Interim Recommendations of the Advisory Committee on Immunization Practices for Use of Moderna and Pfizer-BioNTech COVID-19 Vaccines in Children Aged 6 Months–5 Years — United States, June 2022

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On June 17, 2022, the Food and Drug Administration (FDA) issued Emergency Use Authorization (EUA) amendments for the mRNA-1273 (Moderna) COVID-19 vaccine for use in children aged 6 months–5 years, administered as 2 doses (25 μg [0.25 mL] each), 4 weeks apart, and BNT162b2 (Pfizer-BioNTech) COVID-19 vaccine for use in children aged 6 months–4 years, administered as 3 doses (3 μg [0.2 mL] each), at intervals of 3 weeks between doses 1 and 2 and ≥8 weeks between doses 2 and 3. On June 18, 2022, the Advisory Committee on Immunization Practices (ACIP) issued separate interim recommendations for use of the Moderna COVID-19 vaccine in children aged 6 months–5 years and the Pfizer-BioNTech COVID-19 vaccine in children aged 6 months–4 years for the prevention of COVID-19.* Both the Moderna and Pfizer-BioNTech COVID-19 vaccines met the criteria for immunobridging, which is the comparison of neutralizing antibody levels postvaccination in young children with those in young adults in whom efficacy had been demonstrated. Descriptive efficacy analyses were also conducted for both Moderna and Pfizer-BioNTech COVID-19 vaccines during the period when the Omicron variant of SARS-CoV-2 (the virus that causes COVID-19) predominated. No specific safety concerns were identified among recipients of either vaccine. ACIP recommendations for the use of the Moderna COVID-19 vaccine and the Pfizer-BioNTech COVID-19 vaccine in children aged 6 months–5 years and 6 months–4 years, respectively, are interim and will be updated as additional information becomes available. Vaccination is important for protecting children aged 6 months–5 years against COVID-19.

The Moderna and Pfizer-BioNTech COVID-19 vaccines are lipid nanoparticle–formulated, nucleoside-modified mRNA vaccines encoding the prefusion spike glycoprotein of SARS-CoV-2. On January 31, 2022, FDA approved a Biologics License Application (BLA) for use of the Moderna COVID-19 vaccine (Spikevax, ModernaTX, Inc.) in persons aged ≥18 years, and the Moderna COVID-19 vaccine is also recommended under EUA for children and adolescents aged 6–17 years (*1*). On August 23, 2021, FDA approved a BLA for use of the Pfizer-BioNTech COVID-19 vaccine (Comirnaty, Pfizer, Inc.) in persons aged ≥16 years, and the Pfizer-BioNTech COVID-19 vaccine is also recommended under EUA for children and adolescents aged 5–15 years (*2*). Recommendations regarding products, dosing intervals, and booster doses and for persons who are moderately to severely immunocompromised, which differ from recommendations for persons without immunocompromising conditions, are available at https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html. As of June 17, 2022, among persons aged ≥18 years, 223 million doses of the Moderna COVID-19 vaccine have been administered in the United States, and among persons aged ≥5 years, 349 million doses of the Pfizer-BioNTech COVID-19 vaccine have been administered (*3*).

Since June 2020, ACIP has convened 28 public meetings to review data relevant to the epidemiology of COVID-19 and considerations for the use of COVID-19 vaccines, including the Moderna and Pfizer-BioNTech COVID-19 vaccines.† The ACIP COVID-19 Vaccines Work Group (Work Group), comprising experts in pediatrics, infectious diseases, vaccinology, vaccine safety, public health, and ethics, has held weekly meetings to review COVID-19 surveillance data; evidence for vaccine efficacy, postauthorization effectiveness, and safety; and implementation considerations for COVID-19 vaccines. To guide its deliberations regarding recommendations for use of these vaccines, ACIP used the Evidence to Recommendation (EtR) Framework§ and incorporated a Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach.¶ Within the EtR Framework, ACIP considered the importance of COVID-19 as a public health problem, as well as parents' values and preferences, acceptability, feasibility, resource use, and equity regarding use of mRNA COVID-19 vaccines among children aged 6 months–5 years. Consistent with the age groups for each

* On June 18, 2022, ACIP voted 12 to 0 (three members absent) in favor of the interim recommendation for the use of the Moderna COVID-19 vaccine for children aged 6 months–5 years. ACIP voted 12 to 0 (three members absent) in favor of the interim recommendation for the use of the Pfizer-BioNTech COVID-19 vaccine for children aged 6 months–4 years.

† https://www.cdc.gov/vaccines/acip/meetings/index.html

§ https://www.cdc.gov/vaccines/acip/recs/grade/downloads/acip-evidence-recs-framework.pdf

¶ https://www.cdc.gov/vaccines/acip/recs/grade/about-grade.html

vaccine included under EUA, ACIP also considered, within the EtR Framework, the benefits and harms of using each vaccine (i.e., the Moderna COVID-19 vaccine among children aged 6 months–5 years and the Pfizer-BioNTech COVID-19 vaccine among children aged 6 months–4 years), independently compared with no vaccine. After conducting systematic reviews of published and unpublished evidence for benefits and harms, the Work Group used the GRADE approach to independently assess the certainty of evidence for outcomes related to the Moderna and Pfizer-BioNTech COVID-19 vaccines, rated on a scale of type 1 (high certainty) to type 4 (very low certainty).** Work Group conclusions regarding evidence for the use of Moderna COVID-19 vaccine among children aged 6 months–5 years and Pfizer-BioNTech COVID-19 vaccine among children aged 6 months–4 years were presented to ACIP at a public meeting during June 17–18, 2022.

Summary of Evidence for Use of the Moderna COVID-19 Vaccine in Children Aged 6 Months–5 Years

The body of evidence regarding immunogenicity, efficacy, and safety of the Moderna COVID-19 vaccine among children aged 6 months–5 years was guided by one randomized, double-blind, placebo-controlled phase II/III clinical trial in which 6,388 participants aged 6 months–5 years were enrolled and randomized 3:1 to receive either 2 doses of vaccine (25 μg) or saline placebo, separated by an interval of 28 days (*4*). Interim findings from this clinical trial were based on data from participants with a median blinded follow-up after dose 2 of 68 days for children aged 6–23 months and 71 days for children aged 2–5 years. Vaccine efficacy against symptomatic, laboratory-confirmed COVID-19 was supported by two types of evidence: 1) direct efficacy of 2 doses against symptomatic COVID-19, and 2) immunobridging (i.e., comparing neutralizing antibody levels in one population [e.g., young children] with antibody levels in another population [e.g., young adults] with demonstrated efficacy). Vaccine efficacy ≥14 days after dose 2 was 37.8% (95% CI = 20.9%–51.1%) in preventing symptomatic, laboratory-confirmed COVID-19†† in children aged 6 months–5 years with or without evidence of previous SARS-CoV-2 infection.§§ This estimate was based on symptomatic illness in 181 vaccine recipients and 97 placebo recipients, none of whom were hospitalized. Vaccine efficacy against symptomatic COVID-19 was also inferred based on immunobridging criteria. The measure of immune response to 2 doses (25 μg each) of the Moderna COVID-19 vaccine in children aged 6–23 months and 2–5 years without evidence of previous SARS-CoV-2 infection was at least as high as the response observed in young adults aged 18–25 years after 2 doses (100 μg each) of the Moderna COVID-19 vaccine, with a geometric mean ratio (GMR) for 50% neutralizing antibody titer of 1.28 (95% CI = 1.12–1.47) for children aged 6–23 months and 1.01 (95% CI = 0.88–1.17) for children aged 2–5 years, satisfying the noninferiority criteria¶¶ for both age groups. In addition, vaccine efficacy against asymptomatic, laboratory-confirmed SARS-CoV-2 infection*** was 16.0% (95% CI = –18.5%–40.5%) among children aged 6 months–5 years with or without evidence of previous SARS-CoV-2 infection, based on asymptomatic infection in 111 vaccine recipients and 44 placebo recipients.

Among vaccine recipients aged 6 months–5 years, reactogenicity, defined as solicited local and systemic adverse reactions during the 7 days after vaccination, were reported frequently. After dose 2, 66.1% of caregivers reported any local reaction among the child vaccine recipients after vaccination, and 65.9% reported any systemic reaction; most reactions were mild to moderate with symptom onset 1–2 days after vaccination and resolving after 2–3 days. Reactogenicity was usually less frequent in children aged 6 months–5 years than in those aged 6–11 years. Among children aged 6 months–5 years, severe local and systemic adverse reactions (grade 3 or higher, defined as interfering with daily activity) occurred in 7.7% of vaccine recipients, more commonly after dose 2, and in 4.1% of placebo recipients. The most common grade 3 or higher local symptom reported by vaccine recipients after dose 2 was pain at the injection site (0.4%). The most commonly reported reactions of grade 3 or higher after dose 2 were fever (2.6%) and irritability or crying (1.2%) among vaccine recipients aged 6–36 months and fever (3.1%) and fatigue (2.3%) among those aged 37 months–5 years. Serious adverse events††† were

** https://www.cdc.gov/vaccines/acip/recs/grade

†† In the Moderna COVID-19 vaccine clinical trial, symptomatic, laboratory-confirmed COVID-19 was defined based on the CDC case definition, which required at least one clinical symptom (fever ≥100.4°F [≥38°C], chills, fatigue, headache, myalgia, nasal congestion or rhinorrhea, new loss of taste or smell, sore throat, abdominal pain, diarrhea, nausea or vomiting, poor appetite or poor feeding, cough, or shortness of breath or difficulty breathing), and a positive COVID-19 test result using reverse transcription–PCR (RT-PCR).

§§ In the Moderna COVID-19 vaccine clinical trial, approximately 10% of children aged 6 months–5 years were seropositive, indicating previous SARS-CoV-2 infection, at baseline.

¶¶ Noninferiority is declared if the lower bound of the 2-sided 95% CI for the GMR is >0.67 and the point estimate of GMR is ≥0.8.

*** In the Moderna COVID-19 vaccine clinical trial, asymptomatic SARS-CoV-2 infection was identified by absence of symptoms and at least one of the following conditions: 1) binding antibody level against SARS-CoV-2 nucleocapsid protein negative at baseline (or day 1) that became positive post-baseline (testing performed only on the immunogenicity subset [494]), or 2) a positive COVID-19 test result using RT-PCR post-baseline at a scheduled (29 days after dose 2) or unscheduled visit.

††† Serious adverse event is defined as any untoward medical occurrence that results in death, is life threatening, requires inpatient hospitalization or prolongation of existing hospitalization, results in persistent disability or incapacity, or is a congenital anomaly or birth defect. Serious adverse events occurring after dose 1 or dose 2 were reported.

uncommon and occurred with similar frequency among vaccine (0.5%) and placebo (0.2%) recipients, with no statistically significant difference in frequency. Two serious adverse events in one participant were determined to be potentially related to vaccination.[§§§] No specific safety concerns were identified among vaccine recipients aged 6 months–5 years. A detailed summary of safety data, including information on reactogenicity, is available at https://www.cdc.gov/vaccines/covid-19/info-by-product/moderna/reactogenicity.html.

From the GRADE evidence assessment, the level of certainty for the benefits of Moderna COVID-19 vaccination among children aged 6 months–5 years was type 1 (high certainty) for the prevention of symptomatic laboratory-confirmed COVID-19 assessed using direct efficacy and type 2 (moderate certainty) assessed using immunobridging, because of serious concerns for indirectness, because immunogenicity is a surrogate measure of efficacy. The level of certainty for prevention of asymptomatic SARS-CoV-2 infection was type 3 (low certainty) because of serious concerns of indirectness, because serial SARS-CoV-2 polymerase chain reaction (PCR) testing was not performed, and serology was only performed for a subset of participants[¶¶¶]; serious concerns of imprecision were also noted because of the width of the 95% CI. Regarding potential harms after vaccination, evidence was type 4 (very low certainty) for serious adverse events because of short follow-up time (median = 68 and 71 days after dose 2 for children aged 6–23 months and 2–5 years, respectively), study size, and the width of the 95% CI. Evidence was type 1 (high certainty) for reactogenicity. No data were available to assess the other GRADE benefits, including prevention of COVID-19–associated hospitalization or multisystem inflammatory syndrome in children (MIS-C).

Summary of Evidence for Use of the Pfizer-BioNTech COVID-19 Vaccine in Children Aged 6 Months–4 Years

The body of evidence regarding immunogenicity, efficacy, and safety of the Pfizer-BioNTech COVID-19 vaccine among children aged 6 months–4 years was composed of data from one randomized, double-blind, placebo-controlled phase II/III clinical trial in which 4,526 participants aged 6 months–4 years were enrolled and randomized 2:1 to receive either vaccine or saline placebo (*5*). The protocol initially specified 2 doses of vaccine (3 μg) or saline placebo separated by an interval of 3 weeks. Per protocol, participants were unblinded 6 months after dose 2 or at age 5 years (whichever occurred first). Based on an interim analysis where the predefined criteria for immunobridging and efficacy of the trial were not met after 2 doses, a protocol amendment was implemented on February 1, 2022, to include a third dose of either vaccine (3 μg) or saline placebo, administered ≥56 days after dose 2. Dose 3 was offered to blinded and unblinded participants in the vaccine arm, and blinded participants in the placebo arm were offered a third dose of placebo. Among trial participants, 1,456 (32.2%) received a blinded third dose and were included in a 3-dose efficacy analysis (992 in the vaccine arm and 464 in the placebo arm). The median interval between doses 2 and 3 was 16 weeks among children aged 6–23 months and 11 weeks among children aged 2–4 years. Safety analyses included blinded participants and assessed outcomes starting at dose 1. Interim findings from this clinical trial were based on data from participants with a median blinded follow-up of 35 days after dose 3 for children aged 6–23 months and 40 days for children aged 2–4 years.

Vaccine efficacy was supported by two types of evidence: 1) direct efficacy of 3 doses against symptomatic laboratory-confirmed COVID-19[****] and 2) immunobridging data. Vaccine efficacy ≥7 days after dose 3 was 80.0% (95% CI = 22.8%–94.8%)[††††] in preventing symptomatic, laboratory-confirmed COVID-19 in children aged 6 months–4 years with and without evidence of previous SARS-CoV-2 infection,[§§§§] based on infection in three vaccine recipients and seven placebo recipients, none of whom were hospitalized. In the immunobridging analysis, the measure of immune response to 3 doses (3 μg each) of the Pfizer-BioNTech COVID-19 vaccine in children aged 6 months–4 years without evidence of previous SARS-CoV-2 infection was at least as high as the response observed in persons aged 16–25 years who had received 2 doses (30 μg each) of the Pfizer-BioNTech COVID-19 vaccine, with a GMR for 50% neutralizing

[§§§] One recipient in the Moderna COVID-19 vaccine clinical trial experienced two serious adverse events (i.e., fever and febrile seizure) that the investigator and FDA determined to be potentially related to the vaccine.

[¶¶¶] The definition of asymptomatic SARS-CoV-2 infection specified for GRADE: SARS-CoV-2 infection with no reported symptoms identified through 1) serial RT-PCR testing, or 2) testing of binding antibody level against SARS-CoV-2 nucleocapsid protein, on the entire cohort or a representative sample.

[****] In the Pfizer-BioNTech COVID-19 vaccine clinical trial, symptomatic laboratory-confirmed COVID-19 was defined based on the CDC case definition, which required at least one clinical symptom (fever, new or increased cough, new or increased shortness of breath, chills, new or increased muscle pain, new loss of taste or smell, sore throat, diarrhea, vomiting, and inability to eat or poor feeding), and a positive SARS-CoV-2 nucleic acid amplification test result within 4 days of the symptomatic period.

[††††] For GRADE, relative risks (RR) were calculated from numerators and denominators available in the body of evidence. Vaccine efficacy estimates were defined as 100% x (1–RR). Manufacturer vaccine efficacy estimates were calculated using incident rate ratios. Based on the Pfizer-BioNTech COVID-19 vaccine clinical trial analysis, the vaccine efficacy against symptomatic SARS-CoV-2 infection was 80.3% (95% CI = 13.9%–96.7%).

[§§§§] In the Pfizer-BioNTech COVID-19 vaccine clinical trial, approximately 30% of children aged 6 months–4 years were seropositive, indicating a previous SARS-CoV-2 infection, before dose 3.

antibody titer of 1.19 (95% CI = 1.00–1.43) for children aged 6–23 months and 1.30 (95% CI = 1.13–1.50) for children aged 2–4 years, satisfying the noninferiority criteria[¶¶¶¶] for both age groups.

Among vaccine recipients aged 6 months–4 years, reactogenicity, defined as solicited local injection site or systemic signs or symptoms during the 7 days after vaccination, were common (47.8% reported any local reaction, and 63.8% reported any systemic reaction); most reactions were mild to moderate. Local and systemic reactogenicity symptoms were usually less frequent in children aged 6 months–4 years (63.8%) than in children aged 5–11 years (86.2%) (*6*). Severe local and systemic adverse reactions (grade 3 or higher, defined as interfering with daily activity) occurred in 4.3% and 3.6% of vaccine recipients and placebo recipients, respectively. The most commonly reported reactions of grade 3 or higher among vaccine recipients aged 6–23 months were fever (4.0%) and irritability (1.3%), and among recipients aged 2–4 years, were fatigue (0.8%) and fever (2.2%). Overall, reactions of grade 3 or higher were also more commonly reported after the second dose than after the first or third dose. Serious adverse events[*****] were uncommon and occurred with similar frequency among recipients of vaccine (1.0%) and placebo (1.5%), with no statistically significant difference in frequency. Two serious adverse events in one participant in the vaccinated group were determined to be potentially related to vaccination.[†††††] No specific safety concerns were identified among vaccine recipients aged 6 months–4 years. A detailed summary of safety data, including information on reactogenicity, is available at https://www.cdc.gov/vaccines/covid-19/info-by-product/pfizer/reactogenicity.html.

From the GRADE evidence assessment, the level of certainty for the benefits of Pfizer-BioNTech COVID-19 vaccination among children aged 6 months–4 years was type 4 (very low certainty) for the prevention of symptomatic laboratory-confirmed COVID-19 assessed using direct efficacy because of serious concern about the short duration of follow-up (median = 35 and 40 days for children aged 6–23 months and 2–4 years, respectively) and very serious concerns about imprecision because of case accrual and study size. For the prevention of symptomatic, laboratory-confirmed COVID-19 assessed using immunobridging, the evidence was type 2 (moderate certainty) because of serious concerns for indirectness, because immunogenicity is a surrogate measure of efficacy. Regarding potential harms after vaccination, the evidence was type 4 (very low certainty) for serious adverse events because of very serious concerns for indirectness because of the short duration of follow-up of 1 month after dose 3 and because only 31% of trial participants received dose 3, limiting the ability to detect serious adverse events that might occur at a higher rate after dose 3, and serious concern of imprecision because of the study size. For reactogenicity, the evidence was type 2 (moderate certainty) because of serious concern for indirectness, as only 31% of trial participants received dose 3, limiting the ability to detect severe reactogenicity that might occur specifically after dose 3. No data were available to assess the other GRADE benefits, specifically prevention of COVID-19–associated hospitalization, MIS-C, or asymptomatic SARS-CoV-2 infection.

[¶¶¶¶] Noninferiority is declared if the lower bound of the 2-sided 95% CI for the GMR >0.67 and the point estimate of GMR is ≥0.8.

[*****] Serious adverse event is defined as any untoward medical occurrence that results in death, is life threatening, requires inpatient hospitalization or prolongation of existing hospitalization, results in persistent disability or incapacity, or is a congenital anomaly or birth defect. Serious adverse events occurring after dose 1, dose 2, or dose 3 were reported.

[†††††] One recipient in the Pfizer-BioNTech COVID-19 vaccine clinical trial had two serious adverse events (i.e., fever and pain in extremity requiring hospitalization) that the investigator and FDA determined to be potentially related to the vaccine. FDA noted that the events were also consistent with viral myositis.

Recommendations for the Use of the Moderna COVID-19 Vaccine in Children Aged 6 Months–5 Years and the Pfizer-BioNTech COVID-19 Vaccine in Children Aged 6 Months–4 Years

Data reviewed with the EtR Framework supported the use of COVID-19 vaccine in children aged 6 months–5 years. COVID-19 is a major public health problem among young children. As of June 12, 2022, approximately 2 million COVID-19 cases, 20,000 hospitalizations, and 200 deaths from COVID-19 have been reported among U.S. children aged 6 months–4 years (*7*,*8*). The SARS-CoV-2 Omicron variant emerged in the United States in December 2021 and led to the highest COVID-19 incidence, rates of COVID-19–associated emergency department visits and COVID-19–associated hospitalization among children aged 6 months–4 years yet seen during the pandemic (*9*). Approximately one half (51%–54%) of children aged 6 months–4 years with a COVID-19–associated hospitalization had no underlying health conditions, highlighting the risk for severe COVID-19 even among young children without underlying health conditions (*9*). During the period of Omicron predominance, illness among children aged 6 months–4 years with COVID-19–associated hospitalizations was as severe or more severe than that among children and adolescents aged 5–17 years, who were eligible for COVID-19 vaccination during that period (*9*). Furthermore, COVID-19 hospitalization rates among children aged 6 months–4 years during October 2021–April 2022 were as high or higher than were influenza-associated hospitalization rates during the 2017–18, 2018–19, and 2019–20 influenza seasons (*10*).

SARS-CoV-2 can also lead to complications after acute infection. MIS-C is a severe illness in persons aged <21 years that occurs 2–6 weeks after SARS-CoV-2 infection and is characterized by fever, multisystem organ involvement, and laboratory evidence of inflammation (*11*). As of May 31, 2022, CDC has received 8,525 reports of cases of MIS-C in the United States, including 69 deaths (*12*); children aged 6 months–4 years account for 1,990 (23%) of these cases and 9 (13%) of the deaths among MIS-C cases (*9*). Post–COVID-19 conditions, which include a range of new, returning, or ongoing, health problems occurring ≥4 weeks after acute SARS-CoV-2 infection, also occur in children, including those aged <5 years (*13*–*15*). However, evidence regarding the prevalence and spectrum of these conditions in children, especially young children, is limited by the inability of younger children to verbalize symptoms, few studies that include children, lack of appropriate control groups, and because symptoms similar to those seen in post–COVID-19 conditions are frequently reported among children without known SARS-CoV-2 infection (*13*,*14*,*16*).

The pandemic has also had additional indirect effects on children and families, including missed routine childhood immunizations and health care visits; worsening of children's social, emotional, and mental well-being; and disruptions in early child care and education programs (*17*–*19*). In a survey conducted during July 15–August 2, 2021, 39% of parents reported that an adult in their household either left a job or changed work schedules to care for children during the past year; parents of a child aged <5 years, Black and African American parents, Hispanic or Latino parents, and parents with an annual household income of <$40,000 were most likely to report household job disruptions (*20*). COVID-19 vaccination in this age group may provide parents with increased confidence to return to prepandemic activities, improving social interactions in young children.

Implementation of these recommendations will require educating vaccine providers about the correct age-appropriate product (Table 1) and vaccination schedule (Table 2) for each vaccine, to avoid vaccine administration errors. ACIP determined that use of the Moderna and Pfizer-BioNTech COVID-19 vaccines among children is a reasonable and efficient allocation of resources. To expand COVID-19 vaccine access, additional considerations should be given to demographic groups that have experienced disproportionate COVID-19 morbidity and mortality, as well as those with barriers to routine health care (e.g., members of certain racial and ethnic groups and those living in a rural area, experiencing homelessness, or lacking health insurance). Children from racial and ethnic minority groups have experienced a disproportionately high incidence of COVID-19, associated hospitalization, and MIS-C (*7*,*12*,*21*). Pediatricians and health care providers remain the most trusted source among parents for information about COVID-19 vaccines for children (*22*). Based on the National Immunization Survey-Child COVID Module interviews conducted in May 2022, 33.5% of parents said they would definitely vaccinate their child aged 6 months–4 years for COVID-19, once eligible, and 19.6% said they would probably vaccinate their child aged 6 months–4 years (*7*). Thus, pediatricians and other primary care providers who care for children will be critical to increasing COVID-19 vaccine confidence among parents and coverage with COVID-19 vaccine among young children.

ACIP reviewed the balance of known and potential benefits and risks regarding the use of the Moderna COVID-19 vaccine in children aged 6 months–5 years and Pfizer-BioNTech COVID-19 vaccine in children aged 6 months–4 years, each compared with no vaccine. Both vaccines demonstrated ability to prevent COVID-19 and met noninferiority criteria based on immunobridging data. Although both the Moderna and Pfizer-BioNTech COVID-19 vaccine trials were conducted when Omicron was the predominant circulating SARS-CoV-2 variant, case accrual after the final dose occurred in different months, resulting in differences in COVID-19 incidence across the trials. Thus, efficacy estimates cannot be directly compared between these two vaccines. Moreover, vaccine efficacy from these trials should be interpreted in the context of what is known about vaccine effectiveness against Omicron infection. Postauthorization observational studies in persons aged ≥5 years have demonstrated that the vaccine effectiveness against Omicron infection is lower than that observed against earlier SARS-CoV-2 variants (*23*,*24*). However, postauthorization observational data also indicate that mRNA vaccine effectiveness is higher, even during Omicron predominance, against hospitalization (68% a median of 37 days after the second dose in children aged 5–11 years) than against infection (40% during the 2 months after the second dose in children aged 5–11 years) (*25*). Importantly, during Omicron predominance, mRNA vaccine effectiveness against MIS-C remained high (78%) among children aged 5–11 years (*25*). The clinical trials were not powered to detect efficacy against severe disease in young children, but similar patterns are expected in this age group to what has been observed in persons aged ≥5 years.

ACIP also considered evidence from known and potential harms from COVID-19 vaccines. Myocarditis and pericarditis are rare adverse events that have been reported after receipt of mRNA COVID-19 vaccines (*26*,*27*). Among vaccine recipients aged ≥5 years, the observed risk for myocarditis is highest among males aged 12–39 years (*26*,*28*,*29*). Cases of myocarditis among children aged 5–11 years after Pfizer-BioNTech COVID-19 vaccination have been rarely reported, primarily in boys and after dose 2 (*28*,*29*). To date, monitoring in CDC's

TABLE 1. COVID-19 vaccines approved or authorized by the Food and Drug Administration for children aged 6 months–17 years — United States, June 2022

Vaccine manufacturer	Age group at vaccination	Vial cap color	Label border color	Concentration of mRNA per primary dose	Injection volume per primary dose	Diluent volume	Primary doses per vial
Moderna	6 mos–5 yrs	Dark blue	Magenta	25 μg	0.25 mL	None	10
	6–11 yrs	Dark blue	Purple*	50 μg	0.5 mL	None	5
	6–11 yrs	Dark blue	Teal*	50 μg	0.5 mL	None	5
	12–17 yrs	Red	Light blue	100 μg	0.5 mL	None	10–11
Pfizer-BioNTech	6 mos–4 yrs	Maroon	Maroon	3 μg	0.2 mL	2.2 mL	10†
	5–11 yrs	Orange	Orange	10 μg	0.2 mL	1.3 mL	10†
	12–17 yrs	Gray	Gray	30 μg	0.3 mL	None	6

Abbreviation: FDA = Food and Drug Administration.

* Moderna COVID-19 vaccine supplied in a vial with a dark blue cap and a label with a teal border stating "Age 6y through 11y" is currently not available. Moderna COVID-19 vaccine supplied in a vial with a dark blue cap and a label with a purple border stating "BOOSTER DOSES ONLY" is FDA-authorized for use in children aged 6–11 years to provide primary series doses.

† After dilution with 0.9% sodium chloride (normal saline, preservative-free).

Vaccine Safety Datalink have not detected an increased risk for myocarditis and pericarditis in children aged 5–11 years (*29*). No cases of myocarditis occurred among 7,804 children aged 6 months–5 years in the Moderna and Pfizer-BioNTech COVID-19 vaccine clinical trials who received an mRNA vaccine and had ≥7 days of follow-up, although the trials were not adequately powered to detect rare adverse events. Postauthorization safety monitoring, including monitoring for myocarditis and pericarditis after mRNA COVID-19 vaccination, is conducted through multiple national safety surveillance systems.

ACIP determined that the benefits of COVID-19 vaccination outweigh the known and potential risks, even in the setting of high seroprevalence among young children; by April 2022, in a national sample of children aged 6 months–4 years, 71% had infection-induced SARS-CoV-2 antibodies (*9*). Past infection with SARS-CoV-2 provides some protection against reinfection, but the immune response to infection can vary, especially by disease severity, and might not provide broad protection against all SARS-CoV-2 variants (*30*). The Omicron-wave surges of pediatric COVID-19 hospitalizations occurred even in the setting of high seroprevalence, suggesting this alone is not sufficient to provide broad population-level protection. Vaccination in previously infected persons enhances protection against reinfection (*30*–*32*) and COVID-19–associated hospitalization, including infections and hospitalizations due to the Omicron variant (*32*,*33*). No concerns have been identified in postauthorization safety surveillance associated with vaccination of seropositive persons aged ≥5 years. After assessing the balance of benefits and risks for COVID-19 vaccination, ACIP made an interim recommendation for vaccination with the Moderna COVID-19 vaccine for children aged 6 months–5 years as a 2-dose primary series as authorized under the EUA and an interim recommendation for vaccination with the Pfizer-BioNTech COVID-19 vaccine for children aged 6 months–4 years as a 3-dose primary series as authorized under the EUA. ACIP does not state a product preference between the two recommended vaccines for children aged 6 months–5 years; children may receive any ACIP-recommended COVID-19 vaccine and are encouraged to receive the earliest vaccine available to them. Once a primary series is started, the same mRNA vaccine product should be used for all doses in the series.

The GRADE evidence profiles, which provide details on the identification and assessment of relevant evidence, are available for the Moderna COVID-19 vaccine at https://ww(((0.5 (CO)23.9 6TJ I

TABLE 2. Interim COVID-19 immunization schedule for children aged 6 months–17 years — United States, June 2022

Vaccine manufacturer*	Age group at vaccination	Immunocompromise status: Not moderately or severely immunocompromised† — Primary series§	Not moderately or severely immunocompromised† — Booster dose	Moderately or severely immunocompromised† — Primary series	Moderately or severely immunocompromised† — Booster doses
Moderna	6 mos–5 yrs	2 doses 4–8 weeks between doses 1 and 2	Not authorized	3 doses 4 weeks between doses 1 and 2; ≥4 weeks between doses 2 and 3	Not authorized
	6–11 yrs	2 doses 4–8 weeks between doses 1 and 2	Not authorized	3 doses 4 weeks between doses 1 and 2; ≥4 weeks between doses 2 and 3	Not authorized
	12–17 yrs	2 doses 4–8 weeks between doses 1 and 2	Not authorized	3 doses 4 weeks between doses 1 and 2; ≥4 weeks between doses 2 and 3	Not authorized
Pfizer-BioNTech	6 mos–4 yrs	3 doses 3–8 weeks between doses 1 and 2; ≥8 weeks between doses 2 and 3	Not authorized	3 doses 3 weeks between doses 1 and 2; ≥8 weeks between doses 2 and 3	Not authorized
	5–11 yrs	2 doses 3–8 weeks between doses 1 and 2	≥5 mos after primary series	3 doses 3 weeks between doses 1 and 2; ≥4 weeks between doses 2 and 3	≥3 mos after primary series
	12–17 yrs	2 doses 3–8 weeks between doses 1 and 2	≥5 mos after primary series	3 doses 3 weeks between doses 1 and 2; ≥4 weeks between doses 2 and 3	2 booster doses First: ≥3 mos after primary series Second: ≥4 mos after first booster

Abbreviation: FDA = Food and Drug Administration.

* More information on product and dosage is available at https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html.

† https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#immunocompromised

§ mRNA COVID-19 vaccines are FDA-approved or FDA-authorized for a 3-week (Pfizer-BioNTech vaccine) or 4-week (Moderna vaccine) interval between the first and second dose. CDC recommends that an 8-week interval might be optimal for some persons aged 6 months–64 years, especially for males aged 12–39 years because it might reduce the small risk of myocarditis or pericarditis associated with mRNA COVID-19 vaccines. A shorter interval (3 weeks for Pfizer-BioNTech and 4 weeks for Moderna) between the first and second doses remains the recommended interval for persons who are moderately or severely immunocompromised, adults aged ≥65 years, and those in situations in which there is increased concern about COVID-19 community levels or a person's higher risk for severe disease.

Reporting of Vaccine Adverse Events

FDA requires that vaccination providers report vaccination administration errors, serious adverse events, multisystem inflammatory syndrome cases, and COVID-19 cases that result in hospitalization or death after administration of COVID-19 vaccine under an EUA. Adverse events that occur after receipt of any COVID-19 vaccine should be reported to the Vaccine Adverse Events Reporting System (VAERS). Information on how to submit a report to VAERS is available at https://vaers.hhs.gov/index.html or 1-800-822-7967. Any person who administers or receives a COVID-19 vaccine (or their parent or guardian) is encouraged to report any clinically significant adverse event, whether it is clear that a vaccine caused the adverse event. In addition, CDC has developed a voluntary smartphone-based online tool (v-safe) that uses text messaging and online surveys to provide near real-time health check-ins after receipt of a COVID-19 vaccine. Parents or guardians can register their children in v-safe and complete

Summary

What is already known about this topic?

On June 17, 2022, the Food and Drug Administration granted Emergency Use Authorization for the Moderna and Pfizer-BioNTech COVID-19 vaccines for children aged 6 months–5 years and 6 months–4 years, respectively.

What is added by this report?

On June 18, 2022, the Advisory Committee on Immunization Practices (ACIP) issued interim recommendations for the use of the Moderna COVID-19 vaccine for children aged 6 months–5 years and for the Pfizer-BioNTech COVID-19 vaccine for children aged 6 months–4 years in the United States for prevention of COVID-19. ACIP determined that the benefits of vaccination outweigh risks for this population.

What are the implications for public health practice?

Vaccination is important for protecting children aged 6 months–5 years against COVID-19.

the health surveys on their behalf. CDC's v-safe call center follows up on reports to v-safe that include possible medically significant health events to collect additional information for completion of a VAERS report. Information about v-safe is available at https://www.cdc.gov/vsafe.

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