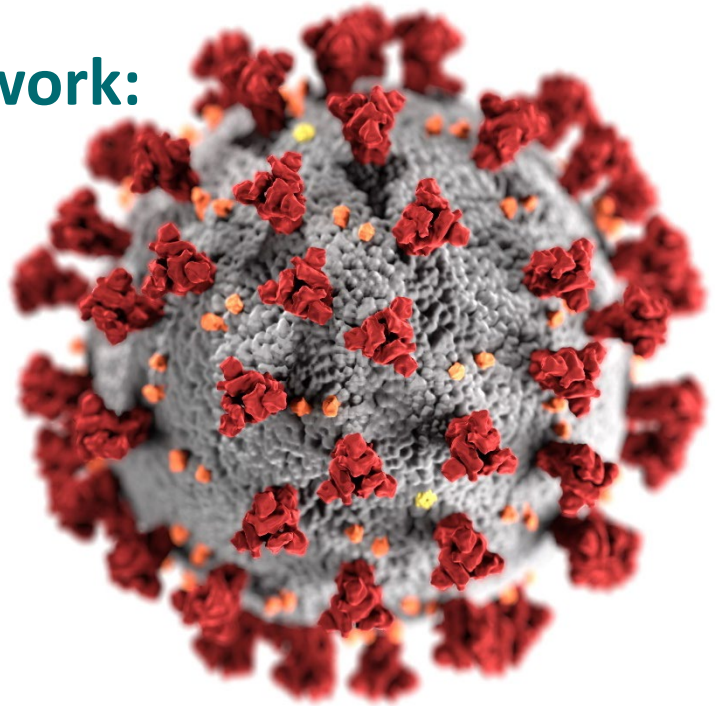
Evidence to Recommendation Framework:

Moderna COVID-19 vaccine in children ages 6 – 11 years and adolescents ages 12 – 17 years



Sara Oliver, MD, MSPH

ACIP Meeting

June 23, 2022

cdc.gov/coronavirus

Evidence to Recommendations Framework

Evidence to Recommendations (EtR) Framework

- Structure to describe information considered in moving from evidence to ACIP vaccine **recommendations**
- Provide **transparency** around the impact of additional factors on deliberations when considering a recommendation

Evidence to Recommendations (EtR) Framework

Policy Questions

- Should vaccination with Moderna COVID-19 vaccine (2-doses, **50 mcg**, IM) be recommended for **children ages 6 – 11 years**, under an Emergency Use Authorization?

- Should vaccination with Moderna COVID-19 vaccine (2-doses, **100 mcg**, IM) be recommended for **adolescents ages 12 – 17 years**, under an Emergency Use Authorization?

Evidence to Recommendations (EtR) Framework:
PICO Question

Population	People ages 6 – 17 years
Intervention	Moderna COVID-19 vaccine mRNA-1273
Comparison	No vaccine
Outcomes	Symptomatic laboratory confirmed COVID-19 Hospitalization due to COVID-19 Multisystem inflammatory syndrome in children (MIS-C) SARS-CoV-2 seroconversion to a non-spike protein Asymptomatic SARS-CoV-2 infection Serious adverse events Reactogenicity grade ≥3

Evidence to Recommendations (EtR) Framework

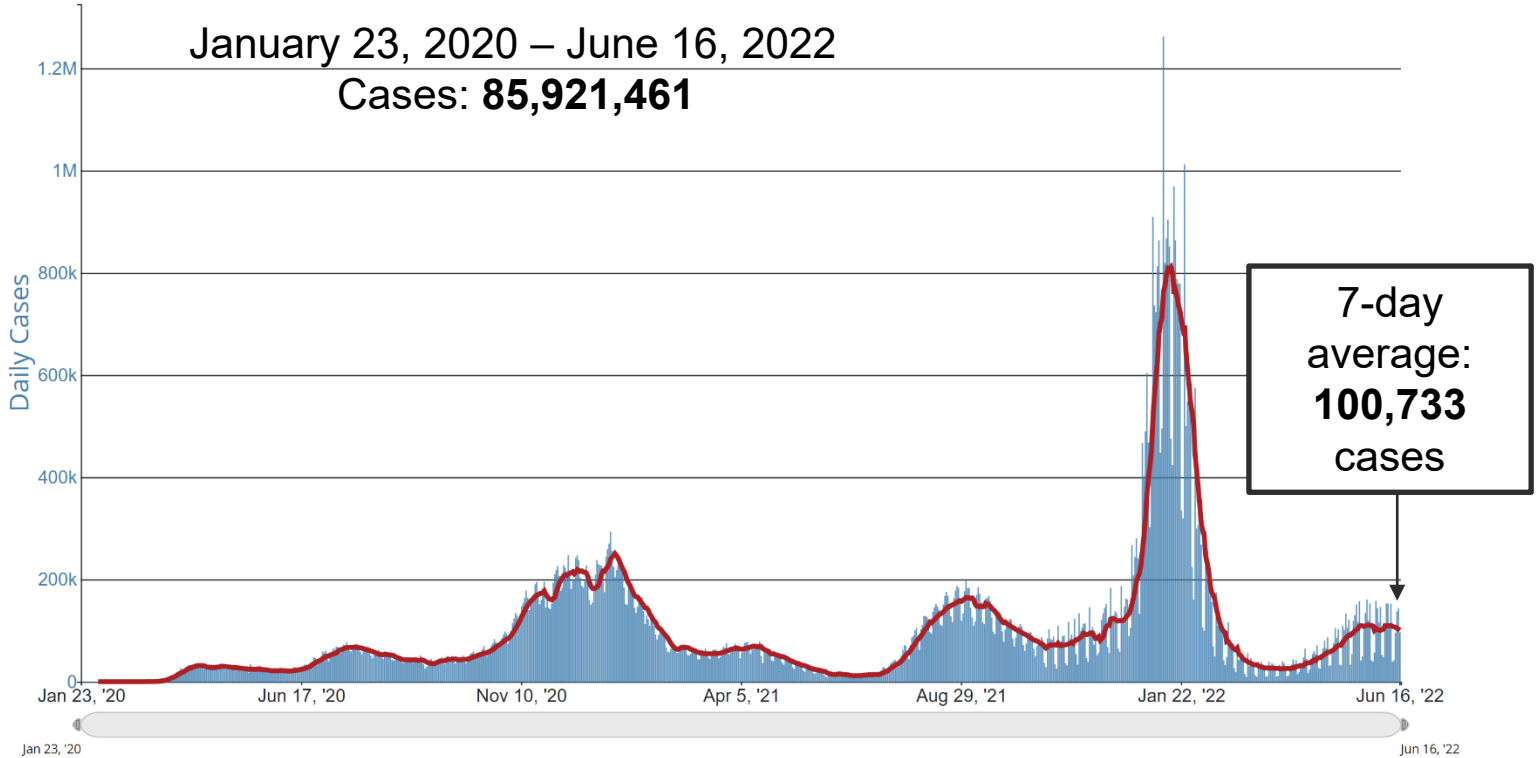
EtR Domain	Question(s)
Public Health Problem	• Is the problem of public health importance?
Benefits and Harms	• How substantial are the desirable anticipated effects? • How substantial are the undesirable anticipated effects? • Do the desirable effects outweigh the undesirable effects?
Values	• Does the target population feel the desirable effects are large relative to the undesirable effects? • Is there important variability in how patients value the outcome?
Acceptability	• Is the intervention acceptable to key stakeholders?
Feasibility	• Is the intervention feasible to implement?
Resource Use	• Is the intervention a reasonable and efficient allocation of resources?
Equity	• What would be the impact of the intervention on health equity?

"The intervention" = Moderna COVID-19 vaccine, given to persons ages 6 – 17 years

"The problem" = COVID-19 among persons ages 6 – 17 years

EtR Domain: Public Health Problem

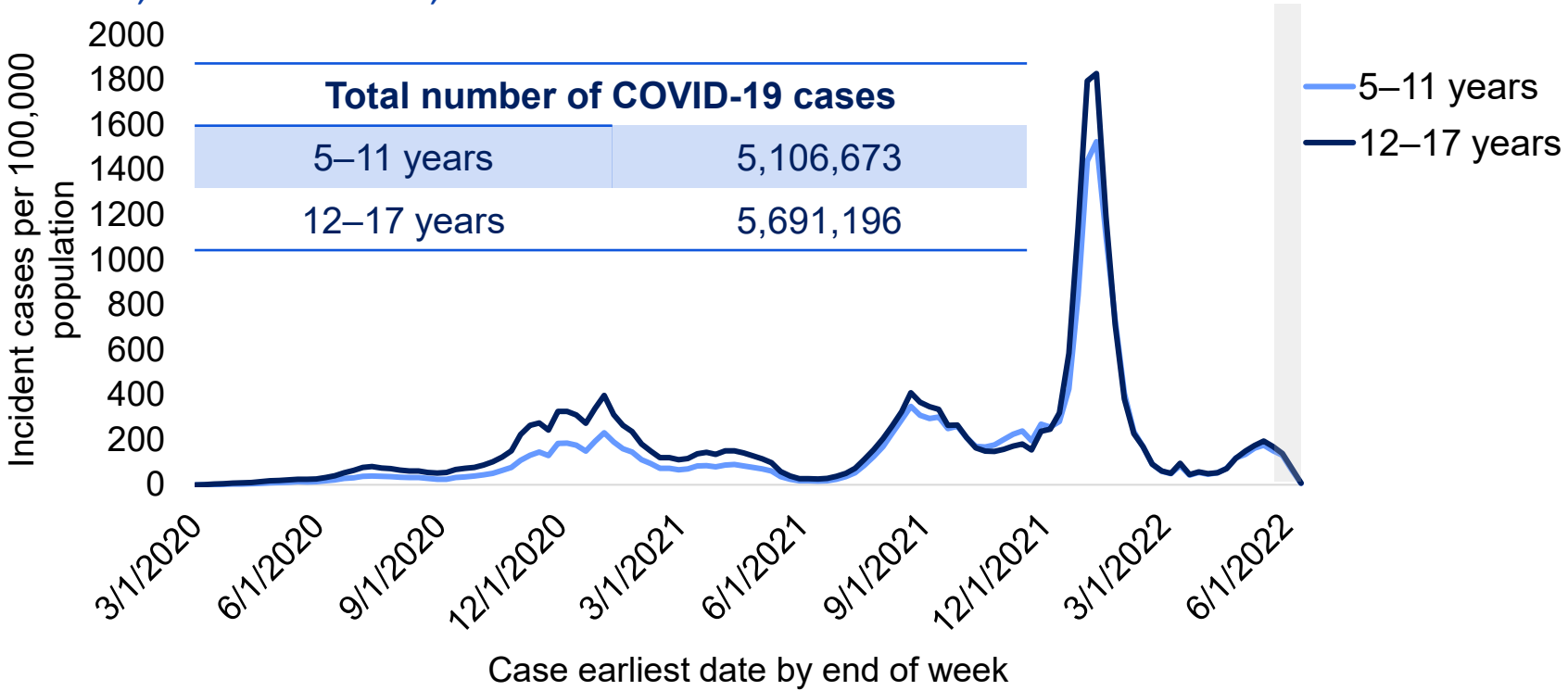
Trends in number of COVID-19 cases in the United States among persons of all ages



Source: COVID Data Tracker, https://covid.cdc.gov/covid-data-tracker/#trends_dailytrendscases. Accessed 6/21/2022

COVID-19 weekly cases per 100,000 population among children ages 5 – 17 years by age group – United States

March 1, 2020 – June 12, 2022



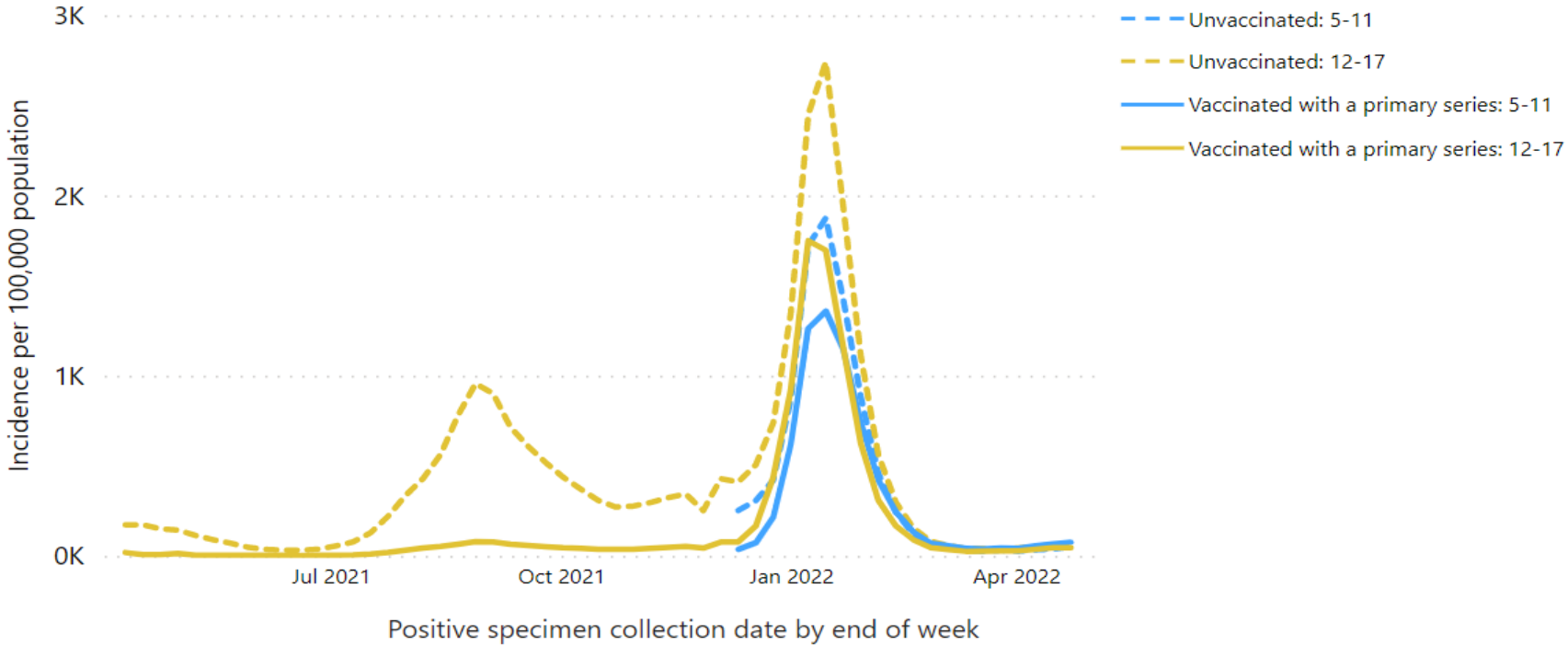
Total number of COVID-19 cases	
5–11 years	5,106,673
12–17 years	5,691,196

Reporting may be incomplete for the most recent two weeks of data, denoted by the grey box.

Source: COVID Data Tracker, https://covid.cdc.gov/covid-data-tracker/#demographicsovertime. Accessed 6/16/2022

Rates of COVID-19 cases by vaccination status and age group

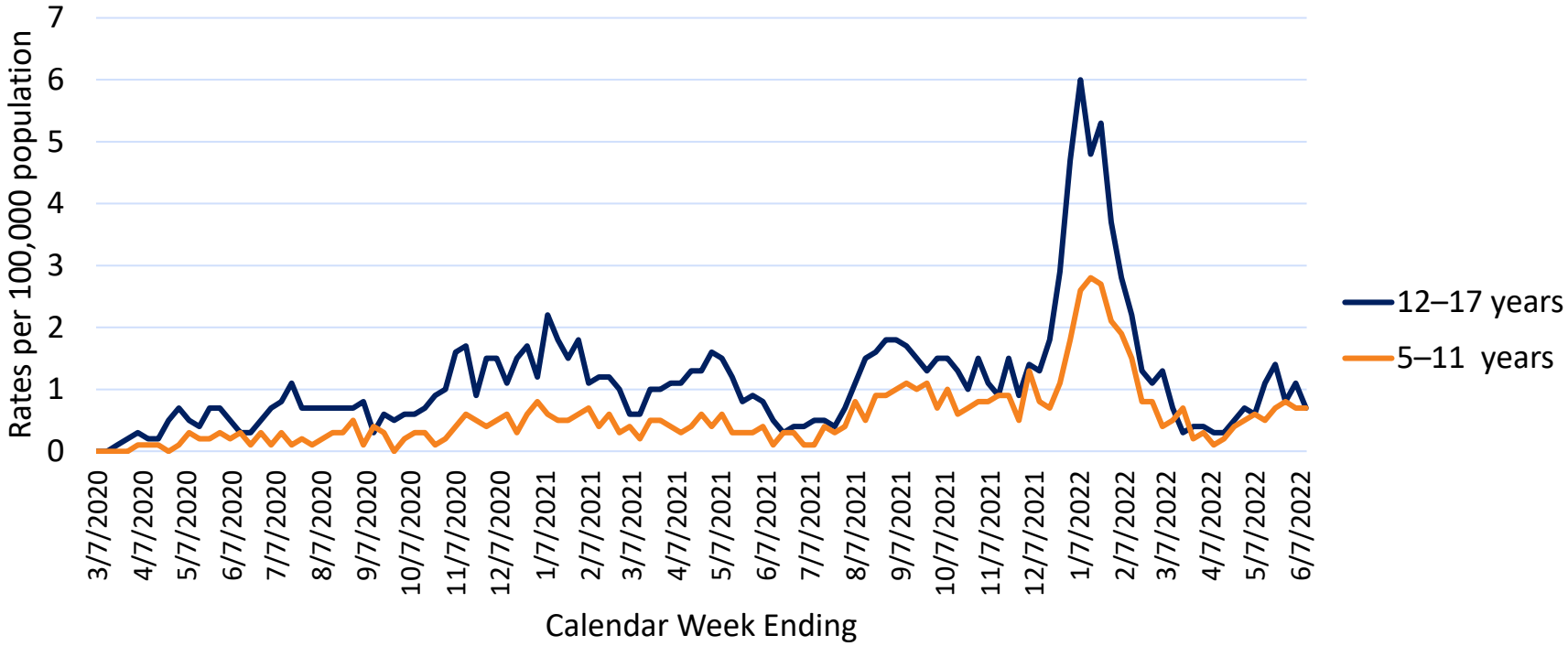
April 04, 2021 – April 23, 2022 (31 U.S. Jurisdictions)



CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#rates-by-vaccine-status Accessed May 20, 2022

Weekly COVID-19-associated hospitalization rates for children ages 5 – 11 and adolescents ages 12 – 17 years, COVID-NET

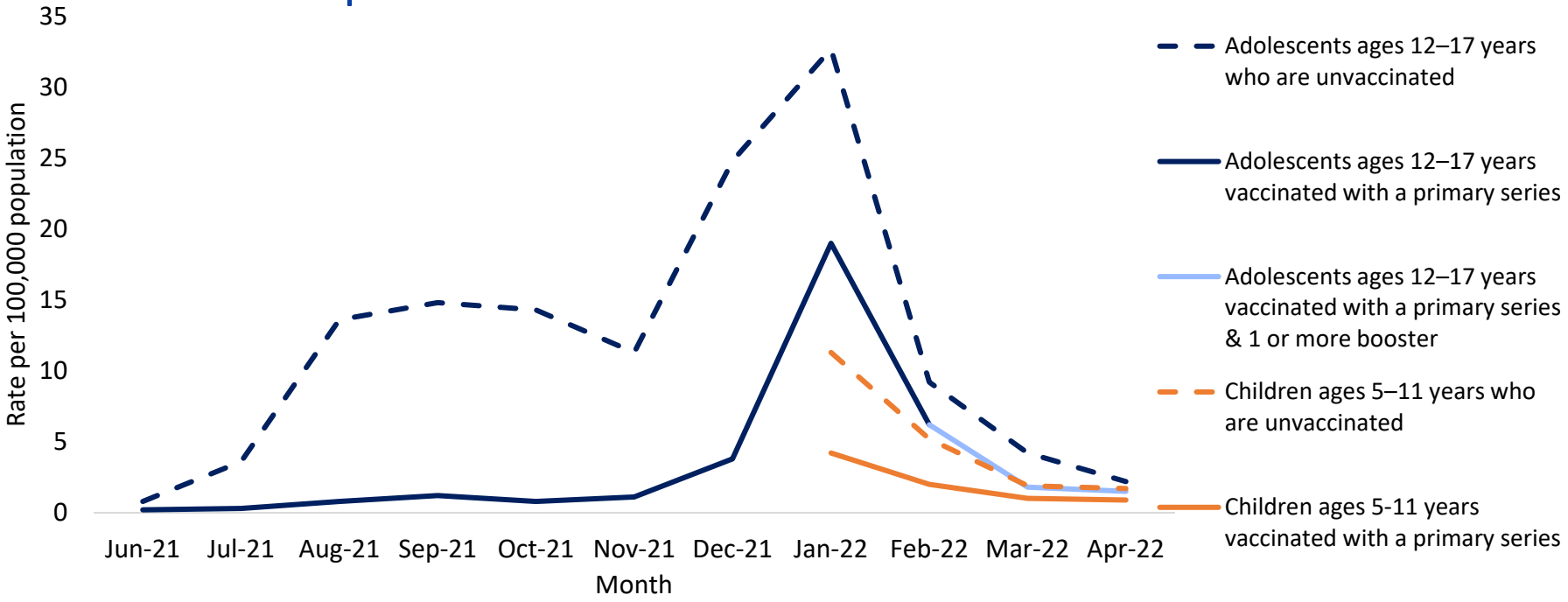
March 7, 2020 – June 11, 2022



Source: COVID-NET, https://gis.cdc.gov/grasp/COVIDNet/COVID19_3.html, accessed 6/20/22

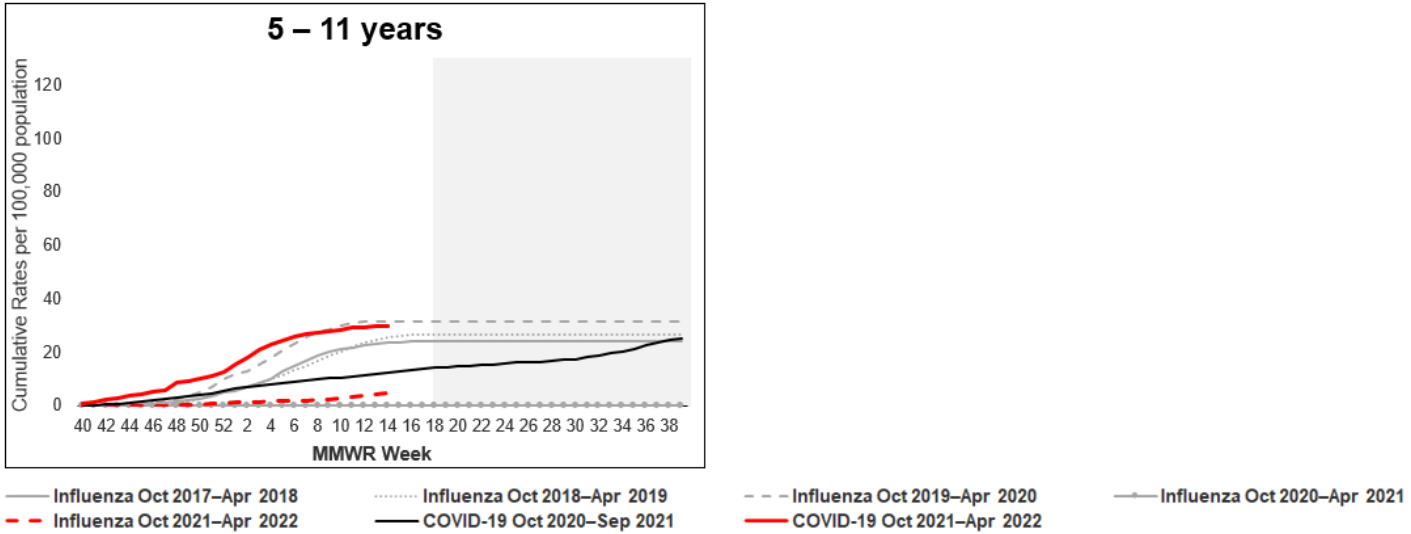
Rates of monthly COVID-19-associated hospitalizations by vaccination status among children and adolescents 5–17 years, COVID-NET

June 2021 – April 2022



Source: CDC COVID Data Tracker: COVID-NET Hospitalizations by Vaccination Status. Accessed June 20, 2022.

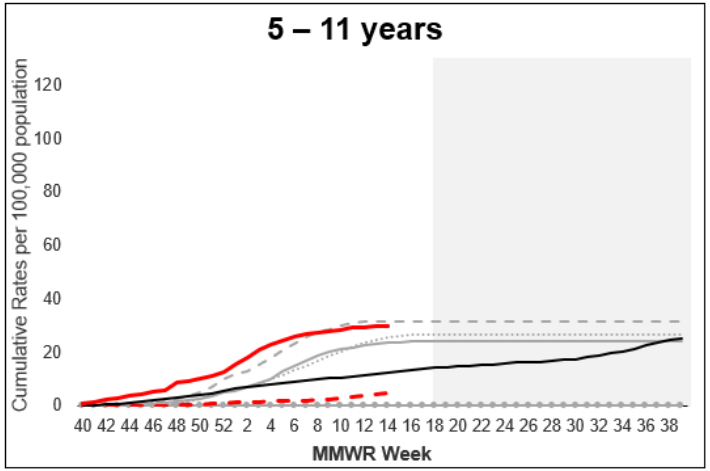
Cumulative influenza- and COVID-19-associated hospitalization rates per 100 000 children and adolescents 5 – 17 years old, by age group – FluSurv-NET and COVID-NET, 2017–2022



FluSurv-NET = Influenza Hospitalization Surveillance Network; COVID-NET = COVID-19-Associated Hospitalization Surveillance Network; MMWR Week = week of epidemiologic year

Delahoy MJ, Ujamaa D, Taylor CA, et al. Comparison of influenza and COVID-19-associated hospitalizations among children < 18 years old in the United States-FluSurv-NET (October-April 2017-2021) and COVID-NET (October 2020-September 2021). Clin Infect Dis. 2022 May 20:ciac388. doi: 10.1093/cid/ciac388.

Cumulative influenza- and COVID-19-associated hospitalization rates per 100 000 children and adolescents 5 – 17 years old, by age group – FluSurv-NET and COVID-NET, 2017–2022



Among children ages 5–11 years

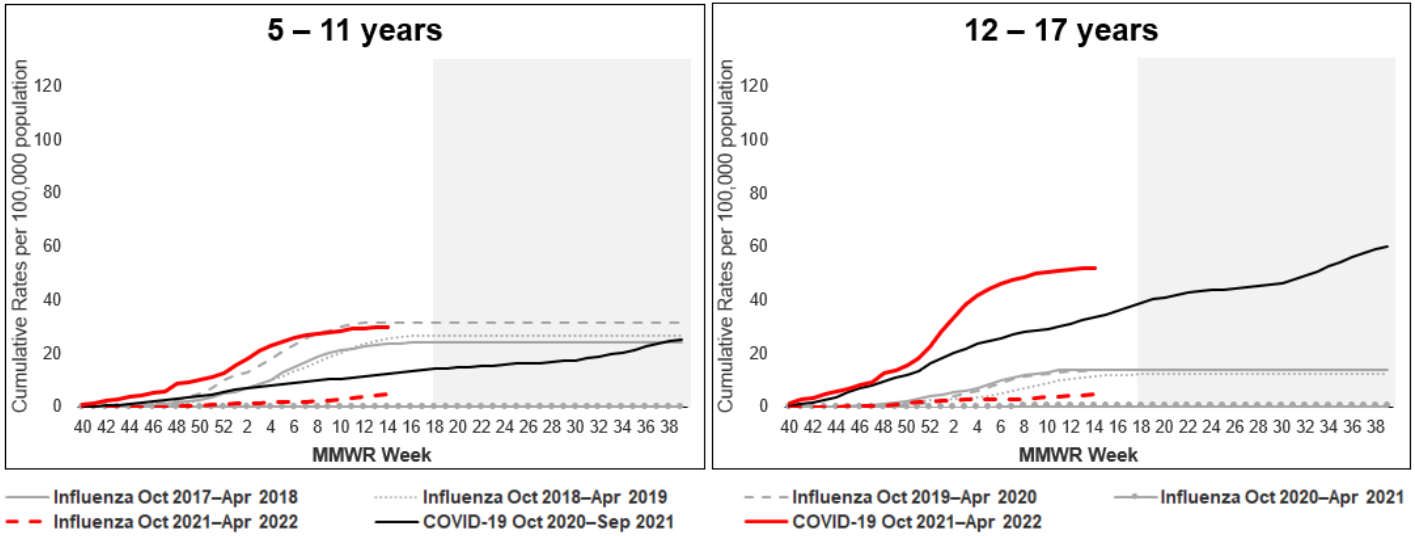
Oct 2020 – Sep 2021: COVID-19 hospitalization rates were **lower** than influenza hospitalization rates during 2017–18 through 2019–20 influenza seasons

Oct 2021 – Apr 2022: COVID-19 hospitalization rates were as **high or higher** than influenza hospitalization rates during all influenza seasons from 2017–18 through 2021–22

FluSurv-NET = Influenza Hospitalization Surveillance Network; COVID-NET = COVID-19-Associated Hospitalization Surveillance Network; MMWR Week = week of epidemiologic year Additional footnotes at the end of the presentation

Delahoy MJ, Ujamaa D, Taylor CA, et al. Comparison of influenza and COVID-19-associated hospitalizations among children < 18 years old in the United States-FluSurv-NET (October-April 2017-2021) and COVID-NET (October 2020-September 2021). Clin Infect Dis. 2022 May 20:ciac388. doi: 10.1093/cid/ciac388.

Cumulative influenza- and COVID-19-associated hospitalization rates per 100 000 children and adolescents 5 – 17 years old, by age group – FluSurv-NET and COVID-NET, 2017–2022



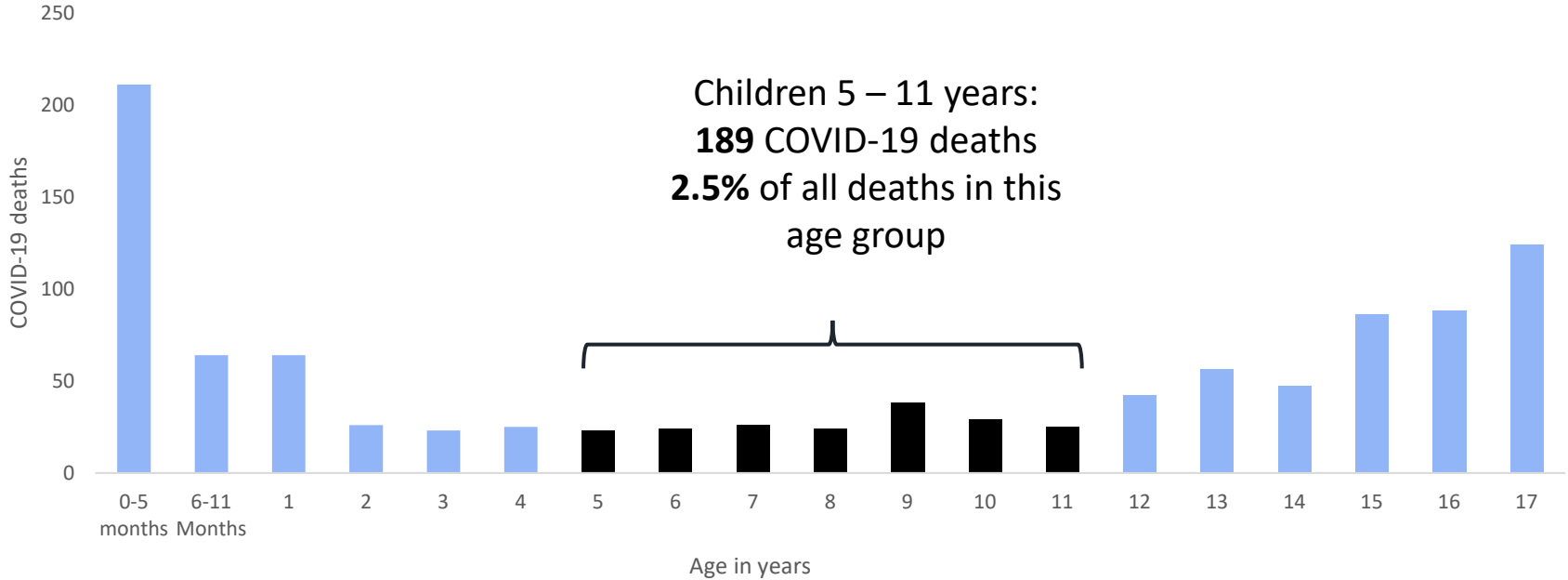
Among **adolescents ages 12–17 years,** COVID-19 hospitalization rates in both years were **higher** than influenza hospitalization rates during 2017–18 through 2021–22 influenza seasons

FluSurv-NET = Influenza Hospitalization Surveillance Network; COVID-NET = COVID-19-Associated Hospitalization Surveillance Network; MMWR Week = week of epidemiologic year Additional footnotes at the end of the presentation

Delahoy MJ, Ujamaa D, Taylor CA, et al. Comparison of influenza and COVID-19-associated hospitalizations among children < 18 years old in the United States-FluSurv-NET (October-April 2017-2021) and COVID-NET (October 2020-September 2021). Clin Infect Dis. 2022 May 20:ciac388. doi: 10.1093/cid/ciac388.

COVID-19 deaths in children and adolescents by age based on death certificate data, National Center for Health Statistics

January 1, 2020–May 11, 2022

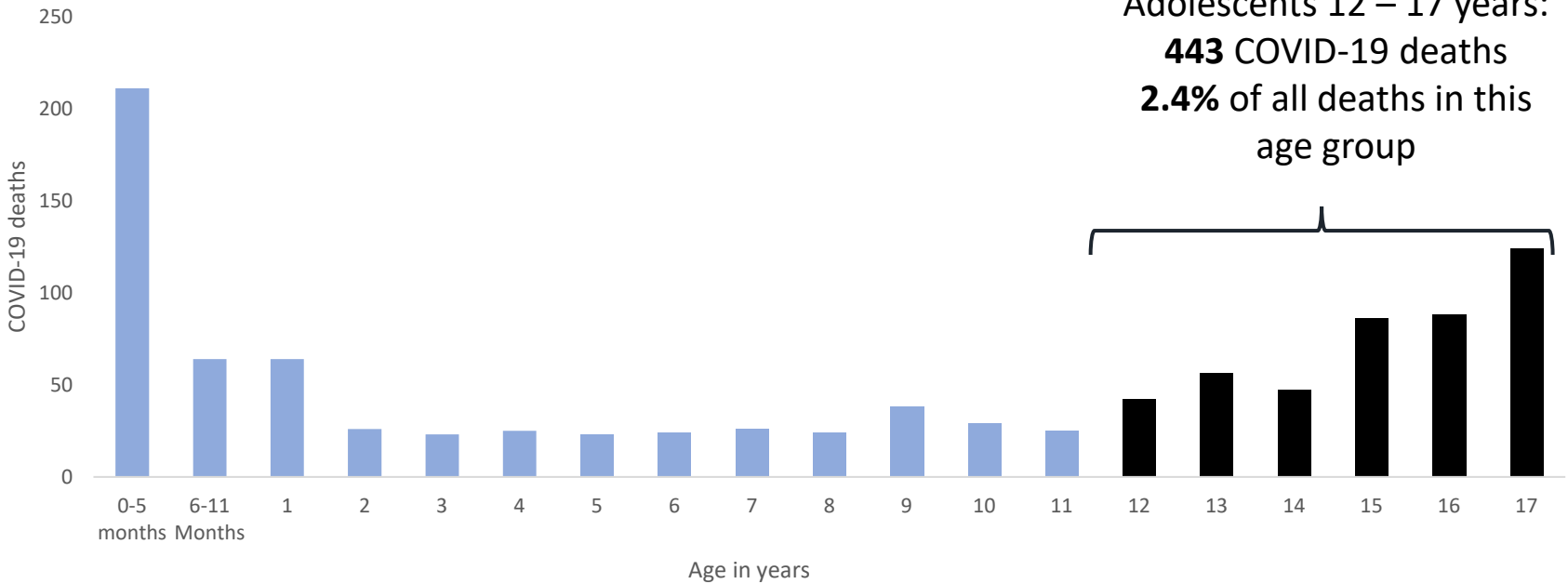


https://data.cdc.gov/NCHS/Provisional-COVID-19-Deaths-Counts-by-Age-in-Years/3apk-4u4f/data. Accessed 5/14/22

The provisional counts for coronavirus disease 2019 (COVID-19) deaths are based on a current flow of mortality data in the National Vital Statistics System. National provisional counts include deaths occurring within the 50 states and the District of Columbia that have been received and coded as of the date specified. It is important to note that it can take several weeks for death records to be submitted to National Center for Health Statistics (NCHS), processed, coded, and tabulated. Therefore, the data shown on this page may be incomplete, and will likely not include all deaths that occurred during a given time period, especially for the more recent time periods.

COVID-19 deaths in children and adolescents by age based on death certificate data, National Center for Health Statistics

January 1, 2020–May 11, 2022



https://data.cdc.gov/NCHS/Provisional-COVID-19-Deaths-Counts-by-Age-in-Years/3apk-4u4f/data. Accessed 5/14/22

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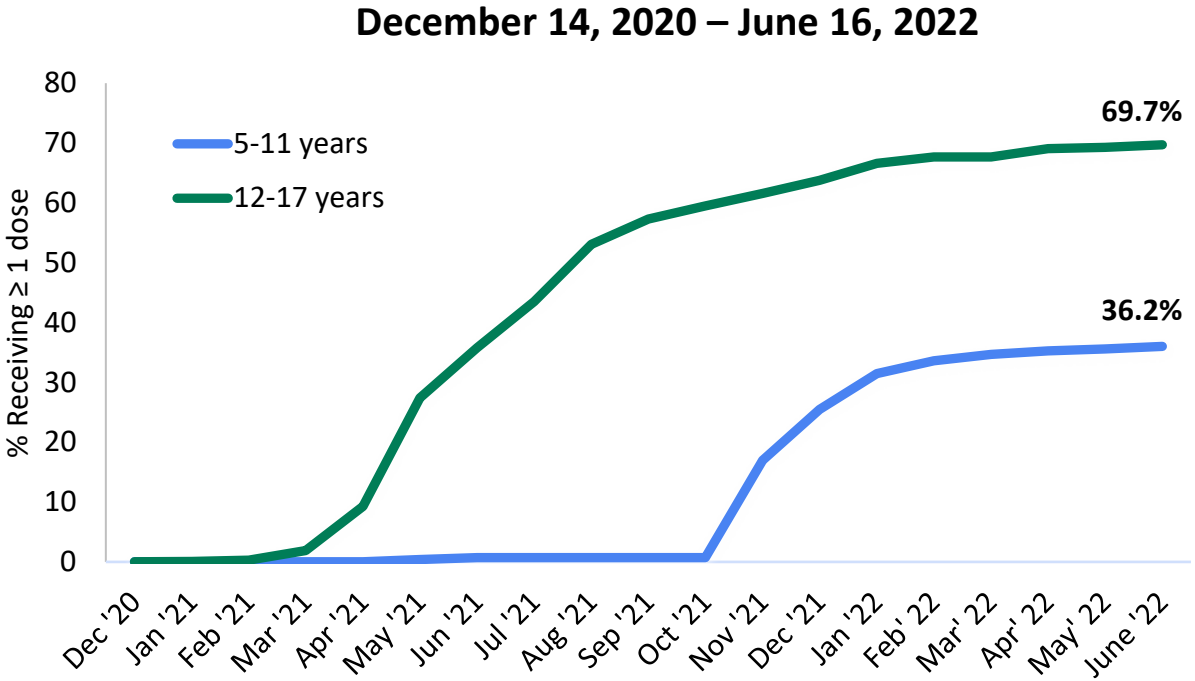
Percentage of children and adolescents who received at least one dose of the COVID-19 vaccine over time



7.5 million unvaccinated children ages 12 – 17 years

18 million unvaccinated children ages 5 – 11 years

CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#vaccination-demographics-trends Accessed June 20, 2022

Public Health Problem:
Summary of the available evidence

- Children and adolescents ages 5 – 17 years are at risk of severe illness from COVID-19
  - Over **10.3 million cases** have occurred in the United States to date
  - Over **600 deaths** since the beginning of the pandemic
- Children and adolescents who have received COVID-19 vaccines have better outcomes than children who are unvaccinated, particularly against severe illness
- 65% of U.S. children ages 5 – 11 years and 30% of U.S. adolescents ages 12 – 17 years have not yet received COVID-19 vaccination

Public Health Problem

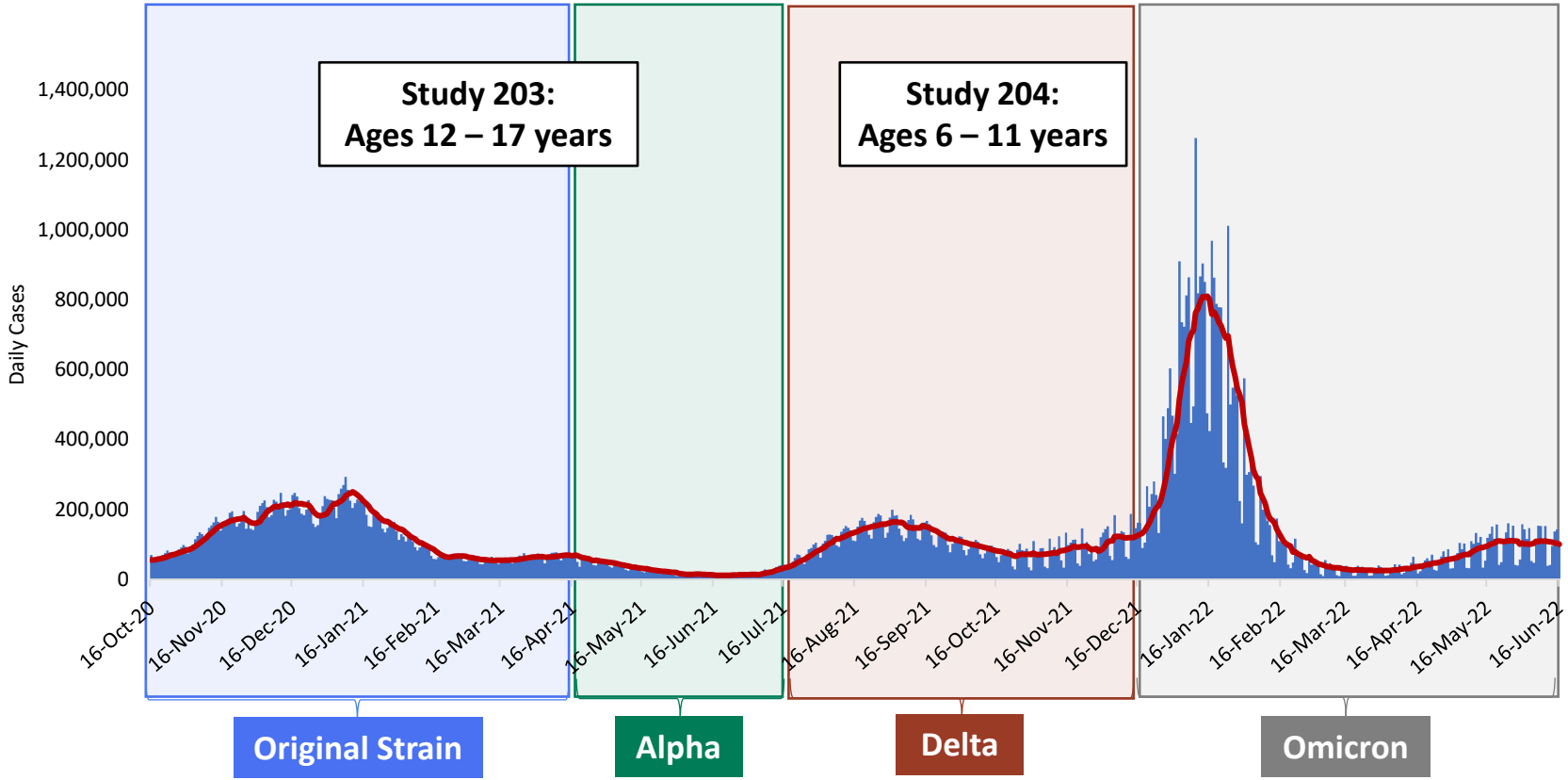
Work Group Interpretation

Is COVID-19 disease among children ages 6 – 11 years and adolescents ages 12 – 17 years of public health importance?

○ No	○ Probably no	○ Probably yes	○ Yes	○ Varies	○ Don't know

EtR Domain: Benefits and Harms

Timeframe of Randomized Controlled Trials



Source: COVID Data Tracker, https://covid.cdc.gov/covid-data-tracker/#trends_dailytrendscases. Accessed 6/16/2022

Children Ages 6–11 Years

Outcome: Symptomatic Lab-Confirmed COVID-19 Children Ages 6–11 Years

- Moderna phase 2/3 randomized controlled trial (RCT) (unpublished, data obtained from sponsor)
- Children ages **6–11 years** in United States
- Randomized **3:1** vaccine to saline placebo
- Data evaluated: all eligible randomized participants who received all vaccinations as randomized within the predefined window and no other important protocol deviations (data cut-off: Nov 10, 2021)
  - The available body of evidence is predominantly from a time period when the **Delta variant** was the dominant circulating variant. The VE estimates do not represent the most recent epidemiology.
- Per protocol, the two co-primary endpoints for immunobridging were geometric mean ratios (GMR) & seroresponse
- Data on symptomatic COVID-19 using various definitions were also supplied

Outcome: Symptomatic Lab-Confirmed COVID-19 Children Ages 6–11 Years

Population	Events/Vaccine (n/N)	Events/Placebo (n/N)	Vaccine efficacy (95% confidence interval)
Per protocol population			
CDC case definition[a], ≥14 d post dose 2	3/2644[b]	4/853[b]	75.8% (-7.9%, 94.6%)
Adult RCT case definition[c], ≥14 d post dose 2	3/2644[b]	3/853[b]	67.7% (-59.6% , 93.5%)
± evidence of prior infection[a], ≥14 d post dose 2	3/2980[b]	5/966[b]	80.6% (18.8%, 95.3%)

[a] Requires at least 1 prespecified clinical symptom and a positive RT-PCR
[b] Number of subjects at risk for the endpoint
[C] Requires at least 2 prespecified systemic symptoms or at least 1 respiratory symptom and a positive RT-PCR

Outcome: Symptomatic Lab-Confirmed COVID-19
Children Ages 6–11 Years

Immunobridging: Summary of Geometric Mean Ratio (GMR)

	6–11 Years		18–25 Years			
Outcome	N[b]	GMT (model based) [c] (95% CI)	N[b]	GMT (model based) [c] (95% CI)	GMR (model based) [c] (95% CI)	Met Noninferiority Objective[d]
Pseudovirus neutralizing antibody level by pseudovirus neutralizing assay (ID50)[a]	319	1610.2 (1456.6, 1780.0)	295	1299.9 (1171.2, 1442.7)	1.2 (1.1, 1.4)	Yes

Abbreviations: ID50 = 50% inhibitory dose; GLSM = geometric least squares mean; GMR = geometric mean ratio; CI=confidence interval

[a]Sampling time point was at 28 days after the second dose (day 57).

[b]Subjects with a negative serology test at baseline and completion of the 2-dose series on schedule.

[c]The log-transformed antibody levels are analyzed using an ANCOVA model with the group variable (children in P204 and young adults in P301) as fixed effect. The resulted LS means, difference of LS means, and 95% CI are back transformed to the original scale for presentation.

[d]Noninferiority is declared if the lower bound of the 2-sided 95% CI for the GMR is greater than 0.67.

GRADE: Symptomatic Lab-confirmed COVID-19, Children Ages 6-11 Years

Assessed using direct efficacy

- RR 0.19 (0.05, 0.81)
- Serious concerns of imprecision due to the small number of events
- Evidence type: **Moderate certainty (type 2)**

GRADE = Grading of Recommendations Assessment, Development and Evaluations

GRADE: Symptomatic Lab-Confirmed COVID-19
Children Ages 6–11 Years
Assessed using immunobridging

- GMR 1.2 (1.1, 1.4); non-inferiority criteria met
- Serious concerns of indirectness because immunogenicity is a surrogate measure of efficacy
- Evidence type: **Moderate certainty (type 2)**

GRADE = Grading of Recommendations Assessment, Development and Evaluations

Outcome: Asymptomatic SARS-CoV-2 Infection Children Ages 6-11 Years

Study/population	Events/Vaccine (n/N)	Events/Placebo (n/N)	Vaccine Efficacy (95% confidence interval)
Asymptomatic SARS-CoV-2 Infection[a]	9/2644	10/853	71.0% (28.8%, 88.1%)

[a]Among participants in the per protocol set for efficacy

- Asymptomatic SAR-CoV-2 infection is identified by absence of symptoms AND at least 1 of following:
  - Binding antibody level against SARS-CoV-2 nucleocapsid protein negative at Day 1 that becomes positive post-baseline. Subset of 510 tested.
  - Positive RT-PCR test post-baseline at scheduled (29 days after dose 2) or unscheduled/illness visit

GRADE: Asymptomatic SARS-CoV-2 Infection Children Ages 6–11 Years

- RR 0.29 (0.12, 0.71)
- Serious concerns of indirectness because asymptomatic SARS-CoV-2 PCR testing on the full cohort only occurred once and serology was not done on all participants
- Serious concerns of imprecision due to the small number of events
- Evidence type: **Low certainty (type 3)**

GRADE = Grading of Recommendations Assessment, Development and Evaluations

Outcome: Serious Adverse Events[a,b]
Children Ages 6–11 Years

Study/population[c]	Events/Vaccine (n/N)[d,e]	% SAE Vaccine	Events/Placebo (n/N)[d,e]	% SAE Placebo	Associated with vaccination[f]
Moderna, unpublished RCT- Full analysis set	6/3007	0.20%	2/995	0.20%	0

[a] Serious adverse event (SAE) is defined as death, life-threatening event, inpatient hospitalization or prolongation of existing hospitalization, persistent or significant incapacity or substantial disruption of the ability to conduct normal life functions, medically important event, or congenital anomaly/birth defect
[b] Median follow up 51 days after 2nd dose
[c] Included all randomized participants who received at least 1 dose of vaccine
[d] Number of participants experiencing SAEs (participants may experience more than one SAE)
[e] No deaths were reported in any trial participants
[F] None of the SAEs were assessed by the FDA as related to study intervention

- Included all randomized participants who received at least 1 dose of vaccine
- Data through November 10, 2021

GRADE: Serious Adverse Events
Children Ages 6–11 Years

- RR 0.99 (0.20, 4.91)
- Serious concerns of indirectness due to short duration of follow up
- Very serious concerns of imprecision due to the study size and width of the confidence interval
- Evidence type: **Very low certainty (type 4)**

GRADE = Grading of Recommendations Assessment, Development and Evaluations

Outcome: Reactogenicity, Severe (Grade ≥3) Children Ages 6–11 Years

- Phase 2/3 trial solicited events through electronic diaries for 7 days following each dose
- Local reactions (pain at injection site, redness, swelling, axillary swelling)
  - Grade 3: pain at injection site preventing daily activity or any use of prescription pain reliever; injection site redness >10 cm or swelling >10 cm; axillary swelling or tenderness ipsilateral to injection side
  - Grade 4: emergency room visit or hospitalization for axillary swelling or severe pain at the injection site, necrosis (redness and swelling categories) or exfoliative dermatitis (redness category only)
- Systemic events (fever, nausea/vomiting, headache, fatigue, chills, new or worsened muscle pain, new or worsened joint pain)
  - Grade 3: fever >38.9°C to 40.0°C , nausea/vomiting requiring IV hydration; chills requiring medical intervention, significant fatigue, headache, muscle pain, or joint pain that prevents daily activity
  - Grade 4: fever >40.0°C, fatigue, headache, muscle pain, joint pain, or nausea/vomiting that require emergency room visit or hospitalization

Outcome: Reactogenicity[a], Severe (Grade ≥3) Children Ages 6–11 Years

Study/population	Events/Vaccine (n/N)	% Vaccine	Events/Placebo (n/N)	% Placebo
Moderna, unpublished (either dose)	514/3006	17.1%	33/994	3.3%
Any local (either dose)	167/3006	5.6%	8/994	0.8%
Any systemic (either dose)	406/3006	13.6%	26/994	2.6%

[a] Reactogenicity outcome includes local and systemic events, grade ≥3 after either dose.
Grade 3: prevents daily routine activity. Grade 4: requires emergency room visit or hospitalization.

GRADE: Reactogenicity, Severe (Grade ≥3)
Children Ages 6–11 Years

- RR 5.2 (3.6, 7.3)
- No serious concerns in certainty assessment
- Evidence type: **High certainty (type 1)**

GRADE = Grading of Recommendations Assessment, Development and Evaluations

Summary of GRADE
Children Ages 6–11 Years

Outcome	Importance	Design (# of studies)	Findings	Evidence type
Benefits				
1a. Symptomatic lab-confirmed COVID-19 (efficacy)	Critical	RCT (1)	Moderna COVID-19 vaccine is effective in preventing symptomatic COVID-19	**2**
1b. Symptomatic lab-confirmed COVID-19 (immunobridging)	Critical	RCT (1)	Moderna COVID-19 vaccine is effective in preventing symptomatic COVID-19	**2**
2. Hospitalization due to COVID-19	Important	No studies	Data not available from any studies	**ND**
3. Multisystem inflammatory syndrome in children (MIS-C)	Important	No studies	Data not available from any studies	**ND**
4. Asymptomatic SARS-CoV-2 infection	Important	RCT (1)	The vaccine may prevent asymptomatic SARS-CoV-2 infection, however certainty in the estimate was low	**3**
Harms				
5. Serious adverse events	Critical	RCT (1)	6 participants with SAEs among vaccinated and 2 among unvaccinated; certainty in the estimate was very low. No SAEs were judged to be related to vaccination.	**4**
6. Reactogenicity	Important	RCT (1)	Severe reactions were more common in vaccinated; any grade ≥3 reaction was reported by 17.0% of vaccinated vs. 3.3% of placebo group	**1**

Evidence type: 1=high; 2=moderate; 3=low; 4=very low; ND, no data

Adolescents Ages 12–17 Years

Outcome: Symptomatic Lab-Confirmed COVID-19 Adolescents Ages 12–17 Years

- Moderna phase 2/3 randomized controlled trial (RCT)
- Persons aged **12–17 years** in United States
- Randomized **2:1** vaccine to saline placebo
- Data evaluated: all eligible randomized participants who received all vaccinations as randomized within the predefined window and no other important protocol deviations (data cut-off: May 31, 2021).
  - The available body of evidence is predominantly from a time period when the **original strain** and **Alpha variant** was the dominant circulating variant. The VE estimates does not represent the most recent epidemiology
- Data on symptomatic COVID-19 using various definitions were also supplied
- Per protocol, the two co-primary endpoints for immunobridging were geometric mean ratios (GMR) & seroconversion

Outcome: Symptomatic Lab-confirmed COVID-19 Children Ages 12–17 Years

Population	Events/Vaccine (n/N)	Events/Placebo (n/N)	Vaccine efficacy (95% confidence interval)
Per protocol population			
CDC case definition[a], ≥14 d post dose 2	2/2142[b]	9/1045[b]	89.2% (49.9%, 97.6%)
Adult RCT case definition[c], ≥14 d post dose 2	0/2142[b]	6/1045[b]	100%[d]

[a] Requires at least 1 prespecified clinical symptom and a positive RT-PCR
[b] Number of subjects at risk for the endpoint
[c] Requires at least 2 prespecified systemic symptoms or at least 1 respiratory symptom and a positive RT-PCR
[d] With a standard continuity correction of 0.5 applied, the estimated VE (95% CI) is 95%, (CI: 33%, 100%)

Outcome: Symptomatic Lab-confirmed COVID-19 Children Ages 12–17 Years

Immunobridging: Summary of Geometric Mean Ratio (GMR)

	12–17 Years		18–25 Years			
Outcome	N[b]	GMT (95% CI)	N[b]	GMT (95% CI)	GMR (95% CI)	Met Noninferiority Objective[c]
Serum antibody level by pseudovirus neutralization (ID50)[a]	340	1401.7 (1276.3, 1539.4)	296	1301.3 (1177.0, 1439.0)	1.1 (0.9, 1.2)	Yes

Abbreviations: ID50 = 50% inhibitory dose; GLSM = geometric least squares mean; GMR = geometric mean ratio; CI=confidence interval

[a]Sampling time point was at 28 days after the second dose (day 57).

[b]Subjects with a negative serology test at baseline and completion of the 2-dose series on schedule.

[c]Noninferiority is declared if the lower bound of the 2-sided 95% CI for the GMR is greater than 0.67.

GRADE: Symptomatic Lab-confirmed COVID-19 Adolescents Ages 12–17 Years

Assessed using direct efficacy

- RR 0.11 (0.02, 0.50)
- Serious concerns of imprecision due to the small number of events
- Evidence type: **Moderate certainty (type 2)**

GRADE = Grading of Recommendations Assessment, Development and Evaluations

GRADE: Symptomatic Laboratory-confirmed COVID-19 Adolescents Ages 12–17 Years

Assessed using immunobridging

- GMR 1.1 (0.9, 1.2); non-inferiority criteria met
- Serious concerns of indirectness because immunogenicity is a surrogate measure of efficacy
- Evidence type: **Moderate certainty (type 2)**

GRADE = Grading of Recommendations Assessment, Development and Evaluations

Outcome: Asymptomatic SARS-CoV-2 Infection Adolescents Ages 12–17 Years

Study/population	Events/Vaccine (n/N)	Events/Placebo (n/N)	Vaccine Efficacy (95% confidence interval)
Asymptomatic SARS-CoV-2[a]	21/2139	16/1042	36.1% (-22.0%, 66.5%)

[a]Among participants in the per protocol set for efficacy

- Asymptomatic SAR-CoV-2 infection is identified by absence of symptoms AND at least 1 of following:
  - Binding antibody level against SARS-CoV-2 nucleocapsid protein negative at Day 1 that becomes positive post-baseline (**conducted on all participants**)
  - Positive RT-PCR test post-baseline at schedule or unscheduled/illness visit

GRADE: Asymptomatic SARS-CoV-2 Infection Adolescents Ages 12–17 Years

- RR 0.64 (0.34, 1.22)
- Very serious concerns of imprecision due to the wide confidence intervals and study size
- Evidence type: **Low certainty (type 3)**

GRADE = Grading of Recommendations Assessment, Development and Evaluations

Outcome: Serious Adverse Events[a] Adolescents Ages 12–17 Years

Study/population[b]	Events/Vaccine (n/N)[c]	% SAE Vaccine	Events/Placebo (n/N)[c]	% SAE Placebo	Associated with vaccination[f]
Moderna, unpublished RCT- Full analysis set	6/2486	0.24	2/1240	0.16	0

[a] Serious adverse event (SAE) is defined as death, life-threatening event, hospitalization, incapacity to perform normal life functions, medically important event, or congenital anomaly/birth defect
[b] Included all randomized participants who received at least 1 dose of vaccine
[c] Number of participants experiencing SAEs (participants may experience more than one SAE)
[d] No deaths were reported in any trial participants
[f] None of the SAEs were assessed by the FDA as related to study intervention

- Included all randomized participants who received at least 1 dose of vaccine
- Data through May 8, 2021
  - Additional safety data from unblinded cross-over were reviewed

GRADE: Serious Adverse Events
Adolescents Ages 12–17 Years

- RR 1.50 (0.30, 7.40)
- Serious concerns of indirectness due to short duration of follow up
- Very serious concerns of imprecision due to the wide confidence interval and study size
- Evidence type: **Very low certainty (type 4)**

GRADE = Grading of Recommendations Assessment, Development and Evaluations

Outcome: Reactogenicity[a], Severe (Grade ≥3) Adolescents Ages 12–17 Years

Study/population	Events/Vaccine (n/N)	% Vaccine	Events/Placebo (n/N)	% Placebo
Moderna, unpublished (either dose)	629/2485	25.3%	60/1240	4.8%
Any local (either dose)	344/2485	13.8%	4/1240	0.3%
Any systemic (either dose)	414/2485	16.7%	58/1240	4.7%

[a] Reactogenicity outcome includes local and systemic events, grade ≥3 after either dose.
Grade 3: prevents daily routine activity. Grade 4: requires emergency room visit or hospitalization.

GRADE: Reactogenicity, Severe (Grade ≥3) Adolescents Ages 12–17 Years

- RR 5.2 (4.1, 6.8)
- No serious concerns in certainty assessment
- Evidence type: **High certainty (type 1)**

GRADE = Grading of Recommendations Assessment, Development and Evaluations

Summary of GRADE
Adolescents ages 12–17 years

Outcome	Importance	Design (# of studies)	Findings	Evidence type
Benefits				
1a. Symptomatic lab-confirmed COVID-19	Critical	RCT (1)	Moderna COVID-19 vaccine is effective in preventing symptomatic COVID-19	**2**
1b. Symptomatic lab-confirmed COVID-19	Critical	RCT (1)	Moderna COVID-19 vaccine is effective in preventing symptomatic COVID-19	**2**
2. Hospitalization due to COVID-19	Important	No studies	Data not available from any studies	**ND**
3. Multisystem inflammatory syndrome in children (MIS-C)	Important	No studies	Data not available from any studies	**ND**
5. Asymptomatic SARS-CoV-2 infection	Important	RCT (1)	The vaccine did not demonstrate efficacy in prevention of asymptomatic SARS-CoV-2 infection	**3**
Harms				
6. Serious adverse events	Critical	RCT (1)	6 participants with SAEs among vaccinated and 2 among unvaccinated; certainty in the estimate was very low. No SAEs were judged to be related to vaccination.	**4**
7. Reactogenicity	Important	RCT (1)	Severe reactions were more common in vaccinated; any grade ≥3 reaction was reported by 25.3% of vaccinated vs. 4.8% of placebo group	**1**

Evidence type: 1=high; 2=moderate; 3=low; 4=very low; ND, no data

Conclusions

Moderna COVID-19 vaccine: Ages 6–17 years

- Efficacy seen after two doses of Moderna COVID-19 vaccine in children and adolescents ages 6–17 years of age consistent with real-world vaccine effectiveness seen with SARS-CoV-2 variants at that time
- Antibody levels after 2 doses in children and adolescents ages 6–17 years produces similar antibody levels after 2 doses in individuals ages 18–25 years
- Reactogenicity post-vaccine consistent with what has been seen with Moderna COVID-19 vaccine in other age groups

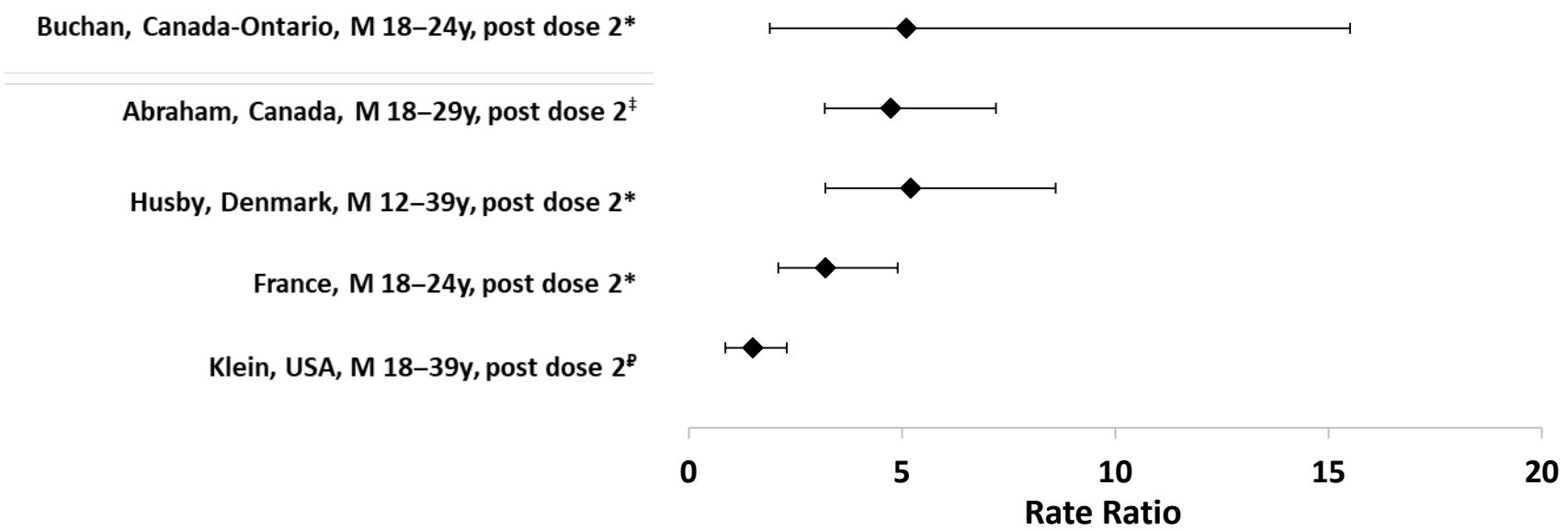
VAERS reporting rates of myocarditis (per 1 million doses administered) after mRNA COVID-19 vaccination, days 0–7 and 8–21 post-vaccination*,†

		0–7 days			8–21 days			0–7 days			8–21 days		
		Males			Males			Females			Females		
	Age (yrs)	Dose 1	Dose 2	Booster	Dose 1	Dose 2	Booster	Dose 1	Dose 2	Booster	Dose 1	Dose 2	Booster
Pfizer-BioNTech	5–11	0.2	2.6	0.0	0.6	0.0	0.0	0.2	0.7	0.0	0.2	0.0	0.0
	12–15	5.3	46.4	15.3	1.2	1.2	0.9	0.7	4.1	0.0	0.4	0.2	0.9
	16–17	7.2	75.9	24.1	1.7	3.2	1.3	0.0	7.5	0.0	0.7	0.4	0.0
Pfizer-BioNTech and Moderna	18–24	4.2	38.9	9.9	1.1	2.2	0.4	0.6	4.0	0.6	0.2	0.7	0.0
	25–29	1.8	15.2	4.8	0.4	1.1	0.5	0.4	3.5	2.0	0.2	0.0	0.8
	30–39	1.9	7.5	1.8	0.4	0.8	0.2	0.6	0.9	0.6	0.3	0.2	0.0
	40–49	0.5	3.3	0.4	0.2	0.5	0.0	0.4	1.6	0.6	0.2	0.2	0.0
	50–64	0.5	0.7	0.4	0.2	0.3	0.1	0.6	0.5	0.1	0.2	0.5	0.1
	65+	0.2	0.3	0.6	0.3	0.2	0.1	0.1	0.5	0.1	0.1	0.2	0.1

* As of May 26, 2022; reports verified to meet case definition by provider interview or medical record review; primary series and 1st booster doses only

† An estimated 1–10 cases of myocarditis per 100,000 person years occurs among people in the United States, regardless of vaccination status; adjusted for days 0–7 and 8–21 risk intervals, this estimated background is **0.2 to 2.2 per 1 million person-day 0–7 risk interval and 0.4 to 3.8 per 1 million person-day 8–21 risk interval** (peach shaded cells indicate that reporting rate exceeded estimated background incidence for the period)

Myocarditis rate ratios (Moderna vs. Pfizer) country, subgroup, and dose



Presented to ACIP Feb 4, 2022: https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2022-02-04/11-COVID-Moulia-508.pdf

*Unadjusted rate ratio; ‡Adjusted with a Poisson model conditioned by calendar week of vaccine administration; ₱ Adjusted for VSD site, age, sex, race/ethnicity, and calendar date

Source. Husby et al., SARS-CoV-2 vaccination and myocarditis or myopericarditis: population-based cohort study. BMJ 2021; 375:e068665 doi:10.1136/bmj-2021-068665

https://ansm.sante.fr/uploads/2021/10/22/20211021-covid-19-vaccins-pfizer-focus-1-2.pdf. Accessed 1/23/2022.

Klein, N. Myocarditis Analyses in the Vaccine Safety Datalink: Rapid Cycle Analyses and "Head-to-Head" Product Comparisons. Slides.

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3988612. https://www.medrxiv.org/content/10.1101/2021.12.02.21267156v1.article-metrics. Accessed 1/23/2022

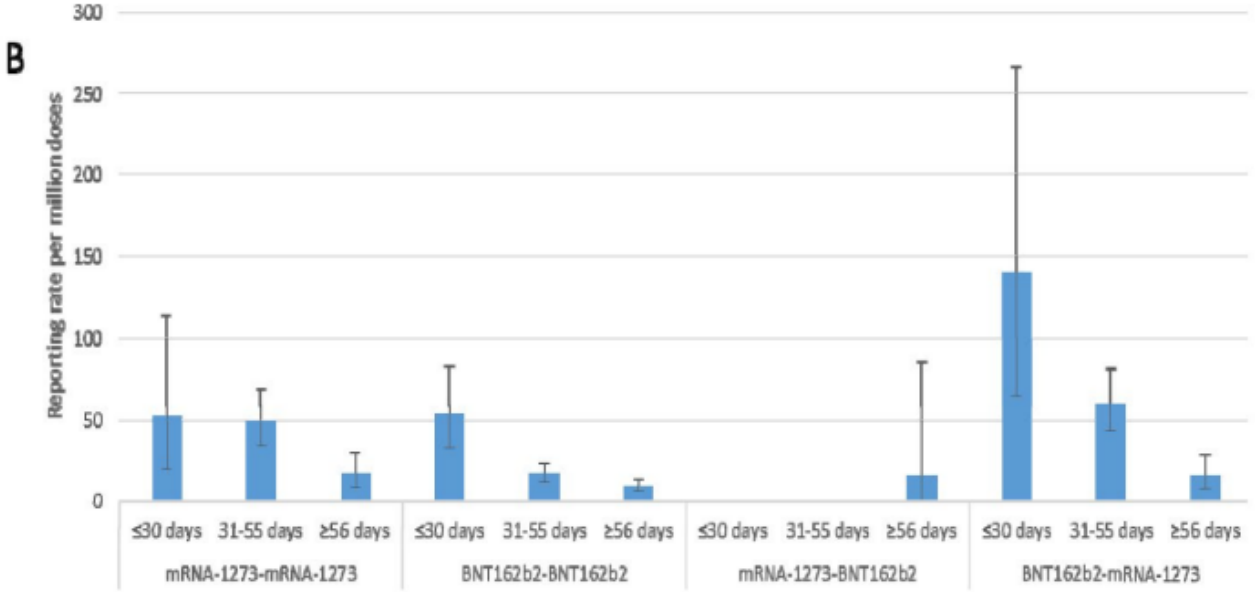
Summary of findings: Myocarditis risk by mRNA product

- Risk of myocarditis may be higher for Moderna than Pfizer vaccine
- Limitations: observational data; rates not readily comparable due to differences in:
  - Case definition and risk interval length
  - Subpopulations
  - Case ascertainment
  - Calendar time and vaccine implementation factors, including extended primary series intervals
- A limited number of geographic locations are administering both Moderna and Pfizer and had data available

Presented to ACIP Feb 4, 2022: https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2022-02-04/11-COVID-Moulia-508.pdf

Data up to and including September 04, 2021

Myocarditis/pericarditis cases (≥12 years of age) following mRNA COVID-19 vaccines in Ontario, Canada, by vaccine product, schedule, and interval, 7-day risk period (n=297)*



- For both vaccine products, overall myocarditis/pericarditis reporting rates were higher when the interval between doses was shorter (i.e., ≤30 days).
- Overall, unadjusted rate ratios comparing ≤30 days vs. ≥56 days were similar:
  - Moderna (RR= **5.2**, 95% CI: 2.6 to 10.0)
  - Pfizer-BioNTech (RR=**5.5**, 95% CI: 3.1 to 9.6).

*Overall reporting rate of myocarditis/pericarditis among people who have completed their two-dose series with dose 2 on or after June 1, 2021 by homologous/heterologous schedule by inter-dose interval

Buchan et al, Epidemiology of myocarditis and pericarditis following mRNA vaccines in Ontario, Canada: by vaccine product, schedule and interval | medRxiv

Presented to ACIP Feb 4, 2022: https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2022-02-04/09-COVID-Tunis-508.pdf

Other Considerations:
Myocarditis

- Unknown what the risk of myocarditis is after Moderna COVID-19 vaccine in children and adolescents ages 6 – 11 and 12 – 17 years
- Some observational data in adults suggests possible increased risk after Moderna COVID-19 vaccine, compared to Pfizer COVID-19 vaccine
- Extending interval between dose 1 and dose 2 of mRNA COVID-19 vaccines to **8 weeks** may further lower myocarditis risk

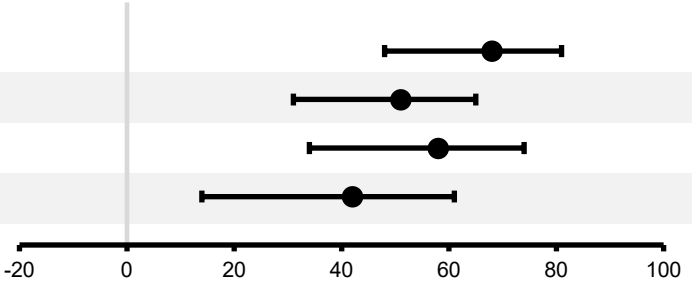
Post-authorization vaccine effectiveness

Overcoming COVID-19 platform

2 doses of Pfizer-BioNTech vaccine against hospitalization, Dec 19, 2021-Apr 27, 2022

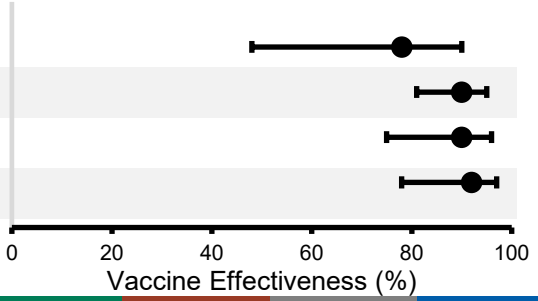
	No. vaccinated COVID-19 patients/Total COVID-19 patients (%)	Adjusted VE % (95% CI)
5–11 years*	25/325 (8)	68 (48-81)
12–18 years	109/286 (38)	51 (31-65)
2–22 weeks since vaccination	42/219 (19)	58 (34-74)
23–45 weeks since vaccination	67/244 (27)	42 (14-61)

*median time from vaccination to hospitalization is 37 days



2 doses of Pfizer-BioNTech vaccine against MIS-C, Jul 1, 2021-Apr 7, 2022

	No. vaccinated MIS-C patients/Total no. MIS-C patients (%)	Median (IQR) days from 2nd dose to MIS-C	Adjusted VE (95% CI)
5–11 years	10/144 (7)	44 (32-56)	78 (48-90)
12–18 years	14/160 (9)	120 (57-169)	90 (81-95)
28-120 days since vaccination	7/153 (5)	60 (42-89)	90 (75-96)
≥121 days since vaccination	7/131 (5)	172 (138-215)	92 (78-97)



Summary

Known and potential benefits

- Clinical trials provide data for protection against **symptomatic infection**
- Clinical trials were not powered to detect efficacy against severe disease, but similar patterns expected to what is seen with mRNA COVID-19 vaccines overall, with **higher** protection against **severe disease**
- Emerging data in adults suggest that post-COVID conditions may be less likely to occur in vaccinated individuals

Summary

Known and potential harms

- Post-authorization safety data after almost **600 million doses** of COVID-19 vaccines given in the United States
- The risk of adverse cardiac outcomes were **1.8–5.6 times higher** after SARS-CoV-2 infection than after mRNA COVID-19 vaccination among males ages 12 – 17 years
- Extending interval between dose 1 and dose 2 of mRNA COVID-19 vaccines to **8 weeks** may further lower myocarditis risk

Benefits and Harms: Summary of the Available Evidence

- Clinical trials conducted **prior to** Omicron predominance
  - Post-authorization vaccine effectiveness studies with lower VE against Omicron, compared to previous SARS-CoV-2 variants
- Moderna COVID-19 vaccine for older children and adolescents met **non-inferiority criteria** for neutralizing antibody levels
- Receipt of a primary COVID-19 vaccine series can provide protection against COVID-19 disease and **severe outcomes**
- **Benefits** of Moderna COVID-19 vaccines in children and adolescents ages 6–17 years outweigh **risks**
  - Extending interval between dose 1 and dose 2 to **8 weeks** may further lower myocarditis risk

Benefits and Harms

How substantial are the desirable anticipated effects?

- How substantial are the anticipated effect for each main outcome for which there is a desirable effect?

○ Minimal	○ Small	○ Moderate	○ Large	○ Varies	○ Don't know

Benefits and Harms

How substantial are the undesirable anticipated effects?

- How substantial are the anticipated effect for each main outcome for which there is an undesirable effect?

○ Minimal	○ Small	○ Moderate	○ Large	○ Varies	○ Don't know

Benefits and Harms

Do the desirable effects outweigh the undesirable effects?

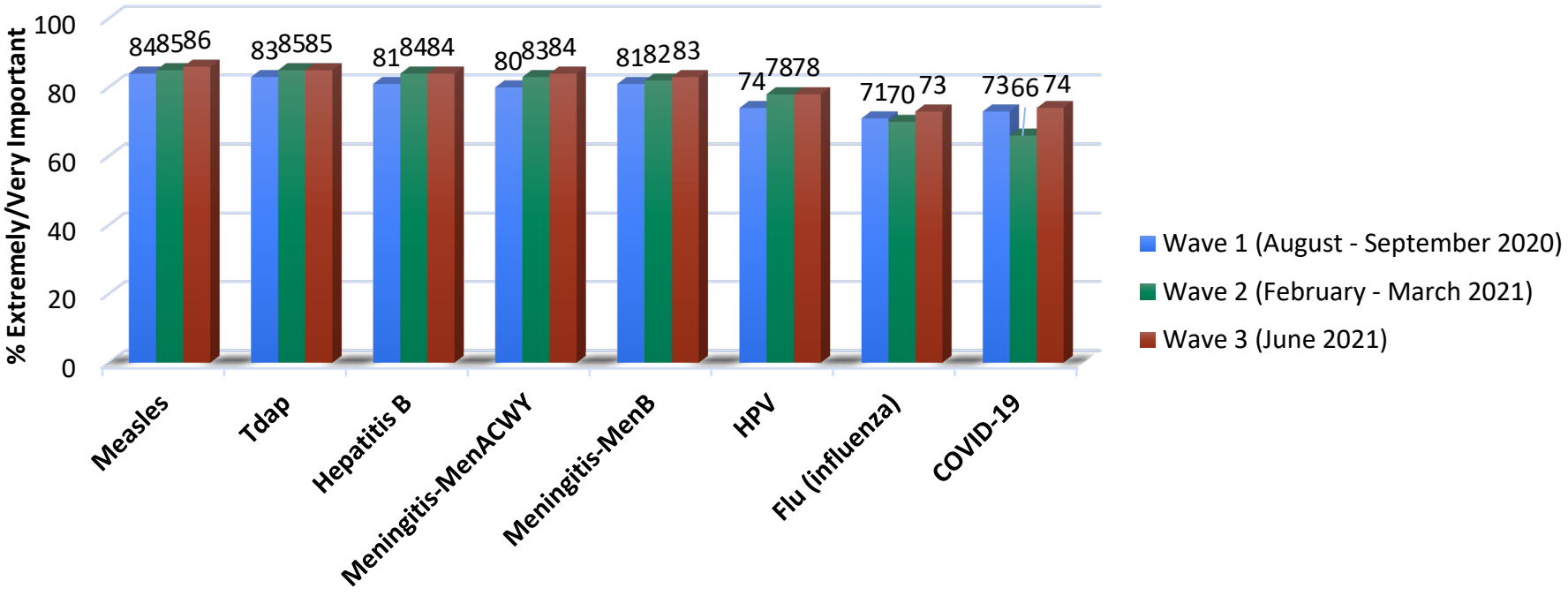
- What is the balance between the desirable effects relative to the undesirable effects?

- ○ Favors intervention (Moderna COVID-19 vaccine)
- ○ Favors comparison (no vaccine)
- ○ Favors both
- ○ Favors neither
- ○ Unclear

EtR Domain: Values

Parental rating of the importance of vaccines for teens

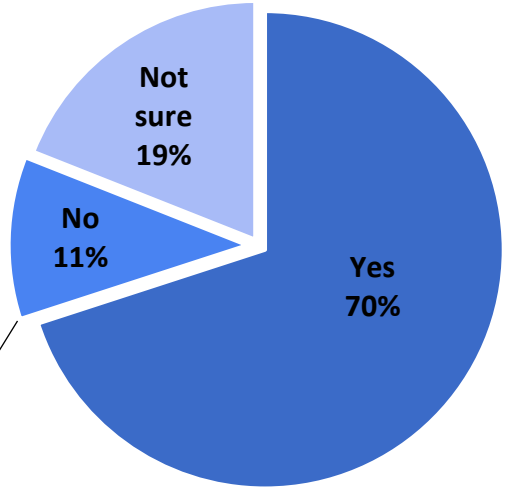
Question: *How important is vaccination against these diseases to your teen's health?*



Middleman, A. B., et al. (2022). "Vaccine Hesitancy in the Time of COVID-19: Attitudes and Intentions of Teens and Parents Regarding the COVID-19 Vaccine." Vaccines 10(1): 4. https://doi.org/10.3390/vaccines10010004

Parents' willingness to have their teen get the COVID-19 vaccine and routine vaccines together

Reasons Why No or Not sure (%)	Wave 3 Parents n=129
My teen is already up-to-date on recommended vaccines	62%
Concerned about the safety of getting COVID-19 vaccine at the same time as other vaccines	38%
COVID-19 vaccine is not required for school	15%
I never give my child more than one vaccine on the same day	11%
Routine vaccines can wait	9%
COVID-19 vaccines can wait	5%
Other	3%

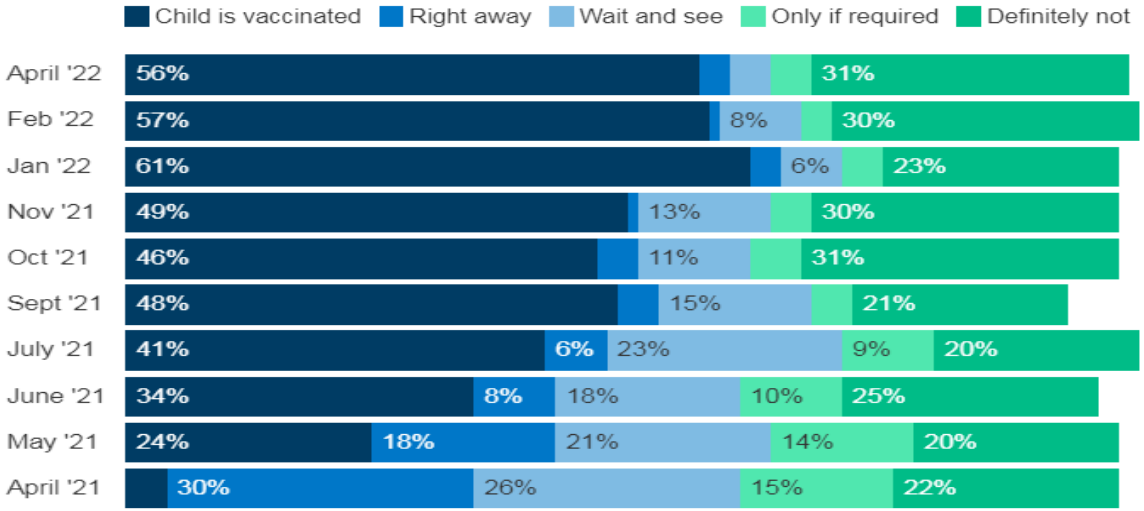


Select all that apply;

Middleman, A. B., et al. (2022). "Vaccine Hesitancy in the Time of COVID-19: Attitudes and Intentions of Teens and Parents Regarding the COVID-19 Vaccine." Vaccines 10(1): 4. https://doi.org/10.3390/vaccines10010004

Nearly six in ten parents of adolescents say their child is now vaccinated, three in ten will definitely not get vaccinated

- Survey respondents were asked, *"Thinking about your child between the ages of 12 and 17, have they received at least one dose of a COVID-19 vaccine, or not? If not, do you think you will get them vaccinated…?"*

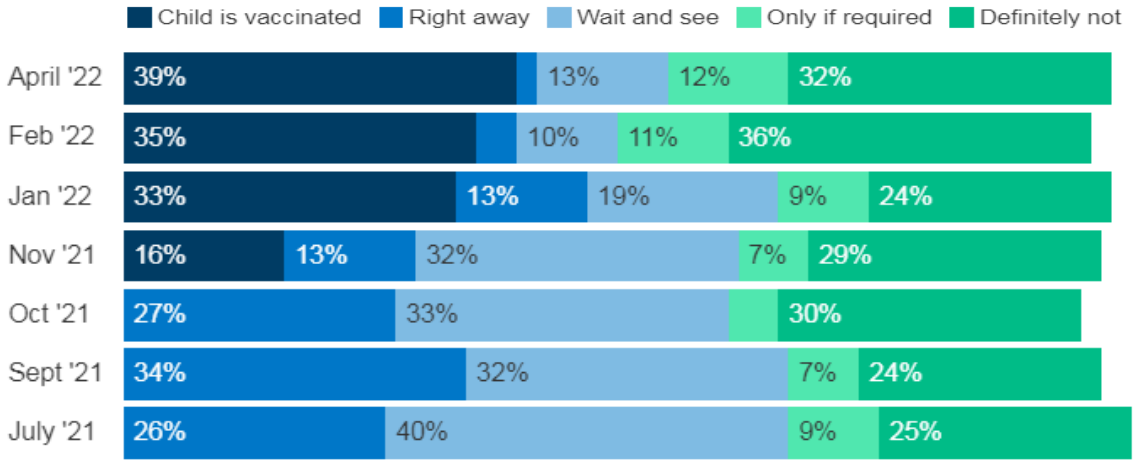


The survey was conducted April 13-26, 2022, among a nationally representative random digit dial telephone sample of 1,889 adults ages 18 and older.

KFF COVID-19 Vaccine Monitor: April 2022. https://www.kff.org/coronavirus-covid-19/dashboard/kff-covid-19-vaccine-monitor-dashboard/#parents. Accessed May 4, 2022

About four in ten parents of children ages 5 - 11 years say their child has been vaccinated, but a third say they will "definitely not"

- Survey respondents were asked, *"Thinking about your children between the ages of 5 and 11, have they received at least one dose of a COVID-19 vaccine, or not? If not, do you think you will get them vaccinated…?"*

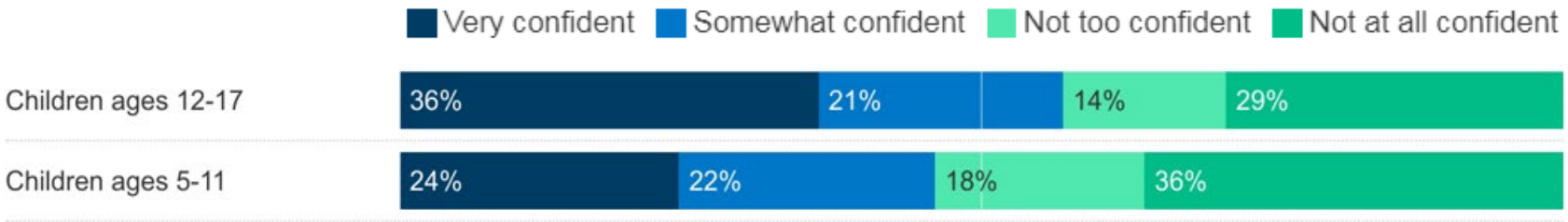


The survey was conducted February 9-21, 2022, among a nationally representative random digit dial telephone sample of 1,502 adults ages 18 and older.

KFF COVID-19 Vaccine Monitor: February 2022. https://www.kff.org/coronavirus-covid-19/dashboard/kff-covid-19-vaccine-monitor-dashboard/#parents. Accessed May 4, 2022

More parents of adolescents are confident COVID-19 vaccines are safe

- Survey respondents were asked, *"How confident, if at all, are you that COVID-19 vaccines are safe for…?"*



The survey was conducted February 9-21, 2022, among a nationally representative random digit dial telephone sample of 1,502 adults ages 18 and older.

KFF COVID-19 Vaccine Monitor: February 2022. https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-february-2022/ Accessed March 8, 2022

Adolescent survey (n=832) of potential factors that would increase vaccination

- Vaccine hesitant adolescents ages 12–17 years reported factors that would **increase vaccination** intent are:
  - More information about **safety** (22%) and **efficacy** (18%)
  - **Preventing the spread** of COVID-19 to family and friends (17%),
  - Resumption of or increase in **social activities** (16%) and **traveling** (15%)

Scherer AM, Gedlinske AM, Parker AM, et al. Acceptability of Adolescent COVID-19 Vaccination Among Adolescents and Parents of Adolescents — United States, April 15–23, 2021. MMWR Morb Mortal Wkly Rep 2021;70:997–1003. DOI: http://dx.doi.org/10.15585/mmwr.mm7028e1

Values: Summary of the Available Evidence

- Approximately **56%** of parents of adolescents ages 12–17 and **39%** of parents of children ages 5–11 years report that their child is already vaccinated, whereas **~30%** of parents for both age groups report their child will "definitely not" get vaccinated
- Parents of adolescents express the most confidence in the safety of COVID-19 vaccines, whereas fewer parents of children ages 5-11 years are confident
- More information about **vaccine safety** and **efficacy**, ability to prevent the spread to family and friends and **resumption of social activities** and travel are potential factors that may increase vaccination intent among adolescents

Values

Criteria 1:

Does the target population feel that the desirable effects are large relative to undesirable effects?

- How does the target population view the balance of desirable versus undesirable effects?
- Would patients/caregivers feel that the benefits outweigh the harms and burden?
- Does the population appreciate and value the Moderna COVID-19 vaccine?

○ Minimal	○ Small	○ Moderate	○ Large	○ Varies	○ Don't know

Values

Criteria 2:

Is there important uncertainty about, or variability in, how much people value the main outcomes?

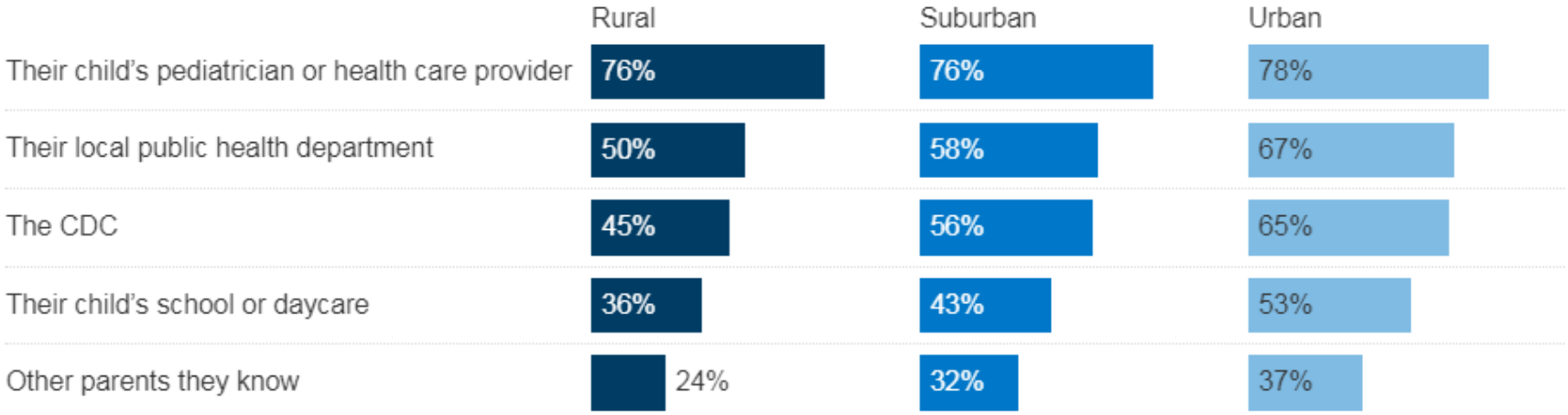
- How much do individuals value each outcome in relation to the other outcomes?
- Is there evidence to support those value judgements?
- Is there evidence that the variability is large enough to lead to different decisions?

- ○ Important uncertainty or variability
- ○ Probably important uncertainty or variability
- ○ Probably not important uncertainty or variability
- ○ No important uncertainty or variability
- ○ No known undesirable outcomes

EtR Domain: Acceptability

Pediatricians are top trusted source of child vaccine information for parents across community types

- Percent of parents who say they trust each of the following a great deal or a fair amount to provide reliable information about the COVID-19 vaccines for children:

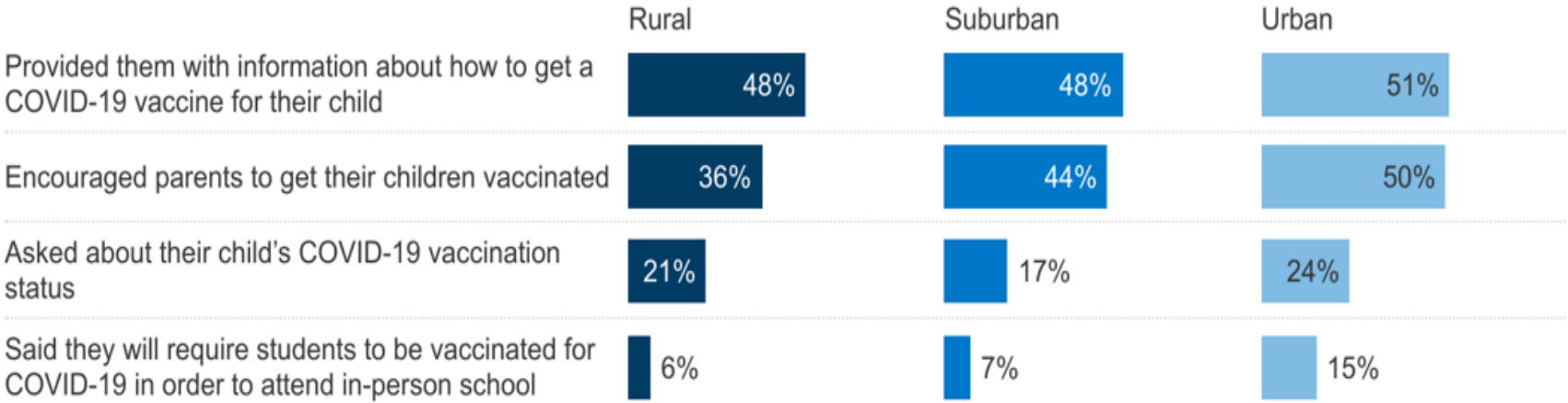


The survey was conducted November 8-23, 2021, via telephone and online among a nationally representative sample of 1,196 parents with a child under the age of 18 in their household. The sample includes 483 parents reached through the November 2021 KFF COVID-19 Vaccine Monitor and 713 who were reached online through a probability-based online panel (SSRS Opinion Panel and Ipsos Knowledge Panel).

KFF COVID-19 Vaccine Monitor: Winter Update on Parents' Views (November 8-23, 2021). https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-vaccine-attitudes-rural-suburban-urban/ Accessed March 7, 2022

One third of rural parents say their child's school has encouraged vaccination, half of urban parents say the same

- Percent of parents who say their child's school has done each of the following:



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KFF COVID-19 Vaccine Monitor: Winter Update on Parents' Views (November 8-23, 2021). https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-vaccine-attitudes-rural-suburban-urban/ Accessed May 26, 2022

Jurisdictional approach to administer COVID-19 vaccine

Jurisdictional immunization programs on implementation planning for children

Strategy	Description	Example	% Share of jurisdictions
Multi-pronged approach	• Using a combination of the three below approaches, often staged over time.	**Region 8 jurisdiction:** "Believe a hybrid model will be needed by utilizing enrolled providers and other pending outreach activities."	46%
Existing provider network	• Reaching adolescents through existing enrolled provider network, including mass vax and public health sites.	**Region 1 jurisdiction:** "Plan to encourage in all existing channels including mass vaccination clinics, retail pharmacy partners, and some local health dept clinics."	28%
Pediatric providers and PCPs	• Emphasis on reaching population through activation of new pediatric providers and family doctors.	**Region 4 jurisdiction:** "Actively recruiting for additional pediatricians to join the COVID enrollment. Sent out notification to bring on additional providers."	15%
School-based clinics	• Preparing school-based clinics and events to reach population through temporary PODs.	**Region 4 jurisdiction:** "Received interest from schools with successful teacher vaccination clinics …will use grant funds to support these."	11%

PODs = Points of dispensing

Source: Jurisdiction data call survey – 05/03/21-05/06/21. n=46.

Parent-reported place of COVID-19 vaccination among children and adolescents, National Immunization Survey

Child COVID-19 Module (NIS-CCM), August 2021–May 2022

	Place of vaccination				
	Medical Place	Pharmacy	School	Mass Vaccination Site	Other Non-Medical Place
Overall	**38%**	**45%**	**6%**	**7%**	**4%**
5-11 years	47%	37%	8%	5%	3%
12-17 years	35%	48%	5%	8%	4%

Notes: The NIS-CCM is an on-going random-digit-dialed telephone survey that began in July 2021 to collect COVID-19 vaccination status and intent for children from adult respondents knowledgeable about the child's vaccination status. All estimates are weighted to represent the non-institutionalized U.S. population of children and mitigate possible bias that can result from an incomplete sample frame or non-response. Survey weights were calibrated to vaccine administration data reported to CDC. For more information about the survey, see https://www.cdc.gov/vaccines/imz-managers/nis/about.html#nis-ccm and https://www.cdc.gov/vaccines/imz-managers/coverage/covidvaxview/index.html.

Acceptability: Summary of the available evidence

- Most jurisdictions utilizing a variety of implementation strategies to vaccinate children and adolescents
- Most children and adolescents are receiving a COVID-19 vaccine at their **medical home** or local **pharmacy**
- **Pediatricians** are the **top trusted source** for information about the COVID-19 vaccines for children among parents across community types

Acceptability

Is Moderna COVID-19 vaccine acceptable to key stakeholders?

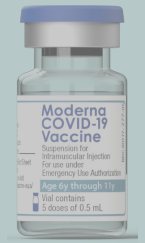
- Are there key stakeholders that would not accept the distribution of benefits and harms?
- Are there key stakeholders that would not accept the undesirable effects in the short term for the desirable effects (benefits) in the future?

○ No	○ Probably no	○ Probably yes	○ Yes	○ Varies	○ Don't know

EtR Domain: Feasibility

Moderna COVID-19 vaccine product for children ages 6–11 years

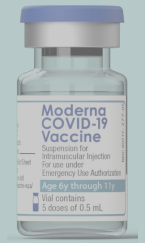
Moderna COVID-19 Vaccine Products

Age Group	6 months through 5 years (*Primary Series*)	6 years through 11 years (*Primary Series*) *Currently unavailable (Use the vial with dark blue cap and a label with a purple border)*	6 years through 11 years (*Primary Series*)	12 years and older (*Primary Series*)
			18 years and older (*Booster Dose*)	18 years and older (*Booster Dose*)
Vial Cap Color	Dark Blue	Dark Blue	Dark Blue	Red
Vial Label Border Color	MAGENTA	TEAL	PURPLE	LIGHT BLUE
Vial Image				
Primary Dose Volume	0.25 mL	0.5 mL	0.5 mL	0.5 mL
Booster Dose Volume	None	None	0.5 mL	0.25 mL

- Moderna vaccine, 50mcg:
  - Ships at -20°C
  - Same cap color as product for children ages 6 month–5 years (blue)
  - Different color border (purple)
  - Different concentration than adult primary series (25µg/0.25mL)
  - Product labeled as “Booster dose, 18 years and older” authorized for use
  - Does not require diluent

Moderna COVID-19 vaccine product for adolescents ages 12–17 years

Moderna COVID-19 Vaccine Products

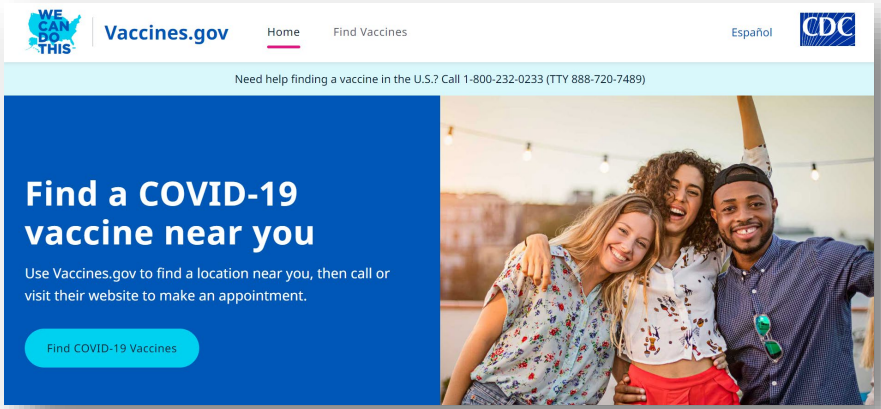
Age Group	6 months through 5 years (*Primary Series*)	6 years through 11 years (*Primary Series*) *Currently unavailable (Use the vial with dark blue cap and a label with a purple border)*	6 years through 11 years (*Primary Series*) / 18 years and older (*Booster Dose*)	12 years and older (*Primary Series*) / 18 years and older (*Booster Dose*)
Vial Cap Color	Dark Blue	Dark Blue	Dark Blue	Red
Vial Label Border Color	MAGENTA	TEAL	PURPLE	LIGHT BLUE
Vial Image				
Primary Dose Volume	0.25 mL	0.5 mL	0.5 mL	0.5 mL
Booster Dose Volume	None	None	0.5 mL	0.25 mL

- Moderna vaccine, 100 mcg:
  - Ships at -20°C
  - Red cap, light blue border
  - Same as product approved for adults
  - 0.5mL volume for primary series in individuals ≥12 years
  - 0.25mL volume for booster dose in adults ≥18 years
  - No new national drug code (NDC)
  - Does not require diluent

CDC. Updated Pediatric COVID-19 Vaccination Operational Planning Guide – Information for the COVID-19 Vaccine for Children 6 Months through 4 Years Old and/or COVID-19 Vaccine for Children 6 Months through 5 Years Old. https://www.cdc.gov/vaccines/covid-19/downloads/Pediatric-Planning-Guide.pdf Accessed June 1, 2022

Resources to locate vaccination sites

- Parents and their children can find a COVID-19 vaccine by:
  - Searching vaccines.gov online
  - Texting their ZIP code to 438829
  - Calling 1-800-232-0233 to find locations near them



Feasibility: Summary of the Available Evidence

- Moderna vaccine for children and adolescents ages 6–17 years
  - May be less familiar to pediatric healthcare providers
  - Product able to be stored at traditional freezer temperatures
  - Does not require diluent
  - Product for children ages 6–11 years will be labeled as ‘booster dose, 18 years and older’, which will require considerable education
  - Product for adolescents ages 12–17 years is the same as adult formulation, will be more familiar to providers and pharmacies

Feasibility

Is the Moderna COVID-19 vaccine feasible to implement among children ages 6 – 11 years and adolescents ages 12 – 17 years?

- Is the Moderna COVID-19 vaccine program sustainable?
- Are there barriers that are likely to limit the feasibility of implementing the Moderna COVID-19 vaccine or require considerations when implementing it?
- Is access to Moderna COVID-19 vaccine an important concern?

○ No	○ Probably no	○ Probably yes	○ Yes	○ Varies	○ Don't know

EtR Domain: Resource Use

Resource Use: Review of the available evidence

- Studies in adults have shown COVID-19 related healthcare costs in the United States could be **billions** or **trillions** of dollars[1,2]. Given this, COVID-19 vaccines overall are likely cost-saving[3-5].
- In a study conducted by Pfizer, they estimated that Pfizer-BioNTech COVID-19 vaccine use in individuals ages ≥12 years in 2021 averted 9 million symptomatic cases, almost 700,000 hospitalizations and over 110,00 deaths resulting in $30.4 billion direct healthcare cost savings[6]
- At this time, vaccine will be available at no cost to the recipient
- Cost-effectiveness not a primary driver for decision making during a pandemic, but will be reassessed in the future

[1] Bartsch et al https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2020.00426 [2] Cutler and Summers. JAMA https://jamanetwork.com/journals/jama/fullarticle/2771764

[3] Bartsch et al. JID https://academic.oup.com/jid/article/224/6/938/6267841?login=true [4] Kohli et al. Vaccine https://www.sciencedirect.com/science/article/pii/S0264410X2031690X

[5] Li et al. Int JID https://www.sciencedirect.com/science/article/pii/S1201971222001680

[6] Di Fusco et al Full article: Public health impact of the Pfizer-BioNTech COVID-19 vaccine (BNT162b2) in the first year of rollout in the United States (tandfonline.com)

Resource Use

Is the Moderna COVID-19 vaccine among children ages 6 – 11 years and adolescents ages 12 – 17 years a reasonable and efficient allocation of resources?

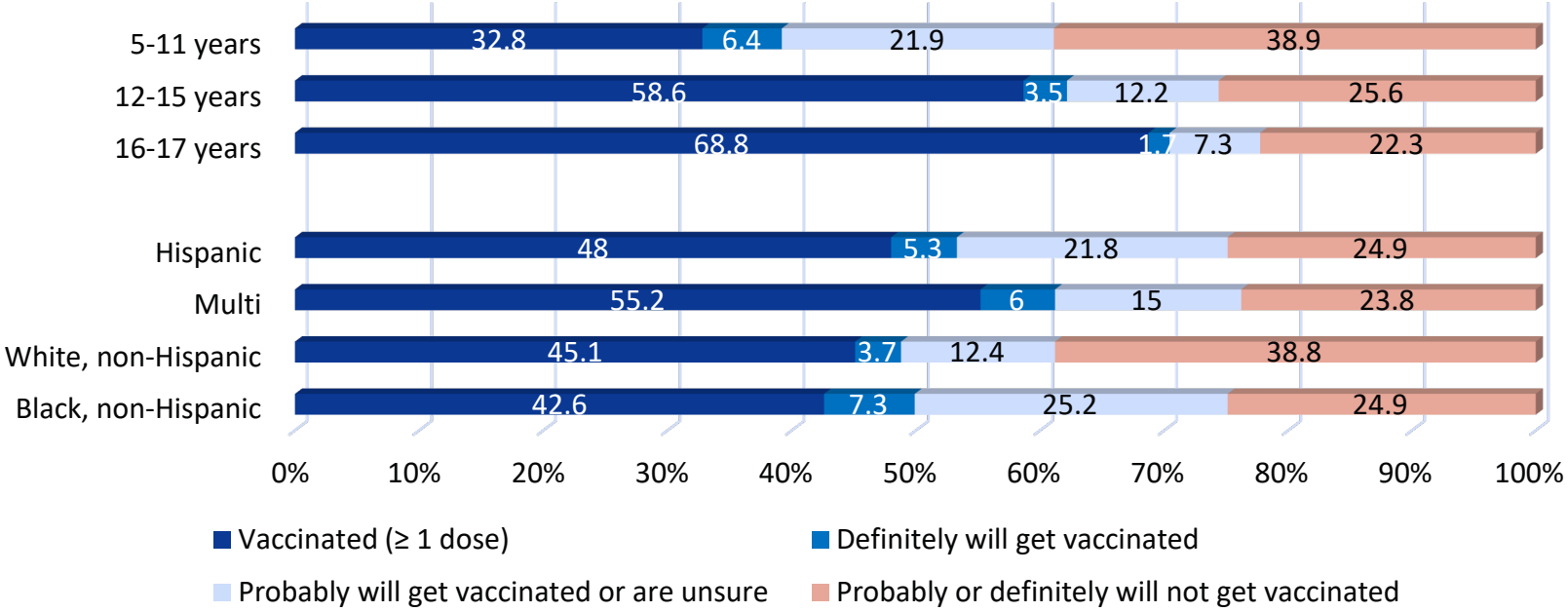
- What is the cost-effectiveness of the Moderna COVID-19 vaccine?
- How does the cost-effectiveness of the Moderna COVID-19 vaccine change in response to changes in context, assumptions, etc.?

○ No	○ Probably no	○ Probably yes	○ Yes	○ Varies	○ Don't know

EtR Domain: Equity

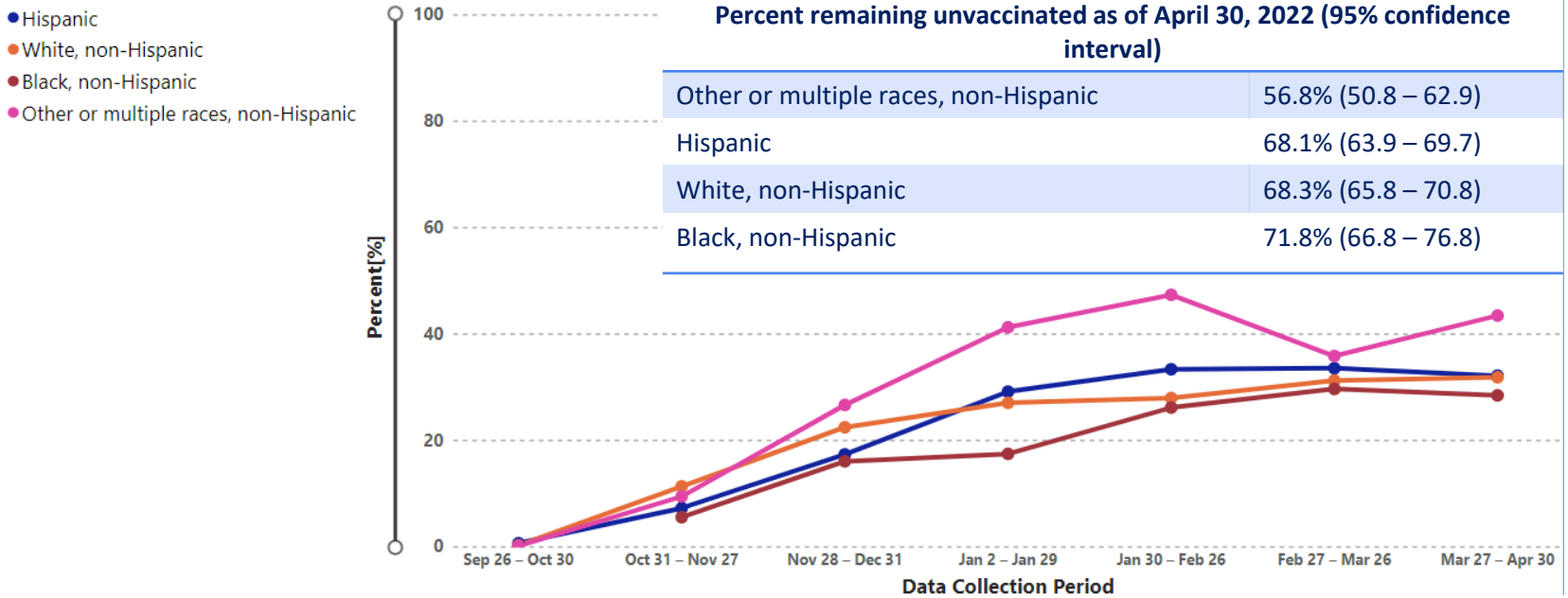
Vaccination coverage and parental intent for children by age and race and ethnicity, United States

Data Collection Period: March 27 – April 30, 2022 (N = 9,587)



CDC COVID Data Tracker. Trends in COVID-19 Vaccine Confidence in the US. https://covid.cdc.gov/covid-data-tracker/#vaccine-confidence. Accessed May 20, 2022

Monthly percent of children ages 5–11 years with at least 1 COVID-19 vaccine dose, by race and ethnicity, September 26, 2021–April 30, 2022

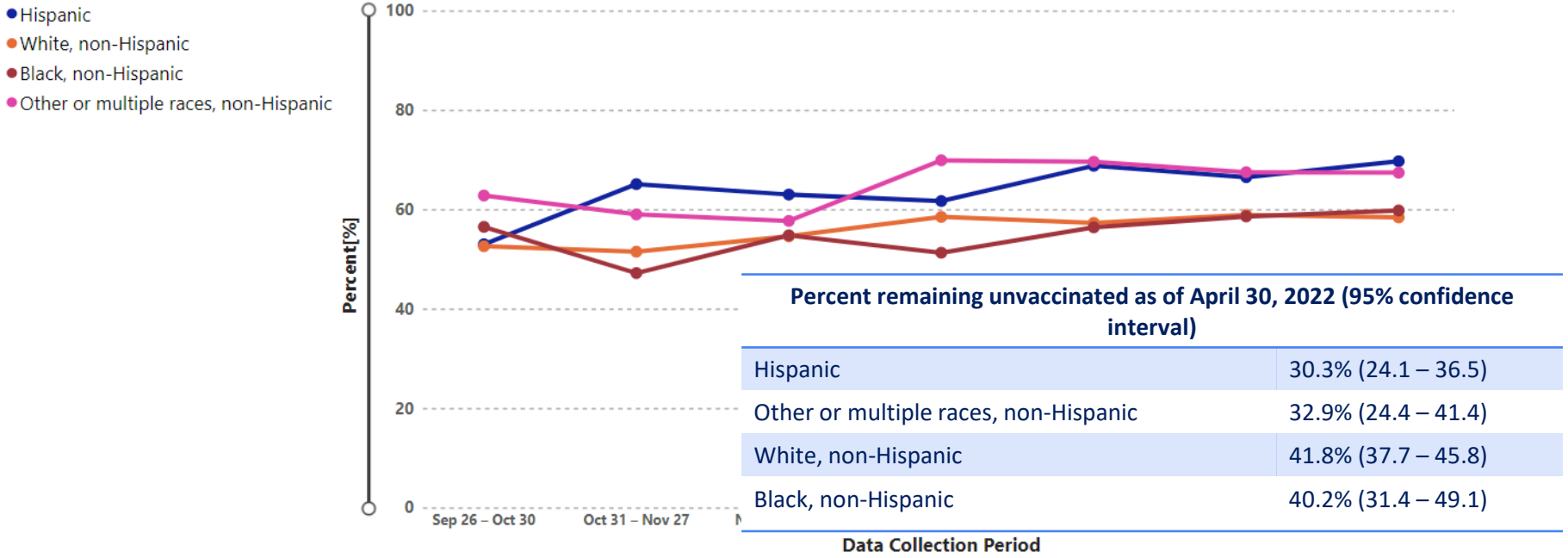


Percent remaining unvaccinated as of April 30, 2022 (95% confidence interval)	
Other or multiple races, non-Hispanic	56.8% (50.8 – 62.9)
Hispanic	68.1% (63.9 – 69.7)
White, non-Hispanic	68.3% (65.8 – 70.8)
Black, non-Hispanic	71.8% (66.8 – 76.8)

Source: Estimates produced by NORC at the University of Chicago using CDC's National Immunization Survey-Adult COVID-19 Module (NIS-ACM). COVID-19 Vaccination Coverage and Vaccine Confidence Among Children | CDC. Accessed June 2, 2022.

Monthly percent of adolescents ages 12–17 years with at least 1 COVID-19 vaccine dose, by race and ethnicity,

September 26, 2021–April 30, 2022

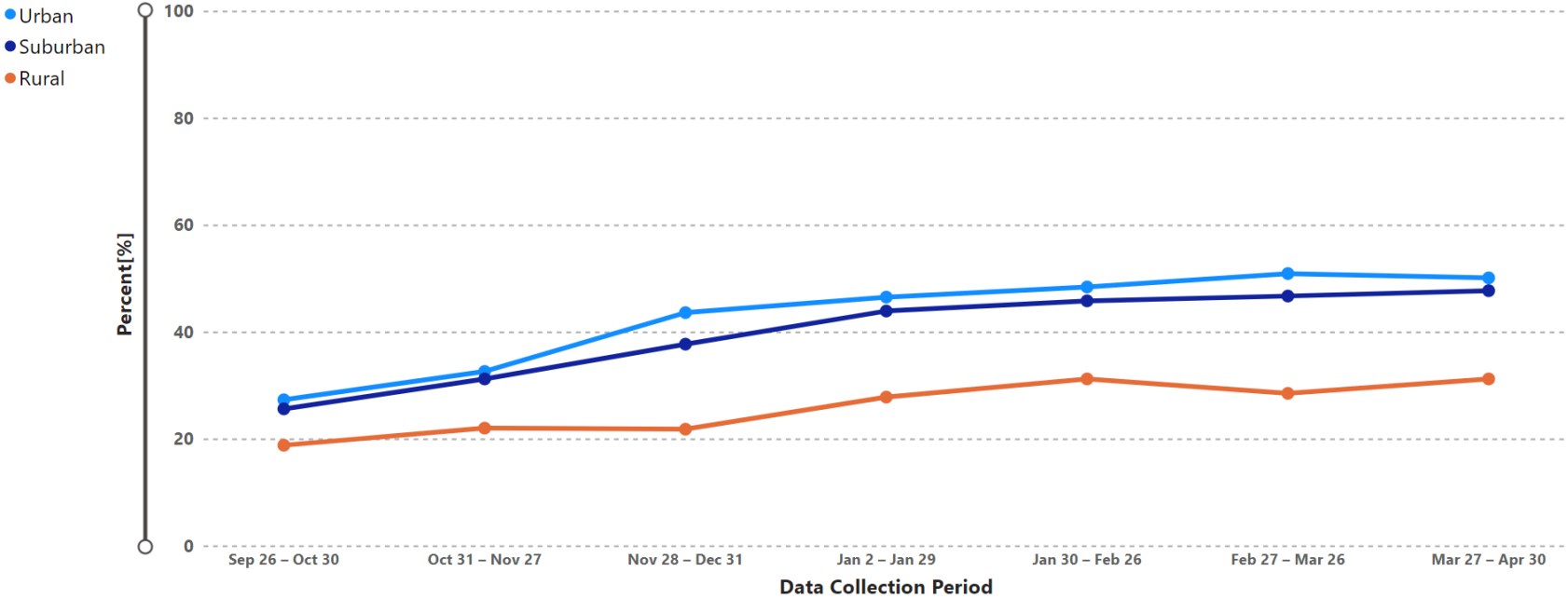


Percent remaining unvaccinated as of April 30, 2022 (95% confidence interval)	
Hispanic	30.3% (24.1 – 36.5)
Other or multiple races, non-Hispanic	32.9% (24.4 – 41.4)
White, non-Hispanic	41.8% (37.7 – 45.8)
Black, non-Hispanic	40.2% (31.4 – 49.1)

Source: Estimates produced by NORC at the University of Chicago using CDC's National Immunization Survey-Adult COVID-19 Module (NIS-ACM). COVID-19 Vaccination Coverage and Vaccine Confidence Among Children | CDC. Accessed June 2, 2022.

Monthly percent of children and adolescents ages 5 – 17 years with ≥1 COVID-19 vaccine dose by metropolitan statistical area (MSA) categorization

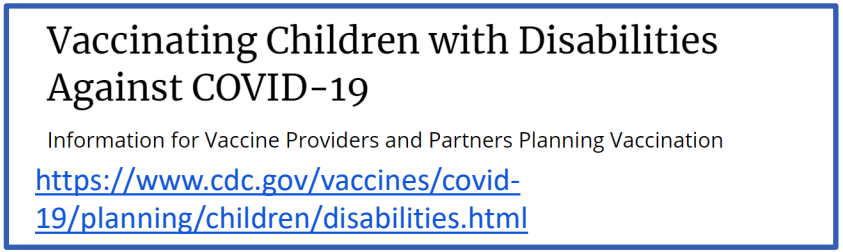
September 26, 2021–April 30, 2022

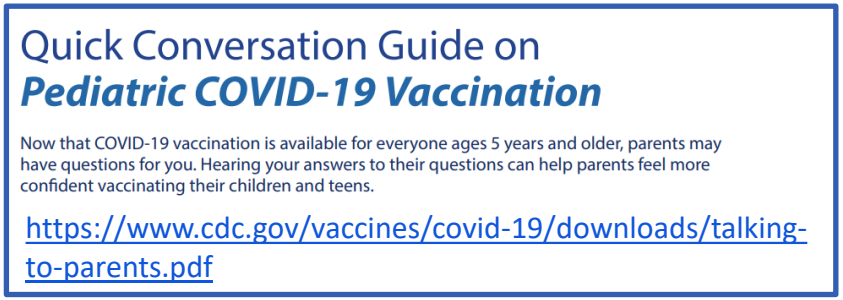


Source: Estimates produced by NORC at the University of Chicago using CDC's National Immunization Survey-Adult COVID-19 Module (NIS-ACM). COVID-19 Vaccination Coverage and Vaccine Confidence Among Children | CDC. Accessed May 25, 2022.

Communication resources for vaccine providers and partners

- Website on vaccinating children with disabilities
- Updated quick conversation guide for talking with families
- Medscape commentary on routine pediatric and COVID-19 vaccination
- Customizable materials that align with key messages
- Updated information for schools to include content for childcare partners

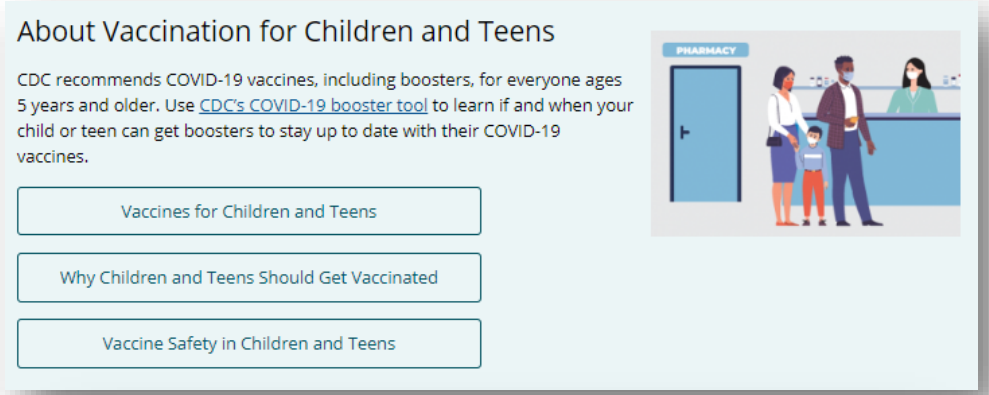




CDC. Vaccinating Children with Disabilities Against Disabilities. https://www.cdc.gov/vaccines/covid-19/planning/children/disabilities.html Accessed June 21, 2022
CDC. Quick Conversation Guide on Pediatric COVID-19 Vaccination. https://www.cdc.gov/vaccines/covid-19/downloads/talking-to-parents.pdf Accessed June 21, 2022

Communicating with parents and caregivers

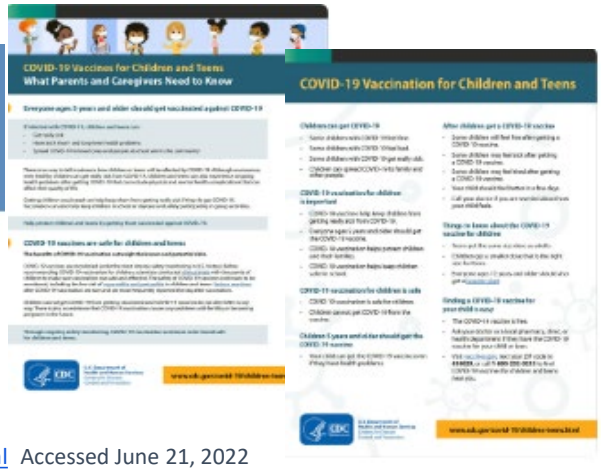
- Redesigned websites
  - COVID-19 Vaccines for Children and Teens
  - Frequently Asked Questions about COVID-19 Vaccination in Children
  - 6 Things to Know About COVID-19 Vaccination for Children and Teens
    - *short videos in development*
- New website content for COVID-19 Vaccination for Children with Disabilities
- Culturally and linguistically appropriate materials including printable fact sheets
  - Available in Amharic, Arabic, Chinese, English, French, Korean, Portuguese, Spanish, Vietnamese



Additional resources: www.cdc.gov/vaccines/covid-19/planning/children/resources-promote.html

Resources to promote the COVID-19 vaccine for children and teens

- Social Media Graphics and Posters
  - Age-appropriate COVID-19 vaccine educational posters and social media graphics to use in exam rooms, waiting rooms, classrooms, and on social media channels
- Videos
  - View, share or embed videos on websites, use as PSAs, and post on social media
- Fact Sheets
  - **Coming Soon**: COVID-19 Vaccines for Children and Teens – What Parents and Caregivers Need to Know
  - **Coming Soon**: COVID-19 Vaccination for Children and Teens (Information for families with lower health literacy)



CDC. Vaccines and Immunizations. https://www.cdc.gov/vaccines/covid-19/planning/children/resources-promote.html Accessed June 21, 2022

Equity: Summary of the Available Evidence

- There are noted disparities in vaccination coverage and parental intent for children by age, race and ethnicity and metropolitan area
- Communications materials that are culturally appropriate and diverse, including materials for children with special healthcare needs, are important

Equity

What would be the impact of the Moderna COVID-19 vaccine among children ages 6 – 11 years and adolescents ages 12 – 17 years on health equity?

- Are there groups or settings that might be disadvantaged in relation to COVID-19 disease burden or receipt of the Moderna COVID-19 vaccine?
- Are there considerations that should be made when implementing the Moderna COVID-19 vaccine program to ensure that inequities are reduced whenever possible, and that they are not increased?

○ Reduced	○ Probably reduced	○ Probably no impact	
○ Probably increased	○ Increased	○ Varies	○ Don't know

Summary

EtR Domain	Question	Work Group Judgments
Public Health Problem	Is COVID-19 disease among children ages 6 – 11 years and adolescents ages 12 – 17 years of public health importance?	Yes
Benefits and Harms	How substantial are the desirable anticipated effects?	Large
	How substantial are the undesirable anticipated effects?	Small
	Do the desirable effects outweigh the undesirable effects?	Favors intervention
Values	Does the target population feel the desirable effects are large relative to the undesirable effects?	Varies
	Is there important variability in how patients value the outcomes?	Probably important uncertainty
Acceptability	Is the Moderna COVID-19 vaccine acceptable to key stakeholders?	Yes
Feasibility	Is the Moderna COVID-19 vaccine feasible to implement among children ages 6 – 11 years and adolescents ages 12 – 17 years?	Yes
Resource Use	Is the Moderna COVID-19 vaccine, given to children ages 6 – 11 years and adolescents ages 12 – 17 years a reasonable and efficient allocation of resources?	Yes
Equity	What would be the impact of the Moderna COVID-19 vaccine, given to children ages 6 – 11 years and adolescents ages 12 – 17 years on health equity?	Probably no impact

Work Group Interpretation

- Work Group discussed each age group for the Moderna COVID-19 vaccine primary series compared to no vaccine
- Two vaccine **options** may allow parents and providers a choice
- Moderna COVID-19 vaccine primary series in older children and adolescents met the non-inferiority endpoints, provide **protection** against symptomatic COVID-19 disease, and are expected to provide **higher protection** against **severe disease**
- An interval of **8 weeks** between dose 1 and dose 2 would likely improve both safety and effectiveness of the Moderna COVID-19 vaccine in older children and adolescents

Evidence to Recommendations Framework

Summary: Work Group Interpretations

Balance of consequences	Undesirable consequences *clearly outweigh* desirable consequences in most settings	Undesirable consequences *probably outweigh* desirable consequences in most settings	The balance between desirable and undesirable consequences is *closely balanced* or *uncertain*	Desirable consequences *probably outweigh* undesirable consequences in most settings	Desirable consequences *clearly outweigh* undesirable consequences in most settings	There is insufficient evidence to determine the balance of consequences

Moderna COVID-19 vaccine in children ages 6–11 years

Two doses of 50µg Moderna COVID-19 vaccine

Evidence to Recommendations Framework

Summary: Work Group Interpretations

Type of recommendation	We do not recommend the intervention	We recommend the intervention for individuals based on shared clinical decision-making	We recommend the intervention

Moderna COVID-19 vaccine in children ages 6–11 years

Two doses of 50µg Moderna COVID-19 vaccine

Evidence to Recommendations Framework

Summary: Work Group Interpretations

Balance of consequences	Undesirable consequences *clearly outweigh* desirable consequences in most settings	Undesirable consequences *probably outweigh* desirable consequences in most settings	The balance between desirable and undesirable consequences is *closely balanced* or *uncertain*	Desirable consequences *probably outweigh* undesirable consequences in most settings	Desirable consequences *clearly outweigh* undesirable consequences in most settings	There is insufficient evidence to determine the balance of consequences

Moderna COVID-19 vaccine in adolescents ages 12–17 years

Two doses of 100µg Moderna COVID-19 vaccine

Evidence to Recommendations Framework

Summary: Work Group Interpretations

Type of recommendation	We do not recommend the intervention	We recommend the intervention for individuals based on shared clinical decision-making	We recommend the intervention

Moderna COVID-19 vaccine in adolescents ages 12–17 years

Two doses of 100µg Moderna COVID-19 vaccine

Summary

- Since the beginning of the COVID-19 pandemic, among U.S. children ages 5 – 17 years of age, there have been

  Over **10 million cases**

  Over **45,000 hospitalizations**

  Over **600 deaths**

- COVID-19 can cause severe disease and death among children, including children without underlying medical conditions
- Future surges will continue to impact children, with unvaccinated children remaining at higher risk of severe outcomes

Summary

- As with all other age groups, priority is **vaccination** of **unvaccinated individuals**
- **25 million** unvaccinated children and adolescents ages 5–11 and 12–17 years
- Benefits outweigh risks for mRNA COVID-19 vaccines in all ages: receipt of **primary series** continues to be the **safest** way to **prevent serious COVID-19**

Questions to ACIP

- Should vaccination with Moderna COVID-19 vaccine (2-doses, **50 mcg**, IM) be recommended for **children ages 6 – 11 years**, under an Emergency Use Authorization?

- Should vaccination with Moderna COVID-19 vaccine (2-doses, **100 mcg**, IM) be recommended for **adolescents ages 12 – 17 years**, under an Emergency Use Authorization?

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- Eddie Shanley
- JoEllen Wolicki
- Kevin Chatham-Stevens
- VTF ACIP WG Team
- ACIP COVID-19 Vaccines Work Group
- Vaccine Task Force
- Epi Task Force
- Data Analytics and Visualization Task Force
- Respiratory Viruses Branch
- MIS-C unit
- CICP TF's Monitoring and Evaluation

Cumulative influenza- and COVID-19-associated hospitalization rates per 100 000 children and adolescents 5 – 17 years old, by age group – FluSurv-NET and COVID-NET, 2017–2022

Additional footnotes

Each season, FluSurv-NET surveillance is conducted from around October 1 of one year to around April 30 of the subsequent year.

The grayed-out area on each panel indicates weeks during which FluSurv-NET surveillance was not conducted but COVID-NET surveillance was conducted. FluSurv-NET rate lines were extended beyond week 18 for ease of comparison.

For the 2021–22 influenza season, data were only included through the week ending April 9, 2022, the last week for which data were available at the time of submission.

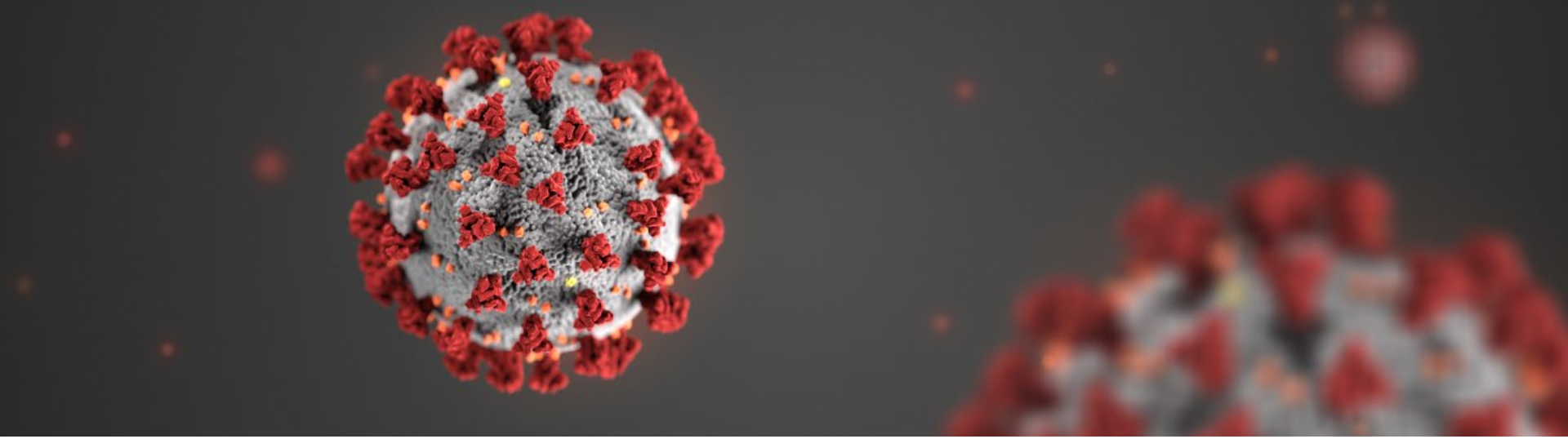
The COVID-NET surveillance period of October 2020–September 2021 begins at MMWR week 40 of year 2020 and ends at MMWR week 39 of year 2021.

The COVID-NET surveillance period for October 2021–April 2022 includes MMWR week 40 of 2021 through MMWR week 14 of 2022 (the week ending April 9, 2022, the last week for which data were available at the time of submission).

MMWR Week 53 for year 2020 is combined with MMWR Week 52 for consistency with other years.

FluSurv-NET = Influenza Hospitalization Surveillance Network; COVID-NET = COVID-19-Associated Hospitalization Surveillance Network; MMWR Week = week of epidemiologic year

Delahoy MJ, Ujamaa D, Taylor CA, et al. Comparison of influenza and COVID-19-associated hospitalizations among children < 18 years old in the United States-FluSurv-NET (October-April 2017-2021) and COVID-NET (October 2020-September 2021). Clin Infect Dis. 2022 May 20:ciac388. doi: 10.1093/cid/ciac388.



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

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