed because RSV circulation and associated hospitalizations increased in Houston in September 2024, before RSV prevention products were widely administered there (Supplementary Figure).

Rate ratios (RRs) and 95% CIs were estimated, and differences were assessed with Z-tests or *t*-tests comparing cumulative 2024–25 hospitalization rates with pooled 2018–20 rates.[*****] Relative hospitalization rate reduction (RRR) was estimated as (1 – RR) x 100. Trends and differences by age were compared using Cochran-Armitage trends and Pearson's chi-square tests, respectively. Data were analyzed using SAS (version 9.4; SAS Institute). This activity was reviewed by CDC, deemed not research, and conducted consistent with applicable federal law and CDC policy.[†††††]

Results

Characteristics of Children Hospitalized for RSV

Overall, 18,389 RSV-associated hospitalizations (15,405 in RSV-NET and 2,984 in NVSN) were identified among children aged <5 years; these included 11,681 during 2018–20 and 6,708 during 2024–25. Median patient age was 6.7 months and 14.7 months in RSV-NET (p<0.001) and 6.3 months and 12.7 months in NVSN (p<0.04), in the earlier versus later seasons, respectively (Supplementary Table 1).

[¶¶¶] Infants and children aged 8–19 months at increased risk for severe RSV disease include those with chronic lung disease of prematurity who require medical support (chronic corticosteroid therapy, diuretic therapy, or supplemental oxygen), severe immunocompromise, or cystic fibrosis who have manifestations of severe lung disease or weight-for-length <10th percentile; and children of American Indian or Alaska Native descent.

[****] Unadjusted RSV-NET hospitalization rates (hospitalizations per 1,000 children aged <5 years) were estimated by dividing total catchment-area RSV hospitalizations by National Center for Health Statistics (NCHS) population estimates; population estimates were divided by 12 to estimate rates by month of life. NCHS vintage 2020 bridge-race postcensal population estimates were used for seasons 2018–19 to 2019–20; U.S. Census Bureau vintage unbridged-race postcensal estimates were used for October 2020 and later.

[††††] For the NVSN 2018–20 rate analysis, county-specific population denominator data were obtained from the 2020 U.S. bridged-race population estimates. The 2024–25 rate analysis used 2022 interim population estimates because these were the most recent available data. Children with inconclusive RSV testing results were excluded. Children with RSV detection from a rapid test but no detection from a molecular test were excluded because of poor rapid test specificity. Population-based numerators were calculated by adjusting the observed number of hospitalizations to account for weeks with <7 days of surveillance, the percentage of eligible children not enrolled, sensitivity of RSV RT-PCR testing (87.6%, using serology as the standard relative to RT-PCR), and the market share of each enrollment hospital site. Rates were estimated per 1,000 children aged <5 years, and 95% CIs were determined by bootstrap percentiles based on 1,000 bootstrap samples for each rate.

[§§§§] RSV-NET only captures children hospitalized with RSV if they were tested for RSV and if tests accurately detect RSV. To correct for RSV hospitalization underascertainment, each RSV-NET site identified all children aged <5 years hospitalized during 2018–2023 with ARI in select hospitals, as identified by *International Classification of Diseases, Tenth Revision, Clinical Modification* codes, and determined the proportion of those children who received testing for RSV and type of RSV test used among a stratified random sample. Adjustment multipliers, the inverse of RSV testing frequency times the average test sensitivity (using 74% sensitivity for rapid antigen tests and 96% for molecular diagnosis), were estimated for each season using testing data from hospitalizations in each age group. Adjusted hospitalization rates were calculated by multiplying unadjusted rates by adjustment multipliers and presented with 95% CIs to account for multiplier uncertainty; 2022–23 adjustment multipliers were the most recent available data and applied to 2024–25. Rate ratios, 95% CIs, and Z-tests were used to identify significant differences between rates.

[¶¶¶¶] NVSN population-based numerators are calculated by adjusting the observed number of hospitalizations to account for weeks with <7 days of surveillance, the percentage of eligible children not enrolled, sensitivity of RSV RT-PCR testing (87.6%), and the market share of each enrollment hospital site for the estimated proportion of catchment-area ARI hospitalizations captured.

[*****] Pooled rates from 2018 through 2020 were estimated by dividing total RSV hospitalizations in the 2018–19 and 2019–20 seasons by pooled population estimates.

[†††††] 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

TABLE. Hospitalization rates among U.S. children aged <5 years with laboratory-confirmed respiratory syncytial virus — Respiratory Syncytial Virus–Associated Hospitalization Surveillance Network and New Vaccine Surveillance Network, United States, 2018–20 and 2024–25

	Age group, mos				
		0–7			
Surveillance system/RSV season/Hospitalization metrics	All (0–7)	0–2	3–7	8–19	20–59
RSV-NET*					
2018–20					
Hospitalizations† (n = 9,547), no. (%)	4,857 (51)	2,694 (28)	2,163 (23)	2,428 (25)	2,262 (24)
Pooled hospitalization rate§ (95% CI)	15.0 (14.7 to 15.4)	22.2 (21.5 to 22.9)	10.7 (10.3 to 11.1)	5.0 (4.9 to 5.2)	1.5 (1.5 to 1.6)
2024–25					
Hospitalizations† (n = 5,858), no. (%)	1,623 (28)	755 (13)	868 (15)	1,935 (33)	2,300 (39)
Hospitalization rate§ (95% CI)	8.5 (8.1 to 8.9)	10.6 (9.9 to 11.3)	7.3 (6.8 to 7.8)	6.7 (6.4 to 7.0)	2.5 (2.4 to 2.6)
Rate ratio (95% CI)¶	0.57 (0.54 to 0.60)	0.48 (0.44 to 0.51)	0.68 (0.63 to 0.73)	1.33 (1.26 to 1.41)	1.64 (1.56 to 1.72)
P-value¶	<0.001	<0.001	<0.001	<0.001	<0.001
RRR, % (95% CI)**,††	43 (40 to 46)	52 (49 to 56)	32 (27 to 37)	−33 (−41 to −26)	−64 (−72 to −56)
NVSN§§					
2018–20					
Hospitalizations† (n = 2,134), no. (%)	1,204 (56)	659 (31)	545 (25)	517 (24)	413 (20)
Pooled hospitalization rate§ (95% CI)	14.8 (14.0 to 15.6)	21.7 (20.0 to 23.3)	10.6 (9.7 to 11.5)	4.7 (4.3 to 5.1)	1.1 (1.0 to 1.2)
2024–25					
Hospitalizations† (n = 850), no. (%)	311 (37)	128 (15)	183 (22)	295 (35)	244 (28)
Hospitalization rate§ (95% CI)	10.7 (9.4 to 12.0)	12 (9.8 to 14.4)	9.9 (8.5 to 11.3)	5.9 (5.2 to 6.7)	1.7 (1.5 to 1.9)
Rate ratio (95% CI)¶	0.72 (0.64 to 0.82)	0.55 (0.43 to 0.68)	0.93 (0.77 to 1.10)	1.26 (1.08 to 1.46)	1.63 (1.36 to 1.90)
P-value¶	<0.001	<0.001	0.56	0.02	<0.001
RRR, % (95% CI)**,††	28 (18 to 36)	45 (32 to 57)	7 (−10 to 23)	−26 (−46 to −8)	−63 (−90 to −36)
NVSN excluding Houston, Texas					
2018–20					
Hospitalizations† (n = 1,721), no. (%)	978 (57)	530 (31)	448 (26)	405 (23)	338 (20)
Pooled hospitalization rate§ (95% CI)	19 (17.8 to 20.1)	26.4 (24.4 to 28.6)	14.6 (13.3 to 15.8)	6.0 (5.4 to 6.6)	1.6 (1.5 to 1.8)
2024–25					
Hospitalizations† (n = 698), no. (%)	223 (32)	87 (13)	136 (19)	237 (34)	238 (34)
Hospitalization rate§ (95% CI)	8.4 (7.3 to 9.6)	7.6 (5.8 to 9.6)	8.9 (7.5 to 10.3)	6.4 (5.6 to 7.2)	2.3 (2.0 to 2.6)
Rate ratio (95% CI)¶	0.44 (0.38 to 0.51)	0.29 (0.22 to 0.36)	0.62 (0.50 to 0.73)	1.07 (0.90 to 1.24)	1.42 (1.19 to 1.67)
P-value¶	<0.001	<0.001	<0.001	0.51	<0.001
RRR, % (95% CI)**,††	56 (49 to 62)	71 (64 to 78)	38 (27 to 50)	−7 (−24 to 10)	−42 (−67 to −19)

Abbreviations: NVSN = New Vaccine Surveillance Network; RRR = relative hospitalization rate reduction; RSV = respiratory syncytial virus; RSV-NET = Respiratory Syncytial Virus–Associated Hospitalization Surveillance Network.

* RSV-NET conducts active population-based surveillance for laboratory-confirmed RSV-associated hospitalizations identified through clinical testing among catchment-area residents of all ages in approximately 300 hospitals in 161 selected counties in California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, North Carolina, Oregon, Tennessee, and Utah.

† Hospitalization data were included from October–April 2018–20 and October–February 2024–25.

§ Cumulative laboratory-confirmed RSV-associated hospitalizations per 1,000 children aged <5 years as of February 28 each season. Rates use U.S. population denominators and are adjusted to account for RSV underdetection because of testing practices and test sensitivity.

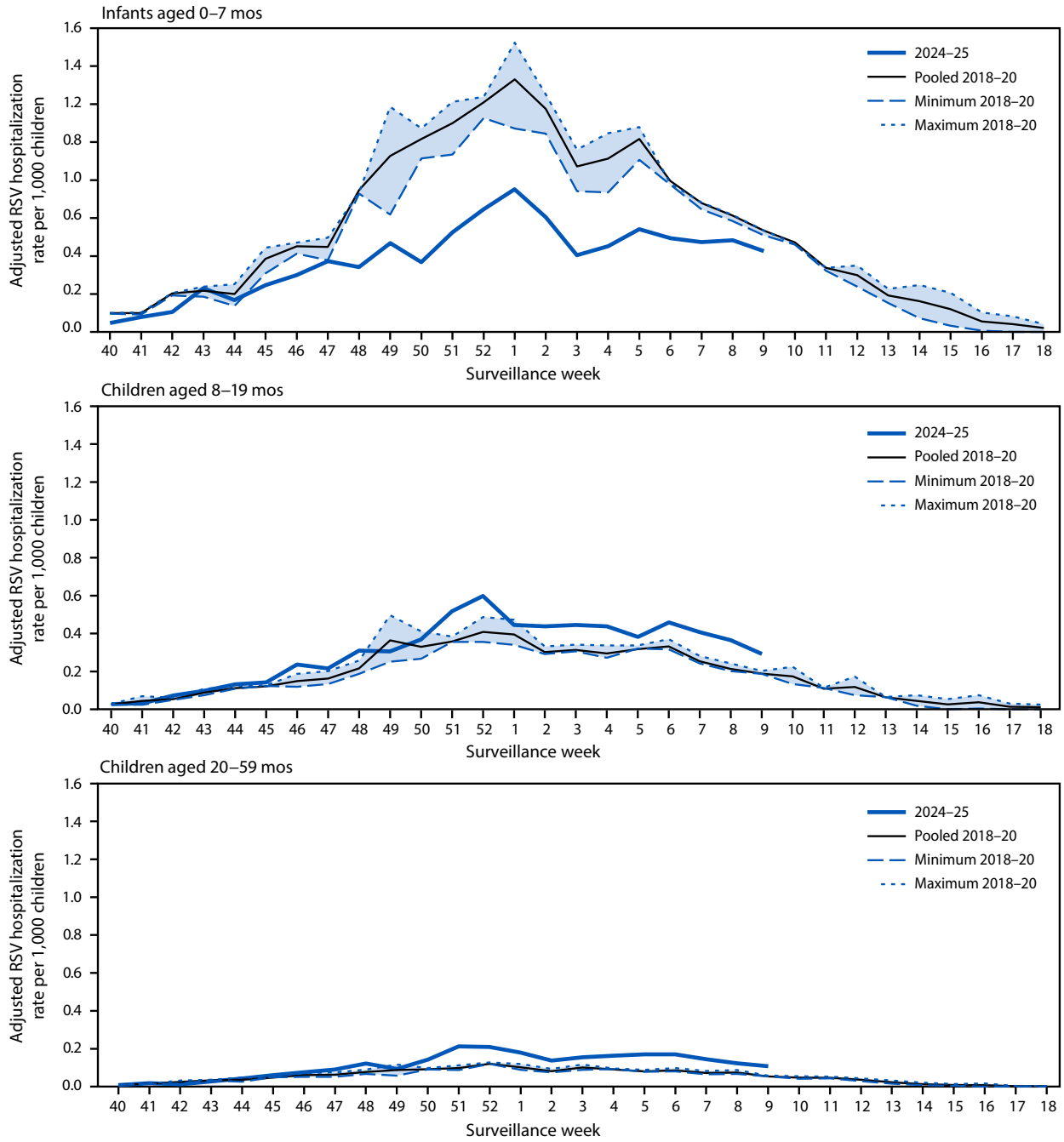
¶ Z-tests (RSV-NET) or *t*-tests (NVSN) were used to assess whether rate ratios differed from 1, with p<0.05 considered statistically significant.

** RRR was estimated as (1 − rate ratio) x 100%.

†† RRR 95% CIs that excluded 0 were considered statistically significant, corresponding to rate ratio 95% CIs excluding 1 and p<0.05.

§§ NVSN conducts active, population-based surveillance for acute respiratory illness among hospitalized children aged <18 years at seven U.S. medical centers. NVSN population-based RSV-associated hospitalization rates were generated using actively enrolled residents of defined catchment-area counties for the seven sites that were included: Cincinnati (Hamilton County, Ohio); Houston (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties, Texas); Kansas City (Jackson County, Missouri); Nashville (Davidson County, Tennessee); Pittsburgh (Allegheny County, Pennsylvania); Rochester (Monroe County, New York); and Seattle (King County, Washington).

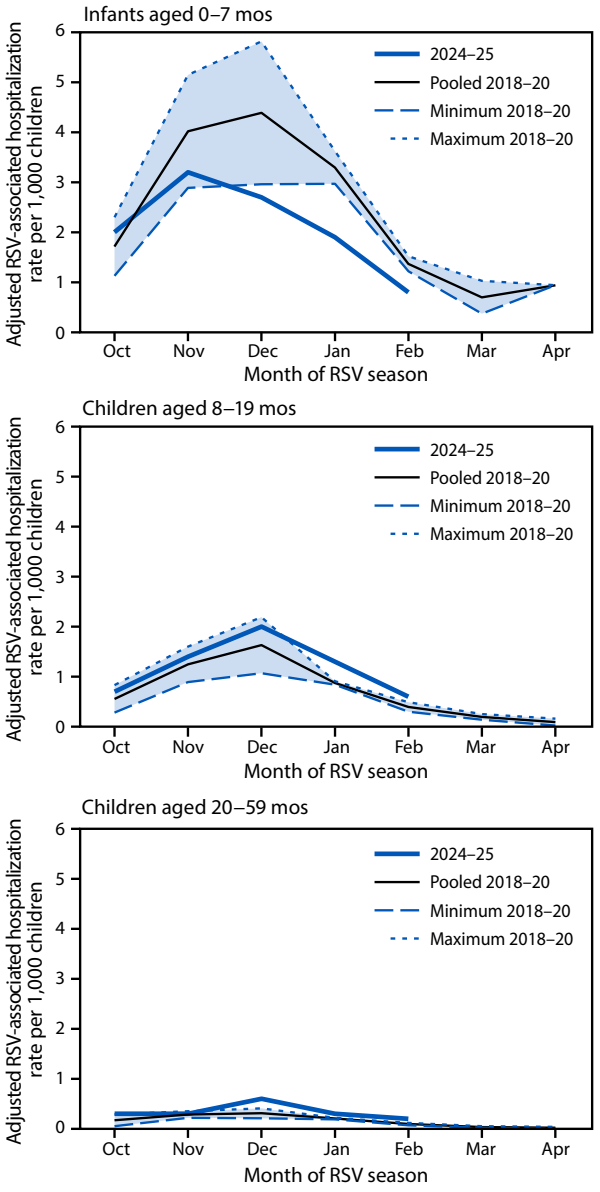
FIGURE 1. Respiratory syncytial virus–associated hospitalization rates* among children aged <5 years, by age group and surveillance week — Respiratory Syncytial Virus–Associated Hospitalization Surveillance Network, United States, October–April 2018–20 and October–February 2024–25



Abbreviation: RSV = respiratory syncytial virus.

* Rate of laboratory-confirmed RSV–associated hospitalizations identified through clinical testing among catchment-area residents per 1,000 children aged <5 years. Rates use U.S. population denominators and are adjusted to account for RSV underdetection because of testing practices and test sensitivity. Pooled rates from 2018 through 2020 were estimated by dividing total RSV hospitalizations in the 2018–19 and 2019–20 RSV seasons by pooled population estimates; minimum and maximum weekly rates reflect the lowest and highest observed rates, respectively, for each week across the 2018–19 and 2019–20 seasons. Data for the 2024–25 RSV season were only available through February 2025.

FIGURE 2. Respiratory syncytial virus–associated hospitalization rates* among children aged <5 years, by age group and month of respiratory syncytial virus season — New Vaccine Surveillance Network, United States, October–April 2018–20 and October–February 2024–25



Abbreviation: RSV = respiratory syncytial virus.

* Rate of laboratory-confirmed RSV-associated hospitalizations among all catchment-area residents, including Houston, per 1,000 children aged <5 years. Rates use U.S. population denominators and are adjusted for enrollment rates, weeks with <7 surveillance days, test sensitivity, and hospital market share. Pooled rates from 2018 through 2020 were estimated by dividing total RSV hospitalizations in the 2018–19 and 2019–20 RSV seasons by pooled population estimates; minimum and maximum monthly rates reflect the lowest and highest observed rates, respectively, for each month across the 2018–19 and 2019–20 seasons. Data for the 2024–25 RSV season were only available through February 2025.

RSV-Associated Hospitalization Rates Among Infants Aged 0–7 Months

Cumulative RSV-associated hospitalization rates among infants aged 0–7 months were lower during 2024–25 compared with 2018–20: 8.5 versus 15.0 per 1,000 children in RSV-NET, and 10.7 versus 14.8 per 1,000 children in NVSN (Table). These differences were associated with estimated hospitalization rate reductions of 43% in RSV-NET and 28% in NVSN during 2024–25 ($p<0.001$ for both). Estimated rate reductions were largest during December–February (Supplementary Table 2). In a sensitivity analysis of NVSN data excluding Houston (because of earlier RSV season onset before prevention product availability), the apparent reduction in RSV-associated hospitalization rates among infants aged 0–7 months during 2024–25 was larger (56%) (Table).

The largest cumulative rate differences during 2024–25 compared with 2018–20 were observed among infants aged 0–2 months. Estimated reductions in RSV-associated hospitalization rates among infants aged 0–2 months were 52% for RSV-NET and 45% for NVSN ($p<0.001$ for all); the NVSN rate reduction was larger (71%) with Houston excluded.

RSV-Associated Hospitalization Rates Among Children Aged 8–19 and 20–59 Months

Among children aged 8–19 and 20–59 months, RSV-associated hospitalization rates were higher during 2024–25 than during 2018–20. Differences in weekly and monthly rates between 2024–25 and 2018–20 among all age groups were comparable to observed differences in cumulative rates (Figure 1) (Figure 2).

Discussion

In 2024–25, the first U.S. RSV season with widespread availability of maternal RSV vaccine and nirsevimab, analyses of two population-based surveillance networks demonstrated significantly lower RSV-associated hospitalization rates among infants aged 0–7 months who were eligible for RSV prevention products, with estimated rate reductions of 28% and 43% compared with rates during the pooled 2018–20 RSV seasons. The largest estimated rate reductions in hospitalization occurred among infants aged 0–2 months (*1*).

Higher RSV-associated hospitalization rates during 2024–25 compared with 2018–20 among children in older age groups, who were largely ineligible for RSV prevention products, suggest a more severe 2024–25 season overall and indicate that observed reductions in hospitalization rates among younger infants might be underestimated. Increased hospitalization rates among these older children also suggest that reduced infant hospitalization rates were likely due to RSV prevention products, rather than to changes in RSV circulation, testing

Summary

What is already known about this topic?

Maternal respiratory syncytial virus (RSV) vaccine and nirsevimab, a long-acting monoclonal antibody, help prevent infant RSV-associated hospitalizations; these products became widely available in the United States during the 2024–25 RSV season.

What is added by this report?

In this ecologic analysis comparing RSV-associated hospitalization rates among infants aged 0–7 months during 2024–25 with those during pre–COVID-19 pandemic RSV seasons in two surveillance networks, rates during 2024–25 were lower by an estimated 28% and 43%.

What are the implications for public health practice?

In the first RSV season with widespread availability of maternal vaccine and nirsevimab, RSV-associated hospitalization rates among infants were lower than in prepandemic seasons. Effective health care planning is needed to protect infants as early in the RSV season as possible through maternal vaccination during pregnancy or infant receipt of nirsevimab.

practices, or health care–seeking behavior. The apparent reduction in RSV-associated infant hospitalization rates temporally associated with widespread availability of two options to protect eligible infants (i.e., maternal RSV vaccination and nirsevimab administration to eligible infants) suggests that most severe RSV disease among infants aged 0–7 months is preventable, consistent with findings in European countries (*9*,*10*). In this analysis, rate decreases were largest among infants aged 0–2 months, the group at highest risk for RSV-associated hospitalization (*1*). The findings suggest the importance of protecting infants born during the RSV season through either maternal vaccination during pregnancy or nirsevimab administration in the first week of life, ideally during the birth hospitalization (*2*).

National immunization survey data indicate the estimated proportion of U.S. infants aged 0–7 months protected by either maternal vaccination or nirsevimab increased during the 2024–25 RSV season, from 30% in October 2024 to 66% in February 2025,[§§§§§] coinciding with the 2024–25 RSV-associated hospitalization rate reductions in both surveillance networks, with the largest monthly reductions occurring during peak hospitalization periods. In addition, reduction in hospitalization rates among NVSN infants aged 0–7 months were larger after excluding Houston, where prevention products were not widely available before RSV season onset. These results support the recommendations of the Advisory Committee on Immunization Practices to optimize population-level impact by administering RSV prevention products as early as possible in the season (i.e., before peak RSV transmission) on the basis of local epidemiology (*3*). Increased and earlier use of RSV prevention products during future seasons might lead to even larger reductions in pediatric RSV–associated hospitalizations.

[§§§§§] Infant Protection Against Respiratory Syncytial Virus (RSV) by Maternal RSV Vaccination or Receipt of Nirsevimab, and Intent for Nirsevimab Receipt, United States

Limitations

The findings in this report are subject to at least four limitations. First, this was an ecologic analysis and does not include individual-level data on coverage with RSV prevention products; therefore, causality could not be assessed. Second, hospitalization rate adjustments accounting for RSV underdetection or underenrollment might be insufficient. Third, RSV-NET and NVSN catchment areas might not be nationally representative. Finally, interim results might underestimate changes during complete RSV seasons or seasons with higher product coverage. However, relatively consistent findings from two geographically diverse, population-based surveillance networks provide reliable support for the population-level impacts of RSV prevention products on U.S. pediatric RSV-associated hospitalizations.

Implications for Public Health Practice

During the first RSV season with widespread availability of prevention products, RSV-associated hospitalization rates were significantly lower compared with those during pre–COVID-19 pandemic seasons among infants aged 0–7 months. Reductions were largest during peak hospitalization periods. These findings highlight the importance of effective annual health care planning to implement Advisory Committee on Immunization Practices' recommendations for RSV prevention products and ensure parents can protect infants as early as possible in the RSV season, either through maternal vaccination during pregnancy or infant receipt of nirsevimab. For infants born during the RSV season who are not protected through maternal vaccination, nirsevimab should be administered within the first week of life, ideally during the birth hospitalization.

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References

1. Hall CB, Weinberg GA, Blumkin AK, et al. Respiratory syncytial virus-associated hospitalizations among children less than 24 months of age. Pediatrics 2013;132:e341–8. PMID:23878043 https://doi.org/10.1542/peds.2013-0303
2. Jones JM, Fleming-Dutra KE, Prill MM, et al. Use of nirsevimab for the prevention of respiratory syncytial virus disease among infants and young children: recommendations of the Advisory Committee on Immunization Practices—United States, 2023. MMWR Morb Mortal Wkly Rep 2023;72:920–5. PMID:37616235 https://doi.org/10.15585/mmwr.mm7234a4
3. Fleming-Dutra KE, Jones JM, Roper LE, et al. Use of the Pfizer respiratory syncytial virus vaccine during pregnancy for the prevention of respiratory syncytial virus–associated lower respiratory tract disease in infants: recommendations of the Advisory Committee on Immunization Practices—United States, 2023. MMWR Morb Mortal Wkly Rep 2023;72:1115–22. PMID:37824423 https://doi.org/10.15585/mmwr.mm7241e1
4. Moline HL, Toepfer AP, Tannis A, et al.; New Vaccine Surveillance Network Collaborators. Respiratory syncytial virus disease burden and nirsevimab effectiveness in young children from 2023–2024. JAMA Pediatr 2025;179:179–87. PMID:39652359 https://doi.org/10.1001/jamapediatrics.2024.5572
5. CDC. Emergency preparedness and response: limited availability of nirsevimab in the United States—interim CDC recommendations to protect infants from respiratory syncytial virus (RSV) during the 2023–2024 respiratory virus season. Atlanta, GA: US Department of Health and Human Services, CDC; 2023. https://www.cdc.gov/han/2023/han00499.html
6. Havers FP, Whitaker M, Melgar M, et al. Burden of respiratory syncytial virus–associated hospitalizations in US adults, October 2016 to September 2023. JAMA Netw Open 2024;7:e2444756. PMID:39535791 https://doi.org/10.1001/jamanetworkopen.2024.44756
7. Garg I, Shekhar R, Sheikh AB, Pal S. Impact of COVID-19 on the changing patterns of respiratory syncytial virus infections. Infect Dis Rep 2022;14:558–68. PMID:35893478 https://doi.org/10.3390/idr14040059
8. Reed C, Chaves SS, Daily Kirley P, et al. Estimating influenza disease burden from population-based surveillance data in the United States. PLoS One 2015;10:e0118369. PMID:25738736 https://doi.org/10.1371/journal.pone.0118369

9. Ernst C, Bejko D, Gaasch L, et al. Impact of nirsevimab prophylaxis on paediatric respiratory syncytial virus (RSV)-related hospitalisations during the initial 2023/24 season in Luxembourg. Euro Surveill 2024;29:2400033. PMID:38275017 https://doi.org/10.2807/1560-7917.ES.2024.29.4.2400033

10. Ezpeleta G, Navascués A, Viguria N, et al. Effectiveness of nirsevimab immunoprophylaxis administered at birth to prevent infant hospitalisation for respiratory syncytial virus infection: a population-based cohort study. Vaccines (Basel) 2024;12:383. PMID:38675765 https://doi.org/10.3390/vaccines12040383

STANDING ORDERS FOR
Administering Measles, Mumps, and Rubella Vaccine to Children and Teens

Purpose

To reduce morbidity and mortality from measles, mumps, and rubella by vaccinating all children and teens who meet the criteria established by the Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices.

Policy

Where allowed by state law, standing orders enable eligible nurses, pharmacists, and other healthcare professionals to assess the need for vaccination and to vaccinate children and teens who meet any of the criteria below.

Procedure

1 **Assess Children and Teens for Need of Measles, Mumps, and Rubella (MMR) Vaccination** based on the following criteria:

- Age 12 months or older with either a) no documentation of any prior MMR vaccine or b) documentation of only 1 dose of MMR vaccine given when younger than age 12 months
- Age 4 years or older with no documentation of two doses of MMR vaccine
- Age 6 months or older with pending international travel
- History of two previous doses of MMR and identified by public health as being at increased risk during a mumps outbreak

2 **Screen for Contraindications and Precautions**

Contraindications

- Do not give MMR vaccine to a child or teen who has experienced a severe allergic reaction (e.g., anaphylaxis) to a previous dose of MMR vaccine or to any of its components. For a list of vaccine components, refer to the manufacturer's package insert (www.immunize.org/official-guidance/fda/pkg-inserts) or go to www.fda.gov/vaccines-blood-biologics/vaccines/vaccines-licensed-use-united-states.
- Do not give MMR vaccine to a child or teen who is pregnant; pregnant teens should be vaccinated upon completion or termination of pregnancy.
- Do not give MMR vaccine to a child or teen having known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, long-term immunosuppressive therapy, or severely immunocompromised from HIV infection).
    - Note: Long-term immunosuppressive therapy is defined as at least 2 weeks of daily receipt of 20 mg or 2 mg/kg body weight of prednisone or its equivalent.
    - Note: Susceptible individuals living with HIV are at increased risk for serious illness if infected with measles. HIV+ children age 12 months or older who are not severely immunocompromised should receive MMR vaccine as recommended. For additional information regarding HIV laboratory parameters and use of live vaccines, see "Altered Immunocompetence," at www.cdc.gov/vaccines/hcp/imz-best-practices/altered-immunocompetence.html and Table 4-1 (footnote J) at www.cdc.gov/vaccines/hcp/imz-best-practices/contraindications-precautions.html.

CONTINUED ON THE NEXT PAGE ▶

Immunize.org
FOR PROFESSIONALS www.immunize.org / FOR THE PUBLIC www.vaccineinformation.org
www.immunize.org/catg.d/p3079a.pdf
Item #P3079a (3/11/2025)
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- Do not give MMR vaccine to a child or teen with a family history of congenital or hereditary immunodeficiency in first-degree relatives (e.g., parents, siblings) unless the immune competence of the potential vaccine recipient has been clinically substantiated or verified by a laboratory.

Precautions *(require evaluation before vaccination)*

- Moderate or severe acute illness with or without fever
- History of recent (within the past 11 months) receipt of antibody-containing blood product (specific interval depends on product)
- Need for tuberculin skin testing (TST) or interferon-gamma release assay (IGRA) testing. If active tuberculosis is suspected, MMR should be delayed. Measles vaccination might suppress tuberculin reactivity temporarily. The TST should be administered either any time before, simultaneously with, or at least 4–6 weeks after any measles-containing vaccine.

3 Provide Vaccine Information Statements

Provide all patients with a copy of the most current federal Vaccine Information Statement (VIS). Provide non-English speaking patients with a copy of the VIS in their native language, if one is available and desired. The MMR VIS and its translations can be found at www.immunize.org/vaccines/vis/mmr/. (For information about how to document that the VIS was given, see section 6 titled "Document Vaccination.")

4 Prepare to Administer Vaccine

MMR II (Merck) may be administered via either the intramuscular (IM) or subcutaneous (Subcut) route; Priorix (GSK) may only be administered by the Subcut route.

If vaccine is to be administered by the **intramuscular route**, choose the needle gauge, needle length, and injection site according to the following chart:

AGE OF CHILD/TEEN	NEEDLE GAUGE	NEEDLE LENGTH	INJECTION SITE
Age 1 through 2 years	22–25	1–1¼"	Anterolateral thigh muscle*
		⅝†–1"	Deltoid muscle of arm
Age 3 through 10 years	22–25	⅝†–1"	Deltoid muscle of arm*
		1–1¼"	Anterolateral thigh muscle
Age 11 years and older	22–25	⅝†–1"	Deltoid muscle of arm*
		1–1½"	Anterolateral thigh muscle

* Preferred site.

† A ⅝" needle may be used for children for IM injection in the deltoid muscle only if the skin is stretched tight, the subcutaneous tissue is not bunched, and the injection is made at a 90-degree angle.

If vaccine is to be administered by the **subcutaneous route**, choose the needle gauge, needle length, and injection site according to the following chart:

NEEDLE GAUGE	NEEDLE LENGTH	INJECTION SITE
23–25	⅝"	Fatty tissue over triceps or fatty tissue over anterolateral thigh muscle

Reconstitute the vaccine with the manufacturer-supplied diluent just prior to administration.

CONTINUED ON THE NEXT PAGE ▶

5 Administer Measles, Mumps, and Rubella Vaccine (MMR), 0.5 mL according to the following criteria and schedule:

HISTORY OF PREVIOUS MMR VACCINATION	AGE GROUP	SCHEDULE FOR ADMINISTRATION OF MMR VACCINE
0 documented doses, or none known	12 months to 4 years	Give dose #1.‡
0 documented doses, or none known	4 years and older	Give dose #1. Give dose #2 at least 4 weeks later.
1 previous dose given before age 12 months	12 months and older	Give dose #1. Give dose #2 at least 4 weeks later.
1 previous dose of MMR given at age 12 months or older	4 years and older	Give dose #2 at least 4 weeks after dose #1.
2 previous doses of MMR and identified by public health to be at increased risk during a mumps outbreak	Any age	Give dose #3 at least 4 weeks after dose #2

‡The minimum interval between dose #1 and dose #2 is 4 weeks. Administration of dose #2 before age 4 years is recommended if a child is at risk of measles virus exposure due to planned international travel or when advised by public health authorities during a measles outbreak.

6 Document Vaccination

Document each patient's vaccine administration information and follow up in the following places:

Medical record: Document the date the vaccine was administered, the manufacturer and lot number, the vaccination site and route, and the name and title of the person administering the vaccine. You must also document, in the patient's medical record or office log, the publication date of the VIS and the date it was given to the patient. Note that medical records/charts should be documented and retained in accordance with applicable state laws and regulations. If vaccine was not administered, record the reason(s) for non-receipt of the vaccine (e.g., medical contraindication, patient refusal); discuss the need for vaccine with the patient (or, in the case of a minor, their parent or legal representative) at the next visit.

Personal immunization record card: Record the date of vaccination and the name/location of the administering clinic.

Immunization Information System (IIS) or "registry": Report the vaccination to the appropriate state/local IIS, if available.

7 Be Prepared to Manage Medical Emergencies

Be prepared for management of a medical emergency related to the administration of vaccine by having a written emergency medical protocol available, as well as equipment and medications. For Immunize.org's "Medical Management of Vaccine Reactions in Children and Teens in a Community Setting," go to www.immunize.org/catg.d/p3082a.pdf. For "Medical Management of Vaccine Reactions in Adults in a Community Setting," go to www.immunize.org/catg.d/p3082.pdf. To prevent syncope, vaccinate patients while they are seated or lying down and consider observing them for 15 minutes after receipt of the vaccine.

8 Report All Adverse Events to VAERS

Report all adverse events following the administration of MMR vaccine to the federal Vaccine Adverse Event Reporting System (VAERS) at www.vaers.hhs.gov. To submit a VAERS report online (preferred) or to download a writable PDF form, go to https://vaers.hhs.gov/reportevent.html. Further assistance is available at (800) 822-7967.

Standing Orders Authorization

This policy and procedure shall remain in effect for all patients of the _____ (NAME OF PRACTICE OR CLINIC)

effective _____ (DATE) until rescinded or until _____ (DATE) .

Medical Director _____ (PRINT NAME) / _____ (SIGNATURE) _____ (DATE)

U.S. Centers for Disease Control and Prevention
MMWR
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Measles Update — United States, January 1–April 17, 2025

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Abstract

A multistate measles outbreak, predominantly affecting members of close-knit communities with low measles vaccination coverage in New Mexico, Oklahoma, and Texas began in January 2025. As of April 17, a total of 800 cases have been reported in the United States in 2025; 654 (82%) cases in New Mexico, Oklahoma, and Texas have been associated with the ongoing outbreak. These cases represent an approximately 180% increase over the 285 measles cases reported in the United States during all of 2024, and the second highest annual case count in the United States in 25 years. Overall, 771 (96%) patients have been unvaccinated or had unknown vaccination status (77% were unvaccinated, and 14% had unknown vaccination status when excluding 590 cases reported by Texas, which requires explicit consent by law [i.e., opt-in] to enroll in the Texas Immunization Registry), 85 (11%) patients have been hospitalized, and three patients have died. Among 48 (6%) internationally imported cases, 44 (92%) occurred among U.S. residents. Endemic measles was declared eliminated in the United States in 2000 as a direct result of high 2-dose childhood coverage with the measles, mumps, and rubella (MMR) vaccine. However, measles cases and outbreaks continue to occur when travelers with measles return to the United States while they are infectious; larger U.S. outbreaks typically follow importation into close-knit communities with low vaccination coverage. Nationally, risk for widespread measles transmission remains low because of high population-level immunity. To prepare for and prevent measles cases and outbreaks, public health departments should continue working with trusted community messengers on culturally competent community engagement, education, vaccination efforts, and other community infection prevention approaches (e.g., case isolation, contact monitoring, and post-exposure prophylaxis) and coordinating with health care facilities and schools. Increasing national and local MMR vaccination coverage is essential to preventing measles cases and outbreaks.

Introduction

Measles is the most highly contagious febrile rash illness, infecting up to 90% of susceptible close contacts and resulting in serious complications such as pneumonia, encephalitis, and death. Among the 4,056 measles cases reported in the United States during 2001–2022, a total of 727 (18%) were hospitalized, and three deaths were reported*; of the 727 hospitalized patients, 473 (65%) were unvaccinated, and 187 (26%) had unknown vaccination status (*1*). Worldwide, measles vaccination is estimated to have saved 93.7 million lives during 1974–2024 and played a substantial role in reducing childhood

* Two measles deaths were reported in 2003 (one in a child aged 13 years who had chronic granulomatous disease and one in an adult aged 75 years), and one was reported in 2015 in an adult with immunocompromise aged 28 years.

INSIDE

Continuing Education examination available at https://www.cdc.gov/mmwr/mmwr_continuingEducation.html

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

mortality (*2*) by preventing complications associated with measles and deaths from other infectious diseases as a consequence of measles-related immunosuppression (*3*).

Endemic measles transmission was declared eliminated† in the United States in 2000 after a change from a 1-dose to a 2-dose measles, mumps, and rubella (MMR) vaccination schedule in 1989 (*4*). However, a recent resurgence in global measles, resulting from COVID-19 pandemic–related challenges in implementing measles vaccination routine services and campaigns, has increased the risk for imported cases and outbreaks in the United States, particularly when U.S. travelers are exposed to measles abroad and return to the United States while they are infectious (*5*). Although the United States still benefits from high population immunity from routine MMR vaccination, declining immunization rates among school-aged children and communities with already low vaccination coverage threaten a resurgence of measles, along with its potentially serious associated complications. For this report, CDC used national surveillance data to describe the epidemiology of measles cases and outbreaks reported in the United States during the first 16 weeks of 2025.

† Measles elimination is defined as the absence of endemic measles transmission for ≥12 months in the presence of an adequate surveillance system.

Methods

Data Source and Case Classification

State health departments notify CDC of confirmed measles cases§ (*6*) through the National Notifiable Diseases Surveillance System and directly (by email or telephone) to the National Center for Immunization and Respiratory Diseases. Measles vaccination status is ascertained by health departments during each case investigation; patients with written or electronic documentation of receipt of ≥1 dose of a measles-containing vaccine ≥14 days before rash onset are considered vaccinated, and all other patients are classified as unvaccinated or as having unknown measles vaccination status.¶ Measles cases are classified by the Council of State and Territorial Epidemiologists as internationally imported if 1) at least part of the exposure period (7–21 days before rash onset) occurred outside the United States, 2) rash onset occurred within 21 days of entering the United States, and 3) no known exposure to measles

§ An acute febrile rash illness with laboratory confirmation (detection of measles virus–specific nucleic acid from a clinical specimen using real-time reverse transcription–polymerase chain reaction or a positive serologic test for measles immunoglobulin M antibody) or direct epidemiologic linkage to a laboratory-confirmed case.

¶ For residents of Texas, vaccination history is verified in the Texas Immunization Registry (ImmTrac2) or by review of vaccination records; patients with no vaccination records in the registry were considered to have an unverified vaccination history. Texas only disaggregates unvaccinated and unknown vaccination status among hospitalized patients; these records are provider-verified.

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occurred in the United States. All other cases are classified as U.S.-acquired (*6*). For this analysis, patients with imported measles cases were classified as age-eligible for vaccination if they were aged ≥6 months and were not vaccinated according to Advisory Committee on Immunization Practices (ACIP) recommendations (*4*).

Analysis of Outbreaks

A measles outbreak was defined as the occurrence of three or more epidemiologically linked** cases. Unique measles virus sequences are defined as those differing by at least one nucleotide in the N-450 sequence (i.e., the 450 nucleotides encoding the carboxyl-terminal 150 nucleoprotein amino acids) based on standard World Health Organization recommendations for describing sequence variants†† (*7*). Patients with confirmed vaccine reactions (i.e., rash caused by a reaction to vaccine strain virus) were not included as persons with measles cases, as studies have found no confirmed instances of human-to-human transmission of the measles vaccine strain virus (*6*). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.§§

Results

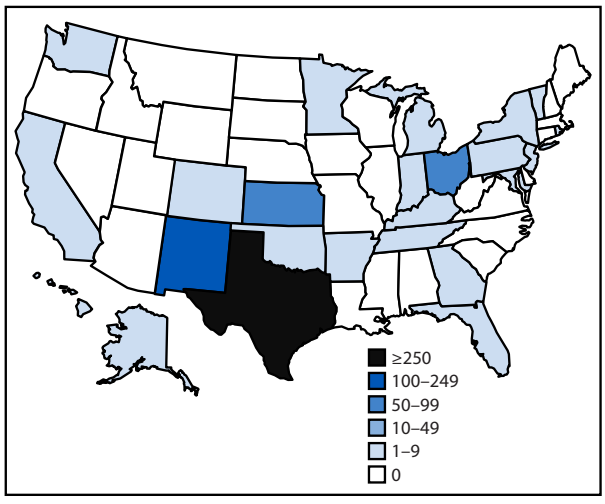
Characteristics of Reported Measles Cases

During January 1–April 17, 2025, a total of 800 confirmed measles cases were reported in 25 U.S. jurisdictions (Figure 1). The highest number of weekly cases (99) was reported during the week ending March 22 (Figure 2). Median patient age was 9 years (IQR = 4–23 years); 249 (31%) patients were aged <5 years, 304 (38%) were aged 5–19 years, 231 (29%) were aged ≥20 years, and age was unknown for 16 (2%) patients (Table). Among all measles patients, 771 (96%) were unvaccinated or their vaccination status was unknown, 10 (1%) had received 1 dose of MMR vaccine, and 19 (2%) had received 2 doses. For Texas cases, it was not possible to disaggregate unvaccinated patients from those with unknown vaccination status because the Texas Immunization Registry requires explicit consent by law (i.e., opt-in) to enroll. Among 210 measles patients (excluding 590 cases reported by Texas), 162 (77%) were unvaccinated, six (3%) had received 1 dose of MMR vaccine, 12 (6%) had received 2 doses, and the vaccination status of 30 (14%) was unknown. Among all 800 cases, 790 (99%) occurred among U.S. residents. Overall, 85 (11%) patients were hospitalized; 56 (66%) of those were unvaccinated, one (1%) had received 1 dose of MMR vaccine, and the vaccination status of 28 (33%) was unknown. Three measles deaths were reported to CDC; two confirmed in Texas in unvaccinated school-aged children with no known underlying medical conditions, and one confirmed in New Mexico in an unvaccinated adult. Most cases (557; 70%) were laboratory-confirmed; among 251 (31%) cases from which specimens were available for molecular sequencing, all were confirmed as wild-type virus strain with 225 (90%) identified as genotype D8 and 26 (10%) as genotype B3.

International Importations

Forty-eight (6%) cases were directly imported from other countries, including 44 (92%) among U.S. residents who had traveled abroad; 752 (94%) cases were U.S.-acquired. Fifteen (31%) importations resulted in secondary cases. Among the 48 internationally imported measles cases, 33 (69%) patients were unvaccinated, one (2%) had received 1 dose of MMR vaccine, four (8%) had received 2 doses, and the vaccination status of 10 (21%) patients was unknown. All 33 of the unvaccinated persons with imported measles were age-eligible for vaccination per ACIP, including 10 infant travelers aged 6–11 months. Source countries of the 48 imported measles cases included Canada (10 cases), Vietnam (10), Mexico (seven), Pakistan (three), the Philippines (two), Saudi Arabia (two), and one imported case each from Afghanistan, Australia, Guinea, Netherlands, Somalia, Spain, and Uganda; a source

FIGURE 1. Reported number of confirmed* measles cases, by state (N = 800) — United States, January 1–April 17, 2025



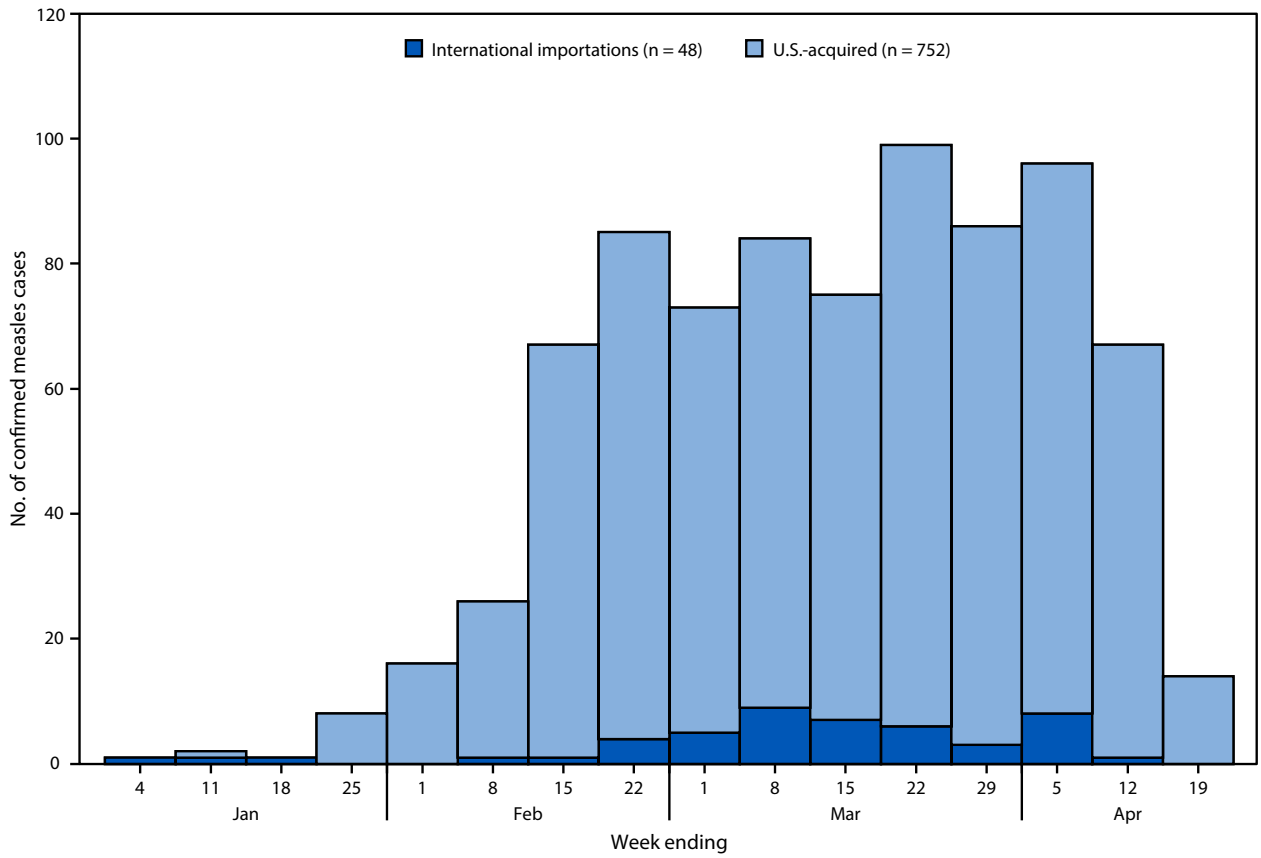
* An acute febrile rash illness with laboratory confirmation of measles or a direct epidemiologic link to a laboratory-confirmed measles case.

** Epidemiologic linkages include having known or suspected contact with an infectious measles patient during the exposure period (7–21 days before rash onset) and living in or visiting a geographic area with ongoing measles transmission during the exposure period.

†† Genotyping was performed at CDC and at the Vaccine Preventable Disease Reference Centers of the Association of Public Health Laboratories.

§§ 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

FIGURE 2. Number of reported confirmed* measles cases, by week of rash onset and importation status (N = 800) — United States, January 1–April 17, 2025†



* An acute febrile rash illness with laboratory confirmation of measles or a direct epidemiologic link to a laboratory-confirmed measles case.
† Data are preliminary as of April 17, 2025. Data for the week ending April 19, 2025, are for a partial week.

country could not be determined for seven travelers who visited multiple countries during their exposure period: Tanzania and United Arab Emirates (two cases); China, Japan, and Vietnam (one); France, South Korea, and Vietnam (one); Thailand and Vietnam (one); Indonesia and the Philippines (one); and Southeast Asia (one).

Measles Outbreaks

Ten measles outbreaks have been reported in 2025¶¶; 751 (94%) of all reported confirmed measles cases were outbreak-associated. An imported source was identified for seven outbreaks, and the source of three outbreaks remains unknown. Outbreak-related cases have been reported in 12 states (Georgia, Indiana, Kansas, Kentucky, Michigan, New Jersey, New Mexico, Ohio, Oklahoma, Pennsylvania, Tennessee, and Texas). The largest outbreak began among a close-knit community with low vaccination coverage in Gaines County, Texas in January 2025 and has accounted for 654 (82%) cases reported during 2025 (584 patients in 24 Texas counties, 63 patients in four New Mexico counties, and seven patients in northeastern Oklahoma); the source of this outbreak remains unknown. Thirty-seven confirmed cases in Kansas are suspected to be linked to this outbreak. In addition, an expanding outbreak in Chihuahua, Mexico*** began in late February after a Mexican resident became infected after reported travel to Gaines County, Texas. All 208 genotyped specimens obtained from measles patients in Kansas, New Mexico, and Texas were genotype D8, 196 (94%) of which had identical N-450 sequences; 12 differed by one nucleotide, which can be expected in prolonged outbreaks.

¶¶ At the time of this report, two measles outbreaks have ended, and eight outbreaks are ongoing. A measles outbreak is considered to be over when no new cases have been identified during two incubation periods (42 days) since the rash onset in the last outbreak-related case.

*** https://www.gob.mx/cms/uploads/attachment/file/990598/Aviso_Epidemiologico_Sarampio_n__16_abril_2025.pdf

TABLE. Selected characteristics of patients with reported measles — United States, January 1–April 17, 2025*

Characteristic	No. of measles cases (%)		
	Total	International importations	U.S.-acquired
Total measles cases	**800 (100)**	**48 (6)**	**752 (94)**
Age group, yrs			
<5	**249 (31)**	17 (35)	232 (31)
5–19	**304 (38)**	6 (13)	298 (40)
≥20	**231 (29)**	22 (46)	209 (28)
Unknown	**16 (2)**	3 (6)	13 (2)
Measles vaccination status			
Unvaccinated or unknown	**771 (96)**	43 (90)	728 (97)
Vaccinated, 2 doses	**19 (2)**	4 (8)	15 (2)
Vaccinated, 1 dose	**10 (1)**	1 (2)	9 (1)
Measles vaccination status (excluding Texas residents)			
Unvaccinated	**162 (77)**	30 (68)	132 (80)
Unknown	**30 (14)**	9 (20)	21 (13)
Vaccinated, 2 doses	**12 (6)**	4 (9)	8 (5)
Vaccinated, 1 dose	**6 (3)**	1 (2)	5 (3)
Residency			
U.S. resident	**790 (99)**	44 (92)	746 (99)
Outcome			
Hospitalized	**85 (11)**	15 (31)	70 (9)
Died†	**3 (3.8)**	0 (—)	3 (4.0)
Vaccination status of hospitalized patients§			
Unvaccinated	**56 (66)**	11 (73)	45 (64)
Unknown	**28 (33)**	3 (20)	25 (36)
Vaccinated, 1 dose	**1 (1)**	1 (7)	0 (—)

* Data are preliminary as of April 17, 2025.
† Deaths per 1,000 persons with measles.
§ Percentage among all hospitalized patients.

Discussion

A total of 800 measles cases and 10 outbreaks were reported in the United States during the first 16 weeks of 2025, representing approximately a 180% increase over the 285 measles cases reported in the United States during all of 2024. Most cases have been associated with an ongoing outbreak in close-knit communities with low vaccination coverage in New Mexico, Oklahoma, and Texas.

Overall, 11% of measles patients have been hospitalized, and three deaths have been reported. Similar to previous years (*1*), nearly all (96%) cases occurred in persons who were unvaccinated or whose vaccination status was unknown, and 77% of cases occurred in persons who were unvaccinated when excluding cases reported by Texas. Most (92%) imported cases occurred among U.S. residents returning to the United States while infectious and from all six World Health Organization regions. Adherence to standard measles control measures, including isolation and quarantine, as well as high vaccination coverage locally, prevented secondary transmission from most of these persons who were infectious after returning from travel abroad.

Summary

What is already known about this topic?

Although measles was declared eliminated in the United States in 2000, large outbreaks with 50 or more cases have become more frequent, especially in close-knit communities with low vaccination coverage.

What is added by this report?

During January 1–April 17, 2025, a total of 800 measles cases were reported in the United States, the second highest annual case count in 25 years; 82% were associated with an ongoing outbreak in close-knit communities with low vaccination coverage in New Mexico, Oklahoma, and Texas. Eighty-five (11%) patients were hospitalized, and three have died.

What are the implications for public health practice?

To prepare for and prevent measles cases and outbreaks, health departments should work with trusted messengers on culturally competent community engagement, education, vaccination efforts, and other infection prevention approaches. Increasing national and local measles, mumps, and rubella vaccination coverage is essential to preventing measles cases and outbreaks.

Most cases reported during 2025 have been associated with an ongoing outbreak in close-knit communities in New Mexico, Oklahoma, and Texas, resulting in the second largest outbreak in the United States since elimination was declared in 2000. During 2001–2023, approximately 90% of U.S. measles outbreaks with 50 or more cases occurred in close-knit communities with low vaccination coverage (*8*). Such communities might have frequent communal gatherings and have concerns about engaging with public health and health care systems for testing, treatment, and vaccination. The United States, Canada,††† and Mexico are all experiencing large, expanding outbreaks in similar interconnected communities. Frequent travel among similar communities across multiple states and countries might facilitate the rapid spread of measles outbreaks. The risk for widespread measles transmission in the United States remains low because of high population immunity resulting from high measles vaccination coverage. However, recent increasing global measles incidence in areas frequently visited by U.S. travelers, coupled with declines in MMR vaccination coverage in many U.S. jurisdictions to <95% (the estimated population-level immunity necessary to prevent measles outbreaks), and spread of measles from ongoing domestic outbreaks to other jurisdictions, have increased the risk for ongoing measles transmission within the United States (*8*,*9*).

††† https://health-infobase.canada.ca/measles-rubella/

Limitations

The findings in this report are subject to at least four limitations. First, imported cases were likely underreported because 30% of reported outbreaks had no known source. Second, outbreak-related cases were likely underreported because certain persons in affected communities might not engage with the health care and public health systems. Third, distinguishing unvaccinated patients from patients with unknown measles vaccination status in Texas was not possible; the Texas Immunization Registry legally requires explicit consent, or opt-in, for adults and by parent or guardian for children to enroll.§§§ Persons with no records available are considered to have an unverified vaccination history. Finally, definitive linkages between the large outbreak in New Mexico, Oklahoma, and Texas and cases reported in Kansas could not be identified.

Implications for Public Health Practice

To protect against measles and its complications before traveling internationally, all persons aged ≥12 months should have documented receipt of 2 appropriately spaced doses of MMR vaccine, and infants aged 6–11 months of age should receive 1 dose of MMR vaccine (*10*). Persons residing in or traveling domestically to outbreak areas should follow local public health guidance, which is developed based on review and analysis of the local outbreak epidemiology (*6*). Infants aged <6 months are at high risk for measles complications but are too young to be vaccinated, and therefore depend upon population immunity and passively transferred maternal measles antibodies (from previously vaccinated or infected mothers) to prevent infections and related complications.

Health care providers continue to serve on the front lines to identify measles cases, alert public health departments¶¶¶, ensure recommended testing, and implement measles isolation precautions to prevent health care–associated and community-based transmission. Health care providers should consider measles in the differential diagnosis for all patients (especially those who are unvaccinated) who 1) have fever (temperature ≥101°F [≥38.3°C]) and a generalized maculopapular rash with cough, coryza, or conjunctivitis, 2) have recently traveled outside the country or to a U.S. region with a known measles outbreak, or 3) have other known or suspected exposure to measles (*6*). Although no specific Food and Drug Administration–approved antiviral therapy for measles exists, rapid access to supportive care can help relieve symptoms and treat complications such as pneumonia and secondary bacterial and viral infections. Providers should also offer and encourage vaccination for eligible patients who lack presumptive evidence of immunity to measles (*4*).

Public health departments might benefit from using a CDC checklist**** to help guide their readiness activities such as preparing for laboratory testing and data reporting needs, conducting tabletop exercises, and facilitating early engagement with communities with low vaccination coverage and their trusted messengers before measles and other vaccine-preventable disease outbreaks occur. To identify communities at risk, public health departments should consider using both MMR vaccination coverage data from immunization information systems and kindergarten entry and vaccination exemption data from kindergarten entry records. Standard measles control interventions, including vaccination, isolation, quarantine, and postexposure prophylaxis (i.e., administration of MMR vaccine within 72 hours of exposure or immunoglobulin within 6 days of exposure for certain persons) (*10*), might be challenging to implement in certain communities. Therefore, public health departments should consider partnering with trusted community messengers (e.g., clinicians and religious leaders) on culturally competent community engagement, education, vaccination efforts, and potentially acceptable community infection control approaches. Coordination with health care facilities, early childhood education facilities and schools, and other congregate settings that surround or serve these communities to prepare for measles cases regarding appropriate infection prevention and control, testing, public health follow-up, and early childhood education or school exclusion policies is crucial to limit transmission. Increasing national and local MMR vaccination coverage is essential to preventing measles cases and outbreaks.

§§§ https://www.cdc.gov/iis/policy-legislation/texas.html
¶¶¶ https://libraries.cste.org/after-hours-contact/

**** https://www.cdc.gov/measles/media/pdfs/2025/02/CDC-Public-Health-Checklist_Sept18_FINAL-updatedlinks-508.pdf

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References

1. Leung J, Munir NA, Mathis AD, et al. The effects of vaccination status and age on clinical characteristics and severity of measles cases in the United States in the postelimination era, 2001–2022. Clin Infect Dis 2025;80:663–72. PMID:39271123 https://doi.org/10.1093/cid/ciae470
2. Shattock AJ, Johnson HC, Sim SY, et al. Contribution of vaccination to improved survival and health: modelling 50 years of the Expanded Programme on Immunization. Lancet 2024;403:2307–16. PMID:38705159 https://doi.org/10.1016/S0140-6736(24)00850-X
3. Mina MJ, Metcalf CJ, de Swart RL, Osterhaus AD, Grenfell BT. Long-term measles-induced immunomodulation increases overall childhood infectious disease mortality. Science 2015;348:694–9. PMID:25954009 https://doi.org/10.1126/science.aaa3662
4. McLean HQ, Fiebelkorn AP, Temte JL, Wallace GS; CDC. Prevention of measles, rubella, congenital rubella syndrome, and mumps, 2013: summary recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 2013;62(No. RR-4):1–34. PMID:23760231
5. Minta AA, Ferrari M, Antoni S, et al. Progress toward measles elimination—worldwide, 2000–2023. MMWR Morb Mortal Wkly Rep 2024;73:1036–42. PMID:39541251 https://doi.org/10.15585/mmwr.mm7345a4
6. Filardo TD, Mathis A, Raines K, et al. Measles [Chapter 7]. In: Manual for the surveillance of vaccine-preventable diseases. Atlanta, GA: US Department of Health and Human Services, CDC; 2024. https://www.cdc.gov/surv-manual/php/table-of-contents/chapter-7-measles.html
7. Williams D, Penedos A, Bankamp B, et al. Update: circulation of active genotypes of measles virus and recommendations for use of sequence analysis to monitor viral transmission. Wkly Epidemiol Rec 2022;97:485–92. https://reliefweb.int/report/world/weekly-epidemiological-record-wer-30-september-2022-vol-97-no-39-2022-pp-481-492-enfr
8. CDC. Assessing measles outbreak risk in the United States. Atlanta, GA: US Department of Health and Human Services; 2024. https://www.cdc.gov/ncird/whats-new/measles-outbreak-risk-in-us.html
9. Seither R, Yusuf OB, Dramann D, et al. Coverage with selected vaccines and exemption rates among children in kindergarten—United States, 2023–24 school year. MMWR Morb Mortal Wkly Rep 2024;73:925–32. PMID:39418212 https://doi.org/10.15585/mmwr.mm7341a3
10. CDC. Vaccines and immunizations: routine measles, mumps, and rubella vaccination. Atlanta, GA: US Department of Health and Human Services, CDC; 2021. https://www.cdc.gov/vaccines/vpd/mmr/hcp/recommendations.html

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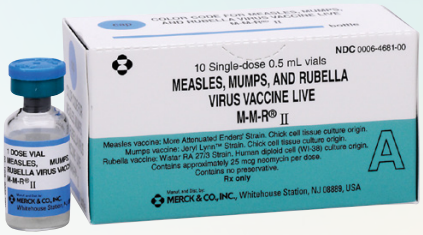

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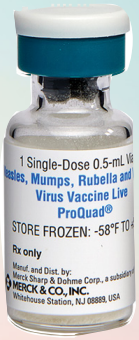

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Vaccine Storage Quick Reference

REMEMBER: Improperly stored or outdated vaccines won't protect your patients!

- This reference includes vaccines approved or authorized in the United States. It does not include travel vaccines. For additional details, refer to vaccine package inserts (www.immunize.org/official-guidance/fda/pkg-inserts).
- If you have a concern about the condition of any vaccine upon arrival or while it is in storage, **take action!** Follow the steps on Immunize.org's "Vaccine Storage Emergency Response Worksheet" and document the situation on the "Vaccine Storage Troubleshooting Record" (see *Additional Resources* #1 and #2).

STORE VACCINES AT APPROPRIATE TEMPERATURES

Refrigerator (most vaccines)

▶ **Maintain between 2°C and 8°C (36°F and 46°F) *Aim for 5°C (41°F)***

- Any combination vaccine containing only refrigerated components listed below
- COVID-19 2024–2025 formulations:
  - Comirnaty (age 12+ yrs)
  - Novavax EUA
- Dengue (Dengvaxia)
- DTaP, Tdap, Td (all)
- Hepatitis A (all)
- Hepatitis B (all)
- *H. influenzae* type b (Hib, all)
- Human papillomavirus (HPV)
- Influenza (all)
- MMR (MMR II, Priorix)*
- Meningococcal (all)
- Pneumococcal (all)
- Polio (IPV)
- Rabies (all)
- RSV (Arexvy, Abrysvo)
- RSV monoclonal antibody
- Rotavirus (all)
- Zoster/Shingles (Shingrix)

Vaccine diluents: All may be stored in the refrigerator; certain diluents may be stored at room temperature (see *Additional Resources* #3).

Freezer

▶ **Maintain between -50°C and -15°C (-58°F and 5°F)**

- COVID-19 2024–2025 Moderna formulations
- MMR (MMR II only)*
- MMRV
- Mpox (Jynneos)
- RSV (mResvia)
- Varicella

Vaccine diluents: Do not freeze.

Ultra-Cold Freezer

▶ **Maintain between -90°C and -60°C (-130°F and -76°F)**

- COVID-19 2024–2025: Pfizer-BioNTech EUA (age 6 mos through 11 yrs)

Special Cases

Certain vaccines may be frozen until their expiration date *or* may be stored in a refrigerator for several weeks before use. Once thawed, DO NOT REFREEZE.

Refrigeration time (use within allowable time or until expiration, whichever is first):

- COVID-19 2024-2025 formulations:
  - All Moderna formulations — *up to 60 days in refrigerator*
  - Pfizer-BioNTech EUA (age 6 mos through 11 yrs) — *up to 10 weeks in refrigerator*
- Mpox (Jynneos) — *up to 8 weeks in refrigerator*

* MMR: MMR II (Merck) may be stored until expiration in a freezer or refrigerator. Store Priorix (GSK) only in the refrigerator.

ADDITIONAL RESOURCES

Immunize.org:

1. "Vaccine Storage Emergency Response Worksheet" – guidance for vaccines exposed to improper storage conditions, such as a power failure (www.immunize.org/catg.d/p3051.pdf)
2. "Vaccine Storage Troubleshooting Record" – form to document an improper vaccine storage incident and actions taken to resolve it (www.immunize.org/catg.d/p3041.pdf)
3. "Vaccines with Diluents: How to Use Them" (www.immunize.org/catg.d/p3040.pdf)
4. Warning Sign: "Do Not Unplug Refrigerator or Freezer" (www.immunize.org/catg.d/p2090.pdf)
5. Warning Sign: "Do Not Turn Off Circuit Breaker" (www.immunize.org/catg.d/p2091.pdf)

CDC:

6. "Vaccine Storage and Handling Toolkit" (www.cdc.gov/vaccines/hcp/storage-handling)
7. Resources for organizing and labeling vaccines in your storage units (www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf)

Immunize.org

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Item #P3048 (3/20/2025)

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Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger

UNITED STATES 2025

Vaccines and Other Immunizing Agents in the Child and Adolescent Immunization Schedule*

Monoclonal antibody	Abbreviation(s)	Trade name(s)
Respiratory syncytial virus monoclonal antibody (Nirsevimab)	RSV-mAb	Beyfortus
Vaccine	**Abbreviation(s)**	**Trade name(s)**
COVID-19 vaccine	1vCOV-mRNA	Comirnaty/Pfizer-BioNTech COVID-19 Vaccine
		Spikevax/Moderna COVID-19 Vaccine
	1vCOV-aPS	Novavax COVID-19 Vaccine
Dengue vaccine	DEN4CYD	Dengvaxia
Diphtheria, tetanus, and acellular pertussis vaccine	DTaP	Daptacel Infanrix
Haemophilus influenzae type b vaccine	Hib (PRP-T)	ActHIB Hiberix
	Hib (PRP-OMP)	PedvaxHIB
Hepatitis A vaccine	HepA	Havrix Vaqta
Hepatitis B vaccine	HepB	Engerix-B Recombivax HB
Human papillomavirus vaccine	HPV	Gardasil 9
Influenza vaccine (inactivated: egg-based)	IIV3	Multiple
Influenza vaccine (inactivated: cell-culture)	ccIIV3	Flucelvax
Influenza vaccine (live, attenuated)	LAIV3	FluMist
Measles, mumps, and rubella vaccine	MMR	M-M-R II Priorix
Meningococcal serogroups A, C, W, Y vaccine	MenACWY-CRM	Menveo
	MenACWY-TT	MenQuadfi
Meningococcal serogroup B vaccine	MenB-4C	Bexsero
	MenB-FHbp	Trumenba
Meningococcal serogroup A, B, C, W, Y vaccine	MenACWY-TT/ MenB-FHbp	Penbraya
Mpox vaccine	Mpox	Jynneos
Pneumococcal conjugate vaccine	PCV15 PCV20	Vaxneuvance Prevnar 20
Pneumococcal polysaccharide vaccine	PPSV23	Pneumovax 23
Poliovirus vaccine (inactivated)	IPV	Ipol
Respiratory syncytial virus vaccine	RSV	Abrysvo
Rotavirus vaccine	RV1 RV5	Rotarix RotaTeq
Tetanus, diphtheria, and acellular pertussis vaccine	Tdap	Adacel Boostrix
Tetanus and diphtheria vaccine	Td	Tenivac Tdvax
Varicella vaccine	VAR	Varivax
Combination vaccines *(use combination vaccines instead of separate injections when appropriate)*		
DTaP, hepatitis B, and inactivated poliovirus vaccine	DTaP-HepB-IPV	Pediarix
DTaP, inactivated poliovirus, and *Haemophilus influenzae* type b vaccine	DTaP-IPV/Hib	Pentacel
DTaP and inactivated poliovirus vaccine	DTaP-IPV	Kinrix Quadracel
DTaP, inactivated poliovirus, *Haemophilus influenzae* type b, and hepatitis B vaccine	DTaP-IPV-Hib-HepB	Vaxelis
Measles, mumps, rubella, and varicella vaccine	MMRV	ProQuad

*Administer recommended vaccines if immunization history is incomplete or unknown. Do not restart or add doses to vaccine series for extended intervals between doses. When a vaccine is not administered at the recommended age, administer at a subsequent visit. The use of trade names is for identification purposes only and does not imply endorsement by the ACIP or CDC.

Revised 05/28/2025

How to use the child and adolescent immunization schedule

1. Determine recommended vaccine by age **(Table 1)**
2. Determine recommended interval for catch-up vaccination **(Table 2)**
3. Assess need for additional recommended vaccines by medical condition or other indication **(Table 3)**
4. Review vaccine types, frequencies, intervals, and considerations for special situations **(Notes)**
5. Review contraindications and precautions for vaccine types **(Appendix)**

Report

- Suspected cases of reportable vaccine-preventable diseases or outbreaks to your state or local health department
- Clinically significant adverse events to the Vaccine Adverse Event Reporting System (VAERS) at www.vaers.hhs.gov or 800-822-7967

Questions or comments

Contact www.cdc.gov/cdc-info or 800-CDC-INFO (800-232-4636), in English or Spanish, 8 a.m.–8 p.m. ET, Monday through Friday, excluding holidays.

Download the CDC Vaccine Schedules app for providers at www.cdc.gov/vaccines/hcp/imz-schedules/app.html

Helpful information

- Complete Advisory Committee on Immunization Practices (ACIP) recommendations: www.cdc.gov/acip-recs/hcp/vaccine-specific/index.html
- ACIP Shared Clinical Decision-Making Recommendations: www.cdc.gov/acip/vaccine-recommendations/shared-clinical-decision-making.html
- *General Best Practice Guidelines for Immunization* (including contraindications and precautions): www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html
- Vaccine information statements: www.cdc.gov/vaccines/hcp/vis/index.html
- Manual for the Surveillance of Vaccine-Preventable Diseases (including case identification and outbreak response): www.cdc.gov/surv-manual/php/

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CS310020-E

Table 1 Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

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).

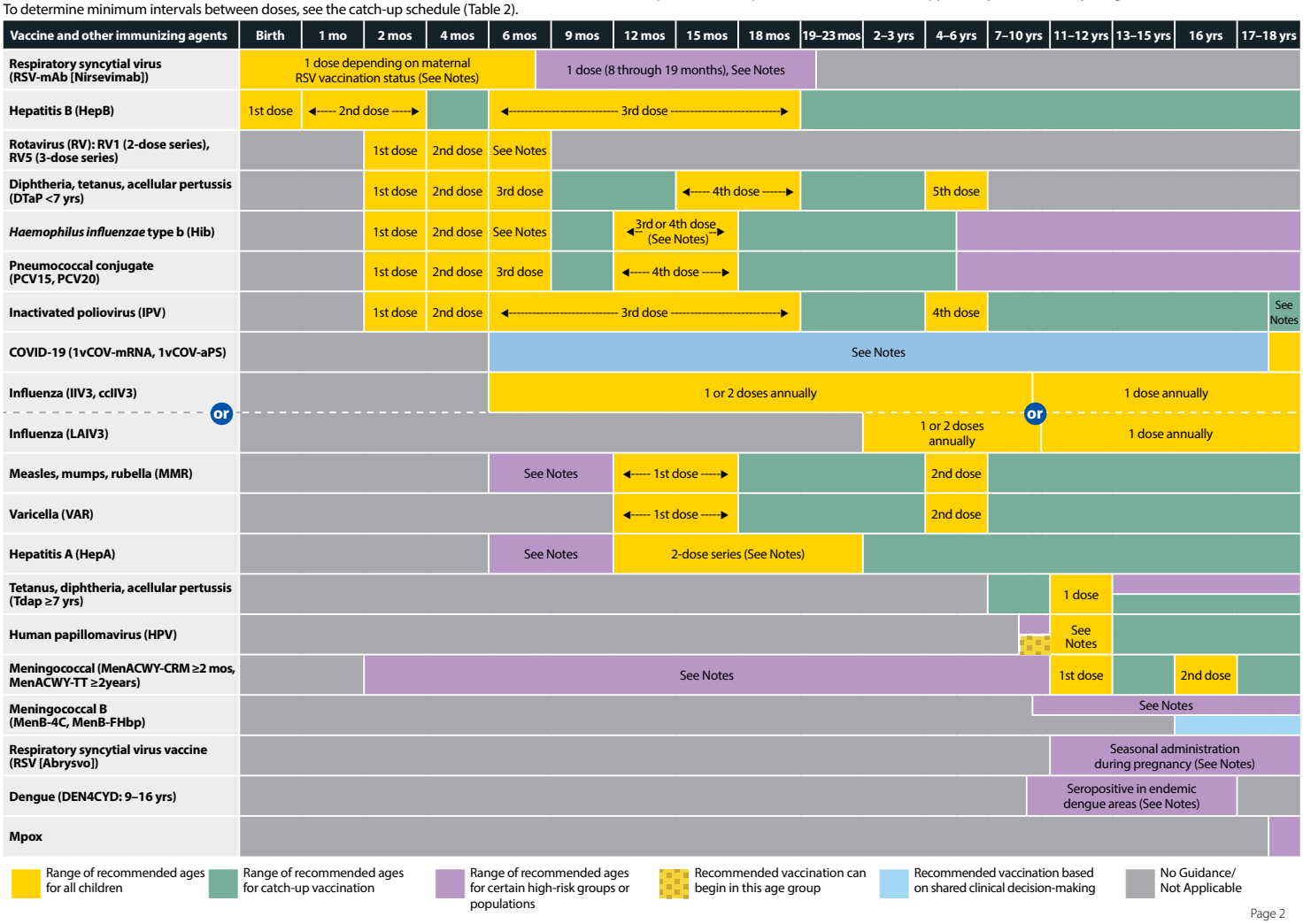

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Table 2 Recommended Catch-up Immunization Schedule for Children and Adolescents Who Start Late or Who Are More than 1 Month Behind, United States, 2025

The table below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age. **Always use this table in conjunction with Table 1 and the Notes that follow.**

Children age 4 months through 6 years					
Vaccine	**Minimum Age for Dose 1**	**Minimum Interval Between Doses**			
		Dose 1 to Dose 2	**Dose 2 to Dose 3**	**Dose 3 to Dose 4**	**Dose 4 to Dose 5**
Hepatitis B	Birth	**4 weeks**	**8 weeks *and* at least 16 weeks after first dose** minimum age for the final dose is 24 weeks		
Rotavirus	6 weeks Maximum age for first dose is 14 weeks, 6 days.	**4 weeks**	**4 weeks** maximum age for final dose is 8 months, 0 days		
Diphtheria, tetanus, and acellular pertussis	6 weeks	**4 weeks**	**4 weeks**	**6 months**	**6 months** A fifth dose is not necessary if the fourth dose was administered at age 4 years or older ***and*** at least 6 months after dose 3
Haemophilus influenzae type b	6 weeks	**No further doses needed** if first dose was administered at age 15 months or older. **4 weeks** if first dose was administered before the 1st birthday. **8 weeks (as final dose)** if first dose was administered at age 12 through 14 months.	**No further doses needed** if previous dose was administered at age 15 months or older **4 weeks** if current age is younger than 12 months ***and*** first dose was administered at younger than age 7 months ***and*** at least 1 previous dose was PRP-T (ActHib, Pentacel, Hiberix), Vaxelis or unknown **8 weeks *and* age 12 through 59 months (as final dose)** if current age is younger than 12 months ***and*** first dose was administered at age 7 through 11 months; **OR** if current age is 12 through 59 months ***and*** first dose was administered before the 1st birthday ***and*** second dose was administered at younger than 15 months; **OR** if both doses were PedvaxHIB and were administered before the 1st birthday	**8 weeks (as final dose)** This dose only necessary for children age 12 through 59 months who received 3 doses before the 1st birthday.	
Pneumococcal conjugate	6 weeks	**No further doses needed** for healthy children if first dose was administered at age 24 months or older **4 weeks** if first dose was administered before the 1st birthday **8 weeks (as final dose for healthy children)** if first dose was administered at the 1st birthday or after	**No further doses needed** for healthy children if previous dose was administered at age 24 months or older **4 weeks** if current age is younger than 12 months ***and*** previous dose was administered at <7 months old **8 weeks (as final dose for healthy children)** if previous dose was administered between 7–11 months (wait until at least 12 months old); **OR** if current age is 12 months or older ***and*** at least 1 dose was administered before age 12 months	**8 weeks (as final dose)** This dose is only necessary for children age 12 through 59 months regardless of risk, or age 60 through 71 months with any risk, who received 3 doses before age 12 months.	
Inactivated poliovirus	6 weeks	**4 weeks**	**4 weeks** if current age is <4 years **6 months (as final dose)** if current age is 4 years or older	**6 months (minimum age 4 years for final dose)**	
Measles, mumps, rubella	12 months	**4 weeks**			
Varicella	12 months	**3 months**			
Hepatitis A	12 months	**6 months**			
Meningococcal ACWY	2 months MenACWY-CRM 2 years MenACWY-TT	**8 weeks**	See Notes	See Notes	
Children and adolescents age 7 through 18 years					
Meningococcal ACWY	Not applicable (N/A)	**8 weeks**			
Tetanus, diphtheria; tetanus, diphtheria, and acellular pertussis	7 years	**4 weeks**	**4 weeks** if first dose of DTaP/DT was administered before the 1st birthday **6 months (as final dose)** if first dose of DTaP/DT or Tdap/Td was administered at or after the 1st birthday	**6 months** if first dose of DTaP/DT was administered before the 1st birthday	
Human papillomavirus	9 years	**Routine dosing intervals are recommended.**			
Hepatitis A	N/A	**6 months**			
Hepatitis B	N/A	**4 weeks**	**8 weeks *and* at least 16 weeks after first dose**		
Inactivated poliovirus	N/A	**4 weeks**	**6 months** A fourth dose is not necessary if the third dose was administered at age 4 years or older ***and*** at least 6 months after the previous dose.	A fourth dose of IPV is indicated if all previous doses were administered at <4 years **OR** if the third dose was administered <6 months after the second dose.	
Measles, mumps, rubella	N/A	**4 weeks**			
Varicella	N/A	**3 months** if younger than age 13 years. **4 weeks** if age 13 years or older			
Dengue	9 years	**6 months**	6 months		

Table 3 Recommended Child and Adolescent Immunization Schedule by Medical Indication, United States, 2025

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

Vaccine and other immunizing agents	Pregnancy	Immunocompromised (excluding HIV infection)	HIV infection CD4 percentage and count[a]		CSF leak or cochlear implant	Asplenia or persistent complement component deficiencies	Heart disease or chronic lung disease	Kidney failure, End-stage renal disease or on dialysis	Chronic liver disease	Diabetes
			<15% or <200/mm³	≥15% and ≥200/mm³						
RSV-mAb (nirsevimab)		2nd RSV season		1 dose depending on maternal RSV vaccination status (See Notes)			2nd RSV season for chronic lung disease (See Notes)	1 dose depending on maternal RSV vaccination status (See Notes)		
Hepatitis B										
Rotavirus		SCID[b]								
DTaP/Tdap	DTaP Tdap: 1 dose each pregnancy									
Hib		HSCT: 3 doses	See Notes			See Notes				
Pneumococcal										
IPV										
COVID-19		See Notes		See Notes						
Influenza inactivated		Solid organ transplant: 18yrs (See Notes)								
LAIV3							Asthma, wheezing: 2–4 years[c]			
MMR	*									
VAR	*									
Hepatitis A										
HPV	*	3-dose series (See Notes)								
MenACWY										
MenB										
RSV (Abrysvo)	Seasonal administration (See Notes)									
Dengue										
Mpox	See Notes									

Recommended for all age-eligible children who lack documentation of a complete vaccination series

Not recommended for all children, but recommended for some children based on increased risk for or severe outcomes from disease

Recommended vaccination based on shared clinical decision-making

Recommended for all age-eligible children, and additional doses may be necessary based on medical condition 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. For additional information regarding HIV laboratory parameters and use of live vaccines, see the General Best Practice Guidelines for Immunization, "Altered Immunocompetence," at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/immunocompetence.html and Table 4-1 (footnote J) at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html.

b. Severe Combined Immunodeficiency

c. LAIV3 contraindicated for children 2–4 years of age with asthma or wheezing during the preceding 12 months

Notes

Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

For vaccination recommendations for persons ages 19 years or older, see the Recommended Adult Immunization Schedule, 2025.

Additional information

- For calculating intervals between doses, 4 weeks = 28 days. Intervals of ≥4 months are determined by calendar months.
- Within a number range (e.g., 12–18), a dash (–) should be read as "through."
- Vaccine doses administered ≤4 days before the minimum age or interval are considered valid. Doses of any vaccine administered ≥5 days earlier than the minimum age or minimum interval should not be counted as valid and should be repeated as age appropriate. **The repeat dose should be spaced after the invalid dose by the recommended minimum interval.** For further details, see Table 3-2, Recommended and minimum ages and intervals between vaccine doses, in *General Best Practice Guidelines for Immunization* at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/timing.html.
- Information on travel vaccination requirements and recommendations is available at www.cdc.gov/travel/.
- For vaccination of persons with immunodeficiencies, see Table 8-1, Vaccination of persons with primary and secondary immunodeficiencies, in *General Best Practice Guidelines for Immunization* at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/immunocompetence.html, and Immunization in Special Clinical Circumstances (In: Kimberlin DW, Barnett ED, Lynfield Ruth, Sawyer MH, eds. *Red Book: 2021–2024 Report of the Committee on Infectious Diseases*. 32nd ed. Itasca, IL: American Academy of Pediatrics; 2021:72–86).
- For information about vaccination in the setting of a vaccine-preventable disease outbreak, contact your state or local health department.
- The National Vaccine Injury Compensation Program (VICP) is a no-fault alternative to the traditional legal system for resolving vaccine injury claims. All vaccines included in the child and adolescent vaccine schedule are covered by VICP except dengue, PPSV23, RSV, Mpox and COVID-19 vaccines. Mpox and COVID-19 vaccines are covered by the Countermeasures Injury Compensation Program (CICP). For more information, see www.hrsa.gov/vaccinecompensation or www.hrsa.gov/cicp.

COVID-19 vaccination

(minimum age: 6 months [Moderna and Pfizer-BioNTech COVID-19 vaccines], 12 years [Novavax COVID-19 Vaccine])

Routine vaccination

Age 18 years and older who are NOT moderately or severely immunocompromised

- **Unvaccinated:**
  - 1 dose 2024–25 Moderna or Pfizer-BioNTech
  - 2 doses 2024–25 Novavax at 0, 3–8 weeks
  - Previously vaccinated before 2024–25 vaccine with:
  - **1 or more doses Moderna or Pfizer-BioNTech:** 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech at least 8 weeks after the most recent dose.
  - **1 dose Novavax:** 1 dose 2024–25 Novavax 3–8 weeks after most recent dose. If more than 8 weeks after most recent dose, administer 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech.
  - **2 or more doses Novavax:** 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech at least 8 weeks after the most recent dose.

Shared clinical decision-making

Ages 6 month –17 years who are NOT moderately or severely immunocompromised. Shared clinical decision-making vaccinations are individually based and informed by a decision process between the health care provider and the patient or parent/guardian. Where the parent presents with a desire for their child to be vaccinated, children 6 months and older may receive COVID-19 vaccination, informed by the clinical judgment of a healthcare provider and personal preference and circumstances. www.cdc.gov/acip/vaccine-recommendations/shared-clinical-decision-making.html

Age 6 months–4 years

All vaccine doses should be from the same manufacturer.

- **Unvaccinated:**
  - 2 doses 2024–25 Moderna at 0, 4–8 weeks
  - 3 doses 2024–25 Pfizer-BioNTech at 0, 3–8, and at least 8 weeks after dose 2
- **Incomplete initial vaccination series before 2024–25 vaccine with:**
  - **1 dose Moderna:** complete initial series with 1 dose 2024–25 Moderna 4–8 weeks after most recent dose
  - **1 dose Pfizer-BioNTech:** complete initial series with 2 doses 2024–25 Pfizer-BioNTech 8 weeks apart (administer dose 1 3–8 weeks after most recent dose).
  - **2 doses Pfizer-BioNTech:** complete initial series with 1 dose 2024–25 Pfizer-BioNTech at least 8 weeks after the most recent dose.
- **Completed initial vaccination series before 2024–25 vaccine with:**
  - **2 or more doses Moderna:** 1 dose 2024–25 Moderna at least 8 weeks after the most recent dose.
  - **3 or more doses Pfizer-BioNTech:** 1 dose 2024–25 Pfizer-BioNTech at least 8 weeks after the most recent dose.

Age 5–11 years

- **Unvaccinated:** 1 dose 2024–25 Moderna or Pfizer-BioNTech
- **Previously vaccinated before 2024–25 vaccine with 1 or more doses Moderna or Pfizer-BioNTech:** 1 dose 2024–25 Moderna or Pfizer-BioNTech at least 8 weeks after the most recent dose.

Age 12–17 years

- **Unvaccinated:**
  - 1 dose 2024–25 Moderna or Pfizer-BioNTech
  - 2 doses 2024–25 Novavax at 0, 3–8 weeks
- **Previously vaccinated before 2024–25 vaccine with:**
  - **1 or more doses Moderna or Pfizer-BioNTech:** 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech at least 8 weeks after the most recent dose.
  - **1 dose Novavax:** 1 dose 2024–25 Novavax 3–8 weeks after most recent dose. If more than 8 weeks after most recent dose, administer 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech.
  - **2 or more doses Novavax:** 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech at least 8 weeks after the most recent dose.

Shared clinical decision-making

Shared clinical decision-making vaccinations are individually based and informed by a decision process between the health care provider and the patient or parent/guardian. This provision would allow for COVID-19 vaccination in children aged 6 months and older based on shared clinical decision-making, allowing for vaccination of immunocompromised children. www.cdc.gov/acip/vaccine-recommendations/shared-clinical-decision-making.html

COVID-19 vaccination - *continued*

Persons who ARE moderately or severely immunocompromised.

Age 6 months–4 years

Use vaccine from the same manufacturer for all doses (initial vaccination series and additional doses*).

- **Unvaccinated:**
  - 4 doses (**3-dose initial series 2024–25 Moderna** at 0, 4 weeks, and at least 4 weeks after dose 2, followed by 1 dose 2024–25 Moderna 6 months later [minimum interval 2 months]).May administer additional doses.*
  - 4 doses (**3-dose initial series 2024–25 Pfizer-BioNTech** at 0, 3 weeks, and at least 8 weeks after dose 2, followed by 1 dose 2024–25 Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses.*
- **Incomplete initial 3-dose vaccination series before 2024–25 vaccine:**
  - **Previous vaccination with Moderna**
    - **1 dose Moderna:** complete initial series with 2 doses 2024–25 Moderna at least 4 weeks apart (administer dose 1 4 weeks after most recent dose), followed by 1 dose 2024–25 Moderna 6 months later (minimum interval 2 months). May administer additional doses of Moderna.*
    - **2 doses Moderna:** complete initial series with 1 dose 2024–25 Moderna at least 4 weeks after most recent dose, followed by 1 dose 2024–25 Moderna 6 months later (minimum interval 2 months). May administer additional doses of Moderna.*
  - **Previous vaccination with Pfizer-BioNTech**
    - **1 dose Pfizer-BioNTech:** complete initial series with 2 doses 2024–25 Pfizer-BioNTech at least 8 weeks apart (administer dose 1 3 weeks after most recent dose), followed by 1 dose 2024–25 Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Pfizer-BioNTech.*
    - **2 doses Pfizer-BioNTech:** complete initial series with 1 dose 2024–25 Pfizer-BioNTech at least 8 weeks after most recent dose, followed by 1 dose 2024–25 Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Pfizer-BioNTech.*
- **Completed initial 3-dose vaccination series before 2024–25 vaccine with:**
  - **3 or more doses Moderna:** 2 doses 2024–25 Moderna 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose. May administer additional doses of Moderna.*
  - **3 or more doses Pfizer-BioNTech:** 2 doses 2024–25 Pfizer-BioNTech 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose. May administer additional doses of Pfizer-BioNTech.*

Age 5–11 years

Use vaccine from the same manufacturer for all doses in the initial vaccination series.

- **Unvaccinated:**
  - 4 doses (**3-dose initial series 2024–25 Moderna** at 0, 4 weeks, and at least 4 weeks after dose 2, followed by 1 dose 2024–25 Moderna or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses.*
  - 4 doses (**3-dose initial series 2024–25 Pfizer-BioNTech** at 0, 3 weeks, and at least 4 weeks after dose 2, followed by 1 dose 2024–25 Moderna or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses.*
- **Incomplete initial 3-dose vaccination series before 2024–25 vaccine:**
  - **Previous vaccination with Moderna**
    - **1 dose Moderna:** complete initial series with 2 doses 2024–25 Moderna at least 4 weeks apart (administer dose 1 4 weeks after most recent dose), followed by 1 dose 2024–25 Moderna or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Pfizer-BioNTech.*
    - **2 doses Moderna:** complete initial series with 1 dose 2024–25 Moderna at least 4 weeks after most recent dose, followed by 1 dose 2024–25 Moderna or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Pfizer-BioNTech.*
  - **Previous vaccination with Pfizer-BioNTech**
    - **1 dose Pfizer-BioNTech:** complete initial series with 2 doses 2024–25 Pfizer-BioNTech at least 4 weeks apart (administer dose 1 3 weeks after most recent dose), followed by 1 dose 2024–25 Moderna or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Pfizer-BioNTech.*
    - **2 doses Pfizer-BioNTech:** complete initial series with 1 dose 2024–25 Pfizer-BioNTech at least 4 weeks after most recent dose, followed by 1 dose 2024–25 Moderna or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Pfizer-BioNTech.*
- **Completed initial 3-dose vaccination series before 2024–25 vaccine with:**
  - **3 or more doses Moderna or 3 or more doses Pfizer-BioNTech:** 2 doses 2024–25 Moderna or Pfizer-BioNTech 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose. May administer additional doses of Moderna or Pfizer-BioNTech.*

Age 12–17 years

Use vaccine from the same manufacturer for all doses in the initial vaccination series.

- **Unvaccinated:**
  - 4 doses (**3-dose initial series Moderna** at 0, 4 weeks, and at least 4 weeks after dose 2, followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
  - 4 doses (**3-dose initial series Pfizer-BioNTech** at 0, 3 weeks, and at least 4 weeks after dose 2, followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
  - 3 doses (**2-dose initial series Novavax** at 0, 3 weeks, followed by 1 dose Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
- **Incomplete initial vaccination series before 2024–25 vaccine:**
  - **Previous vaccination with Moderna**
    - **1 dose Moderna:** complete initial series with 2 doses 2024–25 Moderna at least 4 weeks apart (administer dose 1 4 weeks after most recent dose), followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
    - **2 doses Moderna:** complete initial series with 1 dose 2024–25 Moderna at least 4 weeks after most recent dose, followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*

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COVID-19 vaccination - *continued*

- **Previous vaccination with Pfizer-BioNTech**
  - **1 dose Pfizer-BioNTech:** complete initial series with 2 doses 2024–25 Pfizer-BioNTech at least 4 weeks apart (administer dose 1 3 weeks after most recent dose), followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
  - **2 doses Pfizer-BioNTech:** complete initial series with 1 dose 2024–25 Pfizer-BioNTech at least 4 weeks after most recent dose, followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
- **Previous vaccination with Novavax**
  - **1 dose Novavax:** complete initial series with 1 dose 2024–25 Novavax at least 3 weeks after most recent dose, followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*

• **Completed initial 3-dose vaccination series before 2024–25 vaccine with:**

- **3 or more doses Moderna or 3 or more doses Pfizer-BioNTech:** 2 doses 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose. May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
- **2 or more doses Novavax:** 2 doses 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose. May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*

Special situations

Age 18 years and older who ARE moderately or severely immunocompromised

Use vaccine from the same manufacturer for all doses in the initial vaccination series.

• **Unvaccinated:**

- 4 doses (**3-dose initial series Moderna** at 0, 4 weeks, and at least 4 weeks after dose 2, followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
- 4 doses (**3-dose initial series Pfizer-BioNTech** at 0, 3 weeks, and at least 4 weeks after dose 2, followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
- 3 doses (**2-dose initial series Novavax** at 0, 3 weeks, followed by 1 dose Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*

• **Incomplete initial vaccination series before 2024–25 vaccine:**

- **Previous vaccination with Moderna**
  - **1 dose Moderna:** complete initial series with 2 doses 2024–25 Moderna at least 4 weeks apart (administer dose 1 4 weeks after most recent dose), followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
  - **2 doses Moderna:** complete initial series with 1 dose 2024–25 Moderna at least 4 weeks after most recent dose, followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
- **Previous vaccination with Pfizer-BioNTech**
  - 1 dose Pfizer-BioNTech: complete initial series with 2 doses 2024–25 Pfizer-BioNTech at least 4 weeks apart (administer dose 1 3 weeks after most recent dose), followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
  - 2 doses Pfizer-BioNTech: complete initial series with 1 dose 2024–25 Pfizer-BioNTech at least 4 weeks after most recent dose, followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
- **Previous vaccination with Novavax**
  - **1 dose Novavax:** complete initial series with 1 dose 2024–25 Novavax at least 3 weeks after most recent dose, followed by 1 dose 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*

• **Completed initial 3-dose vaccination series before 2024–25 vaccine with:**

- **3 or more doses Moderna or 3 or more doses Pfizer-BioNTech:** 2 doses 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose. May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*
- **2 or more doses Novavax:** 2 doses 2024–25 Moderna or Novavax or Pfizer-BioNTech 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose. May administer additional doses of Moderna or Novavax or Pfizer-BioNTech.*

***Additional doses of 2024–25 COVID-19 vaccine for moderately or severely immunocompromised:** based on shared clinical decision-making and administered at least 2 months after the most recent dose. For description of moderate and severe immunocompromising conditions and treatment, see www.cdc.gov/covid/hcp/vaccine-considerations/immunocompromised.html#cdc_cg_special_populations_section_3-description-of-moderate-and-severe-immunocompromising-conditions-and-treatment

Unvaccinated persons have never received any COVID-19 vaccine doses. There is no preferential recommendation for the use of one COVID-19 vaccine over another when more than one recommended age-appropriate vaccine is available. Administer an age-appropriate COVID-19 vaccine product for each dose.

For information about transition from age 4 years to age 5 years or age 11 years to age 12 years during COVID-19 vaccination series, see Tables 1 and 2 at www.cdc.gov/covid/hcp/vaccine-considerations/index.html

For information about interchangeability of COVID-19 vaccines, see www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#Interchangeability.

Current COVID-19 schedule and dosage formulation available at www.cdc.gov/covidschedule. For more information on Emergency Use Authorization (EUA) indications for COVID-19 vaccines, see www.fda.gov/emergency-preparedness-and-response/mcm-legal-regulatory-and-policy-framework/emergency-use-authorization#covid19euas

Dengue vaccination (minimum age: 9 years)

Routine vaccination

- Age 9–16 years living in areas with endemic dengue **AND** have laboratory confirmation of previous dengue infection
  - 3-dose series administered at 0, 6, and 12 months
- Endemic areas include Puerto Rico, American Samoa, US Virgin Islands, Federated States of Micronesia, Republic of Marshall Islands, and the Republic of Palau. For updated guidance on dengue endemic areas and pre-vaccination laboratory testing see www.cdc.gov/mmwr/volumes/70/rr/rr7006a1.htm?s_cid=rr7006a1_w and www.cdc.gov/dengue/index.html
- Dengue vaccine should not be administered to children traveling to or visiting endemic dengue areas.

Diphtheria, tetanus, and pertussis (DTaP) vaccination (minimum age: 6 weeks [4 years for Kinrix or Quadracel])

Routine vaccination

- 5-dose series (3-dose primary series at age 2, 4, and 6 months, followed by booster doses at ages 15–18 months and 4–6 years)
  - **Prospectively:** Dose 4 may be administered as early as age 12 months if at least 6 months have elapsed since dose 3.
  - **Retrospectively:** A 4th dose that was inadvertently administered as early as age 12 months may be counted if at least 4 months have elapsed since dose 3.

Catch-up vaccination

- Dose 5 is not necessary if dose 4 was administered at age 4 years or older and at least 6 months after dose 3.
- For other catch-up guidance, see Table 2.

Special situations

- **Children younger than age 7 years with a contraindication specific to the pertussis component of DTaP:** May administer Td for all recommended remaining doses in place of DTaP. Encephalopathy within 7 days of vaccination when not attributable to another identifiable cause is the only contraindication specific to the pertussis component of DTaP. For additional information, see www.cdc.gov/pertussis/hcp/vaccine-recommendations/td-offlabel.html.
- **Wound management in children younger than age 7 years with history of 3 or more doses of tetanus-toxoid-containing vaccine:** For all wounds except clean and minor wounds, administer DTaP if more than 5 years since last dose of tetanus-toxoid-containing vaccine. For detailed information, see www.cdc.gov/mmwr/volumes/67/rr/rr6702a1.htm.

Haemophilus influenzae type b vaccination (minimum age: 6 weeks)

Routine vaccination

- **ActHIB, Hiberix, Pentacel, or Vaxelis:** 4-dose series (3-dose primary series at age 2, 4, and 6 months, followed by a booster dose* at age 12–15 months)
  - *Vaxelis is not recommended for use as a booster dose. A different Hib-containing vaccine should be used for the booster dose.
- **PedvaxHIB:** 3-dose series (2-dose primary series at age 2 and 4 months, followed by a booster dose at age 12–15 months)
- **American Indian and Alaska Native infants:** Vaxelis and PedvaxHIB preferred over other Hib vaccines for the primary series.

Catch-up vaccination

- **Dose 1 at age 7–11 months:** Administer dose 2 at least 4 weeks later and dose 3 (final dose) at age12–15 months or 8 weeks after dose 2 (whichever is later).
- **Dose 1 at age 12–14 months:** Administer dose 2 (final dose) at least 8 weeks after dose 1.
- **Dose 1 before age 12 months and dose 2 before age 15 months:** Administer dose 3 (final dose) at least 8 weeks after dose 2.
- **2 doses of PedvaxHIB before age 12 months:** Administer dose 3 (final dose) at age12–59 months and at least 8 weeks after dose 2.
- **1 dose administered at age 15 months or older:** No further doses needed
- **Unvaccinated at age 15–59 months:** Administer 1 dose.
- **Previously unvaccinated children age 60 months or older who are not considered high risk:** Catch-up vaccination not required.

For other catch-up guidance, see Table 2. Vaxelis can be used for catch-up vaccination in children younger than age 5 years. Follow the catch-up schedule even if Vaxelis is used for one or more doses. For detailed information on use of Vaxelis see www.cdc.gov/mmwr/volumes/69/wr/mm6905a5.htm.

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Special situations

- **Chemotherapy or radiation treatment:**
  Age 12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

  Doses administered within 14 days of starting therapy or during therapy should be repeated at least 3 months after therapy completion.
- **Hematopoietic stem cell transplant (HSCT):**
  - 3-dose series 4 weeks apart starting 6 to 12 months after successful transplant, regardless of Hib vaccination history
- **Anatomic or functional asplenia (including sickle cell disease):**
  Age 12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

  Unvaccinated* persons age 5 years or older
  - 1 dose
- **Elective splenectomy:**
  Unvaccinated* persons age 15 months or older
  - 1 dose (preferably at least 14 days before procedure)
- **HIV infection:**
  Age 12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

  Unvaccinated* persons age 5–18 years
  - 1 dose
- **Immunoglobulin deficiency, early component complement deficiency, or early component complement inhibitor use:**
  Age 12–59 months
  - Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
  - 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

Unvaccinated* = Less than routine series (through age 14 months) **or no doses (age 15 months or older)*

Notes

Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

Hepatitis A vaccination
(minimum age: 12 months for routine vaccination)

Routine vaccination

- **2-dose series** (minimum interval: 6 months) at age 12–23 months

Catch-up vaccination

- **Unvaccinated persons through age 18 years should complete a 2-dose series** (minimum interval: 6 months).
- Persons who previously received 1 dose at age 12 months or older should receive dose 2 at least 6 months after dose 1.
- Adolescents age 18 years or older may receive HepA-HepB (Twinrix) as a 3-dose series (0, 1, and 6 months) or 4-dose series (3 doses at 0, 7, and 21–30 days, followed by a booster dose at 12 months).

International travel

- Persons traveling to or working in countries with high or intermediate endemic hepatitis A (www.cdc.gov/travel/):
  - **Infants age 6–11 months**: 1 dose before departure; revaccinate with 2 doses (separated by at least 6 months) between age 12–23 months.
  - **Unvaccinated age 12 months or older**: Administer dose 1 as soon as travel is considered.

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Hepatitis B vaccination
(minimum age: birth)

Routine vaccination

- **Mother is HBsAg-negative**
  - 3-dose series at age 0, 1–2, 6–18 months **(use monovalent HepB vaccine for doses administered before age 6 weeks)**
    - Birth weight ≥2,000 grams: 1 dose within 24 hours of birth if medically stable
    - Birth weight <2,000 grams: 1 dose at chronological age 1 month or hospital discharge (whichever is earlier and even if weight is still <2,000 grams)
  - Infants who did not receive a birth dose should begin the series as soon as possible (see Table 2 for minimum intervals).
  - Administration of 4 doses is permitted when a combination vaccine containing HepB is used after the birth dose.
  - **Minimum intervals (see Table 2):** when 4 doses are administered, substitute "dose 4" for "dose 3" in these calculations.
  - **Final (3rd or 4th) dose:** age 6–18 months **(minimum age 24 weeks)**
- **Mother is HBsAg-positive**
  - **Birth dose (monovalent HepB vaccine only):** administer **HepB vaccine** and **hepatitis B immune globulin (HBIG)** in separate limbs within 12 hours of birth, regardless of birth weight.
  - **Birth weight <2000 grams:** administer 3 additional doses of HepB vaccine beginning at age 1 month (total of 4 doses).
  - **Final (3rd or 4th) dose:** administer at age 6 months **(minimum age 24 weeks)**.
  - Test for HBsAg and anti-HBs at age 9–12 months. If HepB series is delayed, test 1–2 months after final dose. Do not test before age 9 months.
- **Mother is HBsAg-unknown**

  If other evidence suggestive of maternal hepatitis B infection exists (e.g., presence of HBV DNA, HBeAg-positive, or mother known to have chronic hepatitis B infection), manage infant as if mother is HBsAg-positive.
  - **Birth dose (monovalent HepB vaccine only):**
    - Birth weight ≥2,000 grams: administer **HepB vaccine** within 12 hours of birth. Determine mother's HBsAg status as soon as possible. If mother is determined to be HBsAg-positive, administer **HBIG** as soon as possible (in separate limb), but no later than 7 days of age.
    - Birth weight <2,000 grams: administer **HepB vaccine** and **HBIG** (in separate limbs) within 12 hours of birth. Administer 3 additional doses of **HepB vaccine** beginning at age 1 month (total of 4 doses).
  - **Final (3rd or 4th) dose:** administer at age 6 months **(minimum age 24 weeks)**.
  - If mother is determined to be HBsAg-positive or if status remains unknown, test for HBsAg and anti-HBs at age 9–12 months. If HepB series is delayed, test 1–2 months after final dose. Do not test before age 9 months.

Catch-up vaccination

- Unvaccinated persons should complete a 3-dose series at 0, 1–2, 6 months. See Table 2 for minimum intervals.
- Adolescents age 11–15 years may use an alternative 2-dose schedule with at least 4 months between doses (adult formulation **Recombivax HB** only).
- Adolescents age 18 years may receive:
  - **Heplisav-B:** 2-dose series at least 4 weeks apart
  - **PreHevbrio*:** 3-dose series at 0, 1, and 6 months
  - **HepA-HepB (Twinrix):** 3-dose series (0, 1, and 6 months) or 4-dose series (3 doses at 0, 7, and 21–30 days, followed by a booster dose at 12 months).

Special situations

- Revaccination is generally not recommended for persons with a normal immune status who were vaccinated as infants, children, adolescents, or adults.
- **Post-vaccination serology testing and revaccination** (if anti-HBs <10mIU/mL) is recommended for certain populations, including:
  - Infants born to HBsAg-positive mothers
  - Persons who are predialysis or on maintenance dialysis
  - Other immunocompromised persons
  - For detailed revaccination recommendations, see www.cdc.gov/mmwr/volumes/67/rr/rr6701a1.htm.

***Note:** PreHevbrio is not recommended in pregnancy due to lack of safety data in pregnant women.

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Notes Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

Human papillomavirus vaccination (minimum age: 9 years)

Routine and catch-up vaccination

- HPV vaccination routinely recommended at **age 11–12 years (can start at age 9 years)** and catch-up HPV vaccination recommended for all persons through age 18 years if not adequately vaccinated.
- 2- or 3-dose series depending on age at initial vaccination:
  - **Age 9–14 years at initial vaccination**: 2-dose series at 0, 6–12 months (minimum interval: 5 months; repeat dose if administered too soon)
  - **Age 15 years or older at initial vaccination**: 3-dose series at 0, 1–2 months, 6 months (minimum intervals: dose 1 to dose 2 = 4 weeks; dose 2 to dose 3 = 12 weeks; dose 1 to dose 3 = 5 months; repeat dose if administered too soon)
- No additional dose recommended when any HPV vaccine series **of any valency** has been completed using recommended dosing intervals.

Special situations

- **Immunocompromising conditions, including HIV infection:** 3-dose series, even for those who initiate vaccination at age 9 through 14 years.
- **History of sexual abuse or assault:** Start at age 9 years
- **Pregnancy:** Pregnancy testing not needed before vaccination; HPV vaccination not recommended until after pregnancy; no intervention needed if vaccinated while pregnant

Influenza vaccination (minimum age: 6 months [IIV3], 2 years [LAIV3],18 years [recombinant influenza vaccine, RIV3])

Routine vaccination

- Use any influenza vaccine appropriate for age and health status annually:
  - **Age 6 months–8 years** who have received fewer than 2 influenza vaccine doses before July 1, 2024, or whose influenza vaccination history is unknown: 2 doses, separated by at least 4 weeks. Administer dose 2 even if the child turns 9 years between receipt of dose 1 and dose 2.
  - **Age 6 months–8 years** who have received at least 2 influenza vaccine doses before July 1, 2024: 1 dose.
  - **Age 9 years or older:** 1 dose
  - **Age 18 years solid organ transplant recipients receiving immunosuppressive medications:** high-dose inactivated (HD-IIV3) and adjuvanted inactivated (aIIV3) influenza vaccines are acceptable options. No preference over other age-appropriate IIV3 or RIV3.
- For the 2024–25 season, see www.cdc.gov/mmwr/volumes/73/rr/rr7305a1.htm.
- For the 2025–26 season, see the 2025–26 ACIP influenza vaccine recommendations.

Special situations

- **Close contacts (e.g., household contacts) of severely immunosuppressed persons who require a protected environment:** should not receive LAIV3. If LAIV3 is given, they should avoid contact with, or caring for such immunosuppressed persons for 7 days after vaccination.

Note: Persons with an egg allergy can receive any influenza vaccine (egg-based or non-egg based) appropriate for age and health status.

Measles, mumps, and rubella vaccination (minimum age: 12 months for routine vaccination)

Routine vaccination

- 2-dose series at age 12–15 months, age 4–6 years
- MMR or MMRV* may be administered

Note: For dose 1 in children age 12–47 months, it is recommended to administer MMR and varicella vaccines separately. MMRV* may be used if parents or caregivers express a preference.

Catch-up vaccination

- **Unvaccinated children and adolescents:** 2-dose series at least 4 weeks apart*
- The maximum age for use of MMRV* is 12 years.

Special situations

- **International travel**
  - **Infants age 6–11 months:** 1 dose before departure; revaccinate with 2-dose series at age 12–15 months (12 months for children in high-risk areas) and dose 2 as early as 4 weeks later.*
  - **Children age 12 months or older:**
    - Unvaccinated: 2-dose series (separated by at least 4 weeks*) before departure
    - Previously received 1 dose: administer dose 2 at least 4 weeks after dose 1*
- In mumps outbreak settings, for information about additional doses of MMR (including 3rd dose of MMR), see www.cdc.gov/mmwr/volumes/67/wr/mm6701a7.htm

***Note:** If MMRV is used, the minimum interval between MMRV doses is 3 months.

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Notes

Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

Meningococcal serogroup A,C,W,Y vaccination
(minimum age: 2 months [MenACWY-CRM, Menveo], 2 years [MenACWY-TT, MenQuadfi]), 10 years [MenACWY-TT/MenB-FHbp, Penbraya])

Routine vaccination
- 2-dose series at age 11–12 years; 16 years

Catch-up vaccination
- **Age 13–15 years:** 1 dose now and booster at age 16–18 years (minimum interval: 8 weeks)
- **Age 16–18 years:** 1 dose

Special situations
Anatomic or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, complement inhibitor (e.g., eculizumab, ravulizumab) use:

- **Menveo***
  - Dose 1 at age 2 months: 4-dose series (additional 3 doses at age 4, 6, and 12 months)
  - Dose 1 at age 3–6 months: 3- or 4-dose series (dose 2 [and dose 3 if applicable] at least 8 weeks after previous dose until a dose is received at age 7 months or older, followed by an additional dose at least 12 weeks later and after age 12 months)
  - Dose 1 at age 7–23 months: 2-dose series (dose 2 at least 12 weeks after dose 1 and after age 12 months)
  - Dose 1 at age 24 months or older: 2-dose series at least 8 weeks apart
- **MenQuadfi**
  - Dose 1 at age 24 months or older: 2-dose series at least 8 weeks apart

Travel to countries with hyperendemic or epidemic meningococcal disease, including countries in the African meningitis belt or during the Hajj (www.cdc.gov/travel/)**:**

- **Children younger than age 24 months:**
  - **Menveo* (age 2–23 months)**
    - Dose 1 at age 2 months: 4-dose series (additional 3 doses at age 4, 6, and 12 months)
    - Dose 1 at age 3–6 months: 3- or 4-dose series (dose 2 [and dose 3 if applicable] at least 8 weeks after previous dose until a dose is received at age 7 months or older, followed by an additional dose at least 12 weeks later and after age 12 months)
    - Dose 1 at age 7–23 months: 2-dose series (dose 2 at least 12 weeks after dose 1 and after age 12 months)
- **Children age 2 years or older:** 1 dose Menveo* or MenQuadfi

First-year college students who live in residential housing (if not previously vaccinated at age 16 years or older) or military recruits: 1 dose Menveo* or MenQuadfi

Adolescent vaccination of children who received MenACWY prior to age 10 years:

- **Children for whom boosters are recommended because of an ongoing increased risk of meningococcal disease** (e.g., those with complement component deficiency, HIV, or asplenia): Follow the booster schedule for persons at increased risk.
- **Children for whom boosters are not recommended** (e.g., a healthy child who received a single dose for travel to a country where meningococcal disease is endemic): Administer MenACWY according to the recommended adolescent schedule with dose 1 at age 11–12 years and dose 2 at age 16 years.

**Menveo has two formulations: lyophilized and liquid. The liquid formulation should not be used before age 10 years. See www.cdc.gov/vaccines/vpd/mening/downloads/menveo-single-vial-presentation.pdf.*

Note: For MenACWY **booster dose recommendations** for groups listed under "Special situations" and in an outbreak setting and additional meningococcal vaccination information, see www.cdc.gov/mmwr/volumes/69/rr/rr6909a1.htm.

Children age 10 years or older may receive a single dose of Penbraya as an alternative to separate administration of MenACWY and MenB when both vaccines would be given on the same clinic day (see "Meningococcal serogroup B vaccination" section below for more information).

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Meningococcal serogroup B vaccination
(minimum age: 10 years [MenB-4C, Bexsero; MenB-FHbp, Trumenba; MenACWY-TT/MenB-FHbp, Penbraya])

Shared clinical decision-making
- **Adolescents not at increased risk age 16–23 years (preferred age 16–18 years)* based on shared clinical decision-making.**
  - **Bexsero or Trumenba (use same brand for all doses):** 2-dose series at least 6 months apart (if dose 2 is administered earlier than 6 months, administer dose 3 at least 4 months after dose 2)

*To optimize rapid protection (e.g., for students starting college in less than 6 months), a 3-dose series (0, 1–2, 6 months) may be administered.

For additional information on shared clinical decision-making for MenB, see www.cdc.gov/vaccines/hcp/admin/downloads/isd-job-aid-scdm-mening-b-shared-clinical-decision-making.pdf

Special situations
Anatomic or functional asplenia (including sickle cell disease), persistent complement component deficiency, complement inhibitor (e.g., eculizumab, ravulizumab) use.

- **Bexsero or Trumenba (use same brand for all doses including booster doses)** 3-dose series at 0, 1–2, 6 months (if dose 2 was administered at least 6 months after dose 1, dose 3 not needed; if dose 3 is administered earlier than 4 months after dose 2, a 4th dose should be administered at least 4 months after dose 3)

For MenB **booster dose recommendations** for groups listed under "Special situations" and in an outbreak setting and additional meningococcal vaccination information, see www.cdc.gov/mmwr/volumes/69/rr/rr6909a1.htm.

Note: MenB vaccines may be administered simultaneously with MenACWY vaccines if indicated, but at a different anatomic site, if feasible.

Children age 10 years or older may receive a dose of Penbraya (MenACWY–TT/MenB–FHbp) as an alternative to separate administration of MenACWY and MenB when both vaccines would be given on the same clinic day. For age-eligible children not at increased risk, if Penbraya is used for dose 1 MenB, MenB-FHbp (Trumenba) should be administered for dose 2 MenB. For age-eligible children at increased risk of meningococcal disease, Penbraya may be used for additional MenACWY and MenB doses (including booster doses) if both would be given on the same clinic day **and** at least 6 months have elapsed since most recent Penbraya dose.

Notes

Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

Mpox vaccination
(minimum age: 18 years [Jynneos])

Special situations

- **Age 18 years and at risk for mpox infection:** complete 2-dose series, 28 days apart.

Risk factors for mpox infection include:

- Gay, bisexual, or other MSM, or a person who has sex with gay, bisexual, or other MSM who in the past 6 months have had one of the following:
  - A new diagnosis of at least 1 sexually transmitted disease
  - More than 1 sex partner
  - Sex at a commercial sex venue
  - Sex in association with a large public event in a geographic area where mpox transmission is occurring
- Persons who are sexual partners of the persons described above
- Persons who anticipate experiencing any of the situations described above

- **Pregnancy:** There is currently no ACIP recommendation for Jynneos use in pregnancy due to lack of safety data in pregnant women. Pregnant women with any risk factor described above may receive Jynneos.

For detailed information, see www.cdc.gov/mpox/hcp/vaccine-considerations/vaccination-overview.html

Pneumococcal vaccination
(minimum age: 6 weeks [PCV15], [PCV 20]; 2 years [PPSV23])

Routine vaccination with PCV

- 4-dose series at 2, 4, 6, 12–15 months

Catch-up vaccination with PCV

- Healthy children ages 2–4 years with any incomplete* PCV series: 1 dose PCV
- For other catch-up guidance, see Table 2.

Note: For children **without** risk conditions, PCV20 is not indicated if they have received 4 doses of PCV13 or PCV15 or another age appropriate complete PCV series.

Special situations

Children and adolescents with cerebrospinal fluid leak; chronic heart disease; chronic kidney disease (excluding maintenance dialysis and nephrotic syndrome); chronic liver disease; chronic lung disease (including moderate persistent or severe persistent asthma); cochlear implant; or diabetes mellitus:

Age 2–5 years

- Any incomplete* PCV series with:
  - 3 PCV doses: 1 dose PCV (at least 8 weeks after the most recent PCV dose)
  - Less than 3 PCV doses: 2 doses PCV (at least 8 weeks after the most recent dose and administered at least 8 weeks apart)
- Completed recommended PCV series but have not received PPSV23.
  - Previously received at least 1 dose of PCV20: no further PCV or PPSV23 doses needed
  - Not previously received PCV20: administer 1 dose PCV20 or 1 dose PPSV23 administer at least 8 weeks after the most recent PCV dose.

Age 6–18 years

- Not previously received any dose of PCV13, PCV15, or PCV20: administer 1 dose of PCV15 or PCV20. If PCV15 is used and no previous receipt of PPSV23, administer 1 dose of PPSV23 at least 8 weeks after the PCV15 dose.**
- Received PCV before age 6 years but have not received PPSV23
  - Previously received at least 1 dose of PCV20: no further PCV or PPSV23 doses needed
  - Not previously received PCV20: 1 dose PCV20 or 1 dose PPSV23 administer at least 8 weeks after the most recent PCV dose.
- Received PCV13 only at or after age 6 years: administer 1 dose PCV20 or 1 dose PPSV23 at least 8 weeks after the most recent PCV13 dose.
- Received 1 dose PCV13 and 1 dose PPSV23 at or after age 6 years: no further doses of any PCV or PPSV23 indicated.

Children and adolescents on maintenance dialysis, or with immunocompromising conditions such as nephrotic syndrome; congenital or acquired asplenia or splenic dysfunction; congenital or acquired immunodeficiencies; diseases and conditions treated with immunosuppressive drugs or radiation therapy, including malignant neoplasms, leukemias, lymphomas, Hodgkin disease, and solid organ transplant; HIV infection; or sickle cell disease or other hemoglobinopathies:

Age 2–5 years

- Any incomplete* PCV series:
  - 3 PCV doses: 1 dose PCV (at least 8 weeks after the most recent PCV dose)
  - Less than 3 PCV doses: 2 doses PCV (at least 8 weeks after the most recent dose and administered at least 8 weeks apart)
- Completed recommended PCV series but have not received PPSV23
  - Previously received at least 1 dose of PCV20: no further PCV or PPSV23 doses needed
  - Not previously received PCV20: administer 1 dose PCV20 or 1 dose PPSV23 at least 8 weeks after the most recent PCV dose. If PPSV23 is used, administer 1 dose of PCV20 or dose 2 PPSV23 at least 5 years after dose 1 PPSV23.

Notes

Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

Pneumococcal vaccination - *continued*

Age 6–18 years

- Not previously received any dose of PCV13, PCV15, or PCV20: administer 1 dose of PCV15 or 1 dose of PCV20. If PCV15 is used and no previous receipt of PPSV23, administer 1 dose of PPSV23 at least 8 weeks after the PCV15 dose.**
- Received PCV before age 6 years but have not received PPSV23
  - Previously received at least 1 dose of PCV20: no additional dose of PCV or PPSV23
  - Not previously received PCV20: administer 1 dose PCV20 or 1 dose PPSV23 at least 8 weeks after the most recent PCV dose. If PPSV23 is used, administer either PCV20 or dose 2 PPSV23 at least 5 years after dose 1 PPSV23.
- Received PCV13 only at or after age 6 years: administer 1 dose PCV20 or 1 dose PPSV23 at least 8 weeks after the most recent PCV13 dose. If PPSV23 is used, administer 1 dose of PCV20 or dose 2 PPSV23 at least 5 years after dose 1 PPSV23.
- Received 1 dose PCV13 and 1 dose PPSV23 at or after age 6 years: administer 1 dose PCV20 or 1 dose PPSV23 at least 8 weeks after the most recent PCV13 dose and at least 5 years after dose 1 PPSV23.

Pregnancy: no recommendation for PCV or PPSV23 due to limited data. Summary of existing data on pneumococcal vaccination during pregnancy can be found at www.cdc.gov/mmwr/volumes/72/rr/rr7203a1.htm

For guidance on determining which pneumococcal vaccines a patient needs and when, please refer to the mobile app, which can be downloaded here: wcms-wp.cdc.gov/pneumococcal/hcp/vaccine-recommendations/app.html

**Incomplete series* = Not having received all doses in either the recommended series or an age-appropriate catch-up series. See Table 2 in ACIP pneumococcal recommendations at stacks.cdc.gov/view/cdc/133252

***When both PCV15 and PPSV23 are indicated, administer all doses of PCV15 first. PCV15 and PPSV23 should not be administered during the same visit.*

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Poliovirus vaccination
(minimum age: 6 weeks)

Routine vaccination

- 4-dose series at ages 2, 4, 6–18 months, 4–6 years; administer the final dose on or after age 4 years and at least 6 months after the previous dose.
- 4 or more doses of IPV can be administered before age 4 years when a combination vaccine containing IPV is used. However, a dose is still recommended on or after age 4 years and at least 6 months after the previous dose.

Catch-up vaccination

- In the first 6 months of life, use minimum ages and intervals only for travel to a polio-endemic region or during an outbreak.
- **Adolescents age 18 years known or suspected to be unvaccinated or incompletely vaccinated:** administer remaining doses (1, 2, or 3 IPV doses) to complete a 3-dose primary series.* Unless there are specific reasons to believe they were not vaccinated, most persons aged 18 years or older born and raised in the United States can assume they were vaccinated against polio as children.

Series containing oral poliovirus vaccine (OPV), either mixed OPV-IPV or OPV-only series:

- Total number of doses needed to complete the series is the same as that recommended for the U.S. IPV schedule. See www.cdc.gov/mmwr/volumes/66/wr/mm6601a6.htm?s_%20cid=mm6601a6_w.
- Only trivalent OPV (tOPV) counts toward the U.S. vaccination requirements.
  - Doses of OPV administered before April 1, 2016, should be counted (unless specifically noted as administered during a campaign).
  - Doses of OPV administered on or after April 1, 2016, should not be counted.
  - For guidance to assess doses documented as "OPV," see www.cdc.gov/mmwr/volumes/66/wr/mm6606a7.htm?s_cid=mm6606a7_w.
- For other catch-up guidance, see Table 2.

Special situations

- **Adolescents aged 18 years at increased risk of exposure to poliovirus and completed primary series*:** may administer one lifetime IPV booster

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

For detailed information, see: www.cdc.gov/vaccines/vpd/polio/hcp/recommendations.html

Respiratory syncytial virus immunization
(minimum age: birth [Nirsevimab, RSV-mAb, Beyfortus])

Routine immunization

- **Infants born October – March in most of the continental United States***
  - Mother did not receive RSV vaccine or mother's RSV vaccination status is unknown or mother received RSV vaccine in previous pregnancy: administer 1 dose nirsevimab within 1 week of birth—ideally during the birth hospitalization.
  - Mother received RSV vaccine **less than 14 days** prior to delivery: administer 1 dose nirsevimab within 1 week of birth—ideally during the birth hospitalization.
  - Mother received RSV vaccine **at least 14 days** prior to delivery: nirsevimab not needed but can be considered in rare circumstances at the discretion of healthcare providers (see www.cdc.gov/vaccines/vpd/rsv/hcp/child-faqs.html)
- **Infants born April–September in most of the continental United States***
  - Mother did not receive RSV vaccine or mother's RSV vaccination status is unknown or mother received RSV vaccine in previous pregnancy: administer 1 dose nirsevimab shortly before start of RSV season.*
  - Mother received RSV vaccine **less than 14 days** prior to delivery: administer 1 dose nirsevimab shortly before start of RSV season.*
  - Mother received RSV vaccine **at least 14 days** prior to delivery: nirsevimab not needed but can be considered in rare circumstances at the discretion of healthcare providers (see www.cdc.gov/vaccines/vpd/rsv/hcp/child-faqs.html)

Infants with prolonged birth hospitalization** (e.g., for prematurity) discharged October through March should be immunized shortly before or promptly after discharge.

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Notes

Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

Special situations

- **Ages 8–19 months with chronic lung disease of prematurity requiring medical support (e.g., chronic corticosteroid therapy, diuretic therapy, or supplemental oxygen) any time during the 6-month period before the start of the second RSV season; severe immunocompromise; cystic fibrosis with either weight for length <10th percentile or manifestation of severe lung disease (e.g., previous hospitalization for pulmonary exacerbation in the first year of life or abnormalities on chest imaging that persist when stable)**:**
  - 1 dose nirsevimab shortly before start of second RSV season*
- **Ages 8–19 months who are American Indian or Alaska Native:** 1 dose nirsevimab shortly before start of second RSV season*
- **Age-eligible and undergoing cardiac surgery with cardiopulmonary bypass**:** 1 additional dose of nirsevimab after surgery. See www.accessdata.fda.gov/drugsatfda_docs/label/2023/761328s000lbl.pdf

***Note:** While the timing of the onset and duration of RSV season may vary, administration of nirsevimab is recommended October through March in most of the continental United States (optimally October through November or within 1 week of birth). Providers in jurisdictions with RSV seasonality that differs from most of the continental United States (e.g., Alaska, jurisdiction with tropical climate) should follow guidance from public health authorities (e.g., CDC, health departments) or regional medical centers on timing of administration based on local RSV seasonality.

****Note:** Nirsevimab can be administered to children who are eligible to receive palivizumab. Children who have received nirsevimab should not receive palivizumab for the same RSV season.

For further guidance, see www.cdc.gov/mmwr/volumes/72/wr/mm7234a4.htm and www.cdc.gov/vaccines/vpd/rsv/hcp/child-faqs.html

Respiratory syncytial virus vaccination (RSV [Abrysvo])

Routine vaccination

- **Pregnant at 32 weeks 0 days through 36 weeks and 6 days gestation from September through January in most of the continental United States*:** 1 dose Abrysvo. Administer RSV vaccine regardless of previous RSV infection.
  - Either maternal RSV vaccination with Abrysvo or infant immunization with nirsevimab (RSV monoclonal antibody) is recommended to prevent severe respiratory syncytial virus disease in infants.
- **All other pregnant women:** RSV vaccine not recommended
- **Subsequent pregnancies:** additional doses not recommended. No data are available to inform whether additional doses are needed in subsequent pregnancies. Infants born to pregnant women who received RSV vaccine during a previous pregnancy should receive nirsevimab.

***Note:** Providers in jurisdictions with RSV seasonality that differs from most of the continental United States (e.g., Alaska, jurisdictions with tropical climate) should follow guidance from public health authorities (e.g., CDC, health departments) or regional medical centers on timing of administration based on local RSV seasonality.

Rotavirus vaccination (minimum age: 6 weeks)

Routine vaccination

- **Rotarix:** 2-dose series at age 2 and 4 months
- **RotaTeq:** 3-dose series at age 2, 4, and 6 months
- If any dose in the series is either **RotaTeq** or unknown, default to 3-dose series.

Catch-up vaccination

- Do not start the series on or after age 15 weeks, 0 days.
- The maximum age for the final dose is 8 months, 0 days.
- For other catch-up guidance, see Table 2.

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Tetanus, diphtheria, and pertussis (Tdap) vaccination (minimum age: 11 years for routine vaccination, 7 years for catch-up vaccination)

Routine vaccination

- **Age 11–12 years:** 1 dose Tdap (adolescent booster)
- **Pregnancy:** 1 dose Tdap during each pregnancy, preferably in early part of gestational weeks 27–36

Note: Tdap may be administered regardless of the interval since the last tetanus- and diphtheria-toxoid-containing vaccine.

Catch-up vaccination

- **Age 13–18 years who have not received Tdap:** 1 dose Tdap (adolescent booster)
- **Age 7–18 years not fully vaccinated* with DTaP:** 1 dose Tdap as part of the catch-up series (preferably the first dose); if additional doses are needed, use Td or Tdap.
- **Tdap administered at age 7–10 years:**
  - **Age 7–9 years** who receive Tdap should receive the adolescent Tdap booster dose at age 11–12 years
  - **Age 10 years** who receive Tdap do not need the adolescent Tdap booster dose at age 11–12 years
- **DTaP inadvertently administered on or after age 7 years**:
  - **Age 7–9 years**: DTaP may count as part of catch-up series. Administer adolescent Tdap booster dose at age 11–12 years.
  - **Age 10–18 years**: Count dose of DTaP as the adolescent Tdap booster dose.
- For other catch-up guidance, see Table 2.

Special situations

- **Wound management** in persons age 7 years or older with history of 3 or more doses of tetanus-toxoid-containing vaccine: For clean and minor wounds, administer Tdap or Td if more than 10 years since last dose of tetanus-toxoid-containing vaccine; for all other wounds, administer Tdap or Td if more than 5 years since last dose of tetanus-toxoid-containing vaccine. Tdap is preferred for persons age 11 years or older who have not previously received Tdap or whose Tdap history is unknown. If a tetanus-toxoid-containing vaccine is indicated for a pregnant adolescent, use Tdap.
- For detailed information, see www.cdc.gov/mmwr/volumes/69/wr/mm6903a5.htm.

**Fully vaccinated* = 5 valid doses of DTaP or 4 valid doses of DTaP if dose 4 was administered at age 4 years or older

Varicella vaccination
(minimum age: 12 months)

Routine vaccination

- 2-dose series at age 12–15 months, 4–6 years
- VAR or MMRV may be administered*
- Dose 2 may be administered as early as 3 months after dose 1 (a dose inadvertently administered after at least 4 weeks may be counted as valid).

*__Note__: For dose 1 in children age 12–47 months, it is recommended to administer MMR and varicella vaccines separately. MMRV may be used if parents or caregivers express a preference.

Catch-up vaccination

- Ensure persons age 7–18 years without evidence of immunity (see *MMWR* at www.cdc.gov/mmwr/pdf/rr/rr5604.pdf) have a 2-dose series:
  - **Age 7–12 years**: Routine interval: 3 months (a dose inadvertently administered after at least 4 weeks may be counted as valid)
  - **Age 13 years and older**: Routine interval: 4–8 weeks (minimum interval: 4 weeks)
  - The maximum age for use of *MMRV* is 12 years.

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Appendix Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

Guide to Contraindications and Precautions to Commonly Used Vaccines

Adapted from Table 4-1 in Advisory Committee on Immunization Practices (ACIP) General Best Practice Guidelines for Immunization: Contraindication and Precautions, 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), *and* Contraindications and Precautions for COVID-19 Vaccination

Vaccines and other Immunizing Agents	Contraindicated or Not Recommended[1]	Precautions[2]
COVID-19 mRNA vaccines [Pfizer-BioNTech, Moderna]	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a component of an mRNA COVID-19 vaccine[3]	• Diagnosed non-severe allergy (e.g., urticaria beyond the injection site) to a component of an mRNA COVID-19 vaccine[3]; 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 vaccine [Novavax]	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a component of a Novavax COVID-19 vaccine[3]	• Diagnosed non-severe allergy (e.g., urticaria beyond the injection site) to a component of Novavax COVID-19 vaccine[3]; or non-severe, immediate (onset less than 4 hours) allergic reaction after administration of a previous dose of a 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, egg-based, inactivated injectable (IIV3)	• Severe allergic reaction (e.g., anaphylaxis) after previous dose of any influenza vaccine (i.e., any egg-based IIV, ccIIV, RIV, or LAIV of any valency) • Severe allergic reaction (e.g., anaphylaxis) to any vaccine component[4] (excluding egg)	• Guillain-Barré syndrome (GBS) within 6 weeks after a previous dose of any type of influenza vaccine • Moderate or severe acute illness with or without fever
Influenza, cell culture-based inactivated injectable (ccIIV3) [Flucelvax]	• Severe allergic reaction (e.g., anaphylaxis) to any ccIIV of any valency, or to any component[4] of ccIIV3	• Guillain-Barré syndrome (GBS) within 6 weeks after a previous dose of any type of influenza vaccine • Persons with a history of severe allergic reaction (e.g., anaphylaxis) after a previous dose of any egg-based IIV, RIV, or LAIV of any valency. If using ccIIV3, administer in medical setting under supervision of health care provider who can recognize and manage severe allergic reactions. May consult an allergist. • Moderate or severe acute illness with or without fever
Influenza, recombinant injectable (RIV3) [Flublok]	• Severe allergic reaction (e.g., anaphylaxis) to any RIV of any valency, or to any component[4] of RIV3	• Guillain-Barré syndrome (GBS) within 6 weeks after a previous dose of any type of influenza vaccine • Persons with a history of severe allergic reaction (e.g., anaphylaxis) after a previous dose of any egg-based IIV, ccIIV, or LAIV of any valency. If using RIV3, administer in medical setting under supervision of health care provider who can recognize and manage severe allergic reactions. May consult an allergist. • Moderate or severe acute illness with or without fever
Influenza, live attenuated (LAIV3) [Flumist]	• Severe allergic reaction (e.g., anaphylaxis) after previous dose of any influenza vaccine (i.e., any egg-based IIV, ccIIV, RIV, or LAIV of any valency) • Severe allergic reaction (e.g., anaphylaxis) to any vaccine component[4] (excluding egg) • Children age 2–4 years with a history of asthma or wheezing • Anatomic or functional asplenia • Immunocompromised due to any cause including, but not limited to, medications and HIV infection • Close contacts or caregivers of severely immunosuppressed persons who require a protected environment • Pregnancy • Cochlear implant • Active communication between the cerebrospinal fluid (CSF) and the oropharynx, nasopharynx, nose, ear or any other cranial CSF leak • Children and adolescents receiving aspirin or salicylate-containing medications • Received influenza antiviral medications oseltamivir or zanamivir within the previous 48 hours, peramivir within the previous 5 days, or baloxavir within the previous 17 days	• Guillain-Barré syndrome (GBS) within 6 weeks after a previous dose of any type of influenza vaccine • Asthma in persons age 5 years old or older • Persons with underlying medical conditions other than those listed under contraindications that might predispose to complications after wild-type influenza virus infection, e.g., chronic pulmonary, cardiovascular (except isolated hypertension), renal, hepatic, neurologic, hematologic, or metabolic disorders (including diabetes mellitus) • Moderate or severe acute illness with or without fever

1. When a contraindication is present, a vaccine should **NOT** be administered. Kroger A, Bahta L, Hunter P. ACIP General Best Practice Guidelines for Immunization.
2. When a precaution is present, vaccination should generally be deferred but might be indicated if the benefit of protection from the vaccine outweighs the risk for an adverse reaction. Kroger A, Bahta L, Hunter P. ACIP General Best Practice Guidelines for Immunization.
3. See package inserts and FDA EUA fact sheets for a full list of vaccine ingredients. mRNA COVID-19 vaccines contain polyethylene glycol (PEG).
4. Vaccination providers should check FDA-approved prescribing information for the most complete and updated information, including contraindications, warnings, and precautions. See Package inserts for U.S.-licensed vaccines.

Appendix

Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

Vaccines and other Immunizing Agents	Contraindicated or Not Recommended[1]	Precautions[2]
Dengue (DEN4CYD)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] • 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) • Lack of laboratory confirmation of a previous dengue infection	• Pregnancy • HIV infection without evidence of severe immunosuppression • Moderate or severe acute illness with or without fever
Diphtheria, tetanus, pertussis (DTaP)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] • 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 or DTaP	• Guillain-Barré syndrome (GBS) within 6 weeks after 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 • For DTaP only: Progressive neurologic disorder, including infantile spasms, uncontrolled epilepsy, progressive encephalopathy; defer DTaP until neurologic status clarified and stabilized • Moderate or severe acute illness with or without fever
Haemophilus influenzae type b (Hib)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] • Younger than age 6 weeks	• Moderate or severe acute illness with or without fever
Hepatitis A (HepA)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] including neomycin	• Moderate or severe acute illness with or without fever
Hepatitis B (HepB)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] including yeast • Pregnancy: PreHevbrio is not recommended due to lack of safety data in pregnant women. Use other hepatitis B vaccines if HepB is indicated[4]	• Moderate or severe acute illness with or without fever
Hepatitis A-Hepatitis B vaccine (HepA-HepB) [Twinrix]	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] including neomycin and yeast	• Moderate or severe acute illness with or without fever
Human papillomavirus (HPV)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] • *Pregnancy: HPV vaccination not recommended.*	• Moderate or severe acute illness with or without fever
Measles, mumps, rubella (MMR) Measles, mumps, rubella, and varicella (MMRV)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] • 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 • For MMRV only: HIV infection of any severity	• 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 • For MMRV only: Personal or family (i.e., sibling or parent) history of seizures of any etiology • If using MMRV, see Varicella/MMRV for additional precautions
Meningococcal ACWY (MenACWY) MenACWY-CRM [Menveo] MenACWY-TT [MenQuadfi]	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] • For Men ACWY-CRM only: severe allergic reaction to any diphtheria toxoid— or CRM197—containing vaccine • For MenACWY-TT only: severe allergic reaction to a tetanus toxoid-containing vaccine	• For MenACWY-CRM only: Preterm birth if younger than age 9 months • Moderate or severe acute illness with or without fever
Meningococcal B (MenB) MenB-4C [Bexsero] MenB-FHbp [Trumenba]	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3]	• Pregnancy • For MenB-4C only: Latex sensitivity • Moderate or severe acute illness with or without fever
Meningococcal ABCWY (MenACWY-TT/MenB-FHbp) [Penbraya]	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] • Severe allergic reaction to a tetanus toxoid-containing vaccine	• Moderate or severe acute illness, with or without fever
Mpox [Jynneos]	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3]	• Moderate or severe acute illness, with or without fever
Pneumococcal conjugate (PCV)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] • Severe allergic reaction (e.g., anaphylaxis) to any diphtheria-toxoid-containing vaccine or its component[3]	• 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[3]	• Moderate or severe acute illness with or without fever
Poliovirus vaccine, inactivated (IPV)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3]	• Pregnancy • Moderate or severe acute illness with or without fever
RSV monoclonal antibody (RSV-mAb)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[5]	• Moderate or severe acute illness with or without fever
Respiratory syncytial virus vaccine (RSV)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3]	• Moderate or severe acute illness with or without fever
Rotavirus (RV) RV1 [Rotarix] RV5 [RotaTeq]	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] • Severe combined immunodeficiency (SCID) • History of intussusception	• Altered immunocompetence other than SCID • Chronic gastrointestinal disease • RV1 only: Spina bifida or bladder exstrophy • Moderate or severe acute illness with or without fever
Tetanus, diphtheria, and acellular pertussis (Tdap) Tetanus, diphtheria (Td)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] • 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	• Guillain-Barré 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 • For Tdap only: Progressive or unstable neurological disorder, uncontrolled seizures, or progressive encephalopathy until a treatment regimen has been established and the condition has stabilized • Moderate or severe acute illness with or without fever
Varicella (VAR) Measles, mumps, rubella, and varicella (MMRV)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component[3] • 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 • For MMRV only: HIV infection of any severity	• 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 • If using MMRV, see MMR/MMRV for additional precautions

1. When a contraindication is present, a vaccine should NOT be administered. Kroger A, Bahta L, Hunter P. ACIP General Best Practice Guidelines for Immunization. www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html.
2. When a precaution is present, vaccination should generally be deferred but might be indicated if the benefit of protection from the vaccine outweighs the risk for an adverse reaction. Kroger A, Bahta L, Hunter P. ACIP General Best Practice Guidelines for Immunization. www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html.
3. Vaccination providers should check FDA-approved prescribing information for the most complete and updated information, including contraindications, warnings, and precautions. Package inserts for U.S.-licensed vaccines are available at www.fda.gov/vaccines-blood-biologics/approved-products/vaccines-licensed-use-united-states.
4. For information on the pregnancy exposure registry for persons who were inadvertently vaccinated with PreHevbrio while pregnant, please visit www.prehevbrio.com/#safety.
5. Full prescribing information for BEYFORTUS (nirsevimab-alip) www.accessdata.fda.gov/drugsatfda_docs/label/2023/761328s000lbl.pdf.

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