Vaccines and Related Biological Products Advisory Committee Meeting

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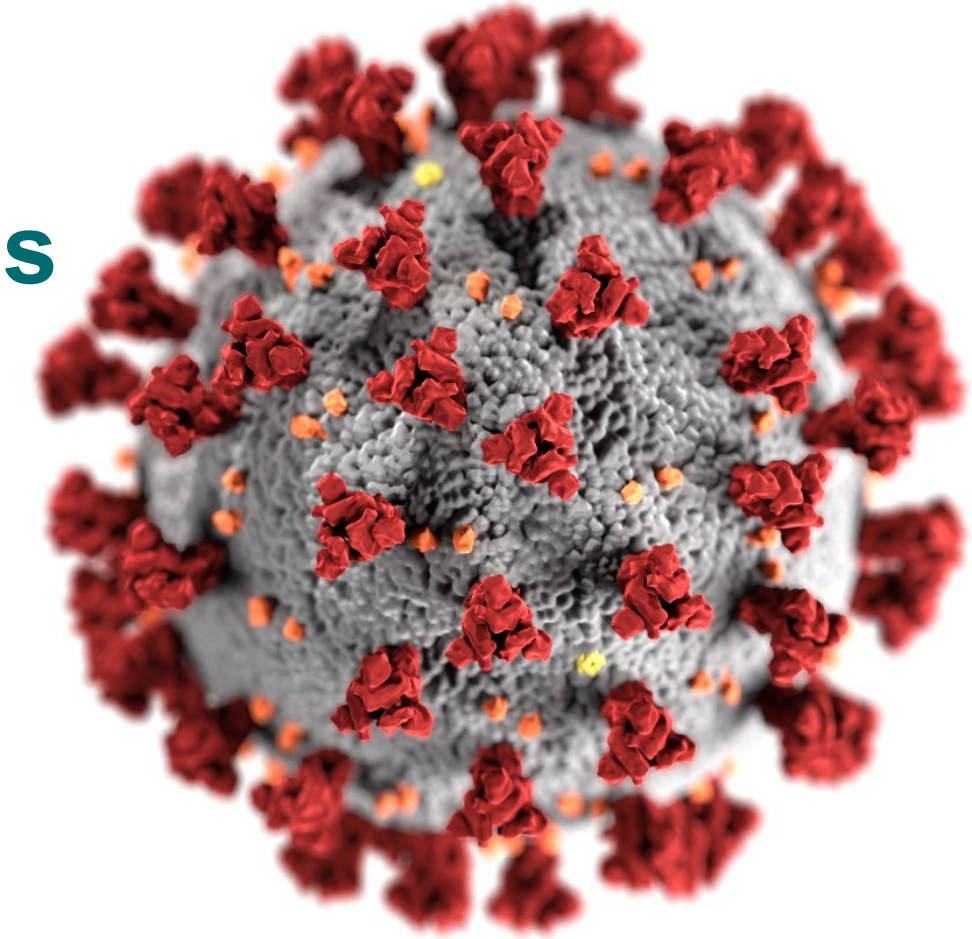
COVID-19 epidemiology in children and adolescents ages 6 months–17 years



Katherine E. Fleming-Dutra, MD
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
June 14, 2022

cdc.gov/coronavirus

Overview

- COVID-19 incidence and burden
- Emergency department visits
- Hospitalization rates and severity
- COVID-19-associated mortality
- Multisystem Inflammatory Syndrome in Children (MIS-C)
- Post-COVID conditions
- Other impacts of the pandemic on children and families

6 months–4 years

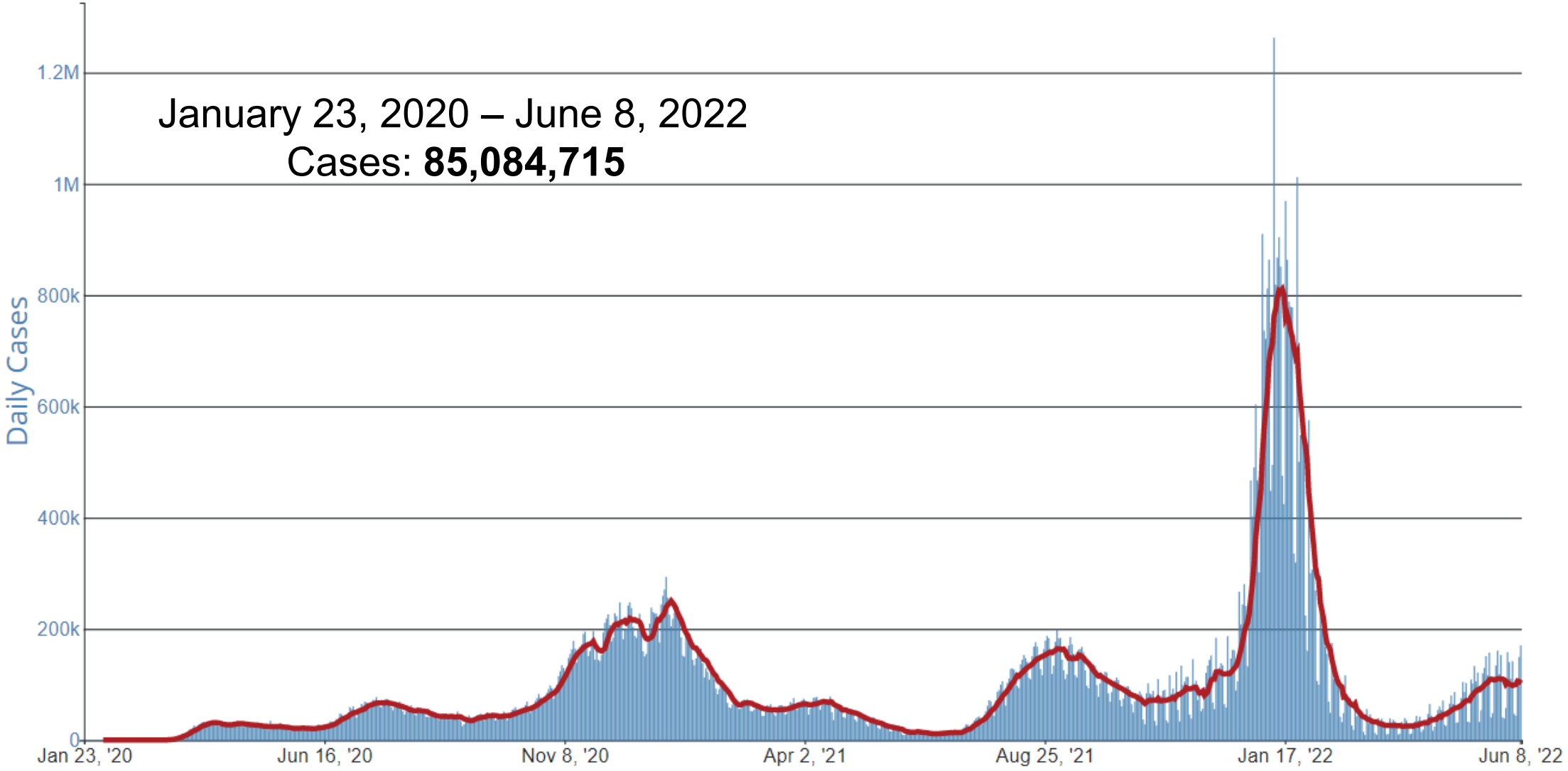
5–11 years

12–17 years

Currently eligible for COVID-19 vaccination

COVID-19 incidence and burden

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 June 9, 2022

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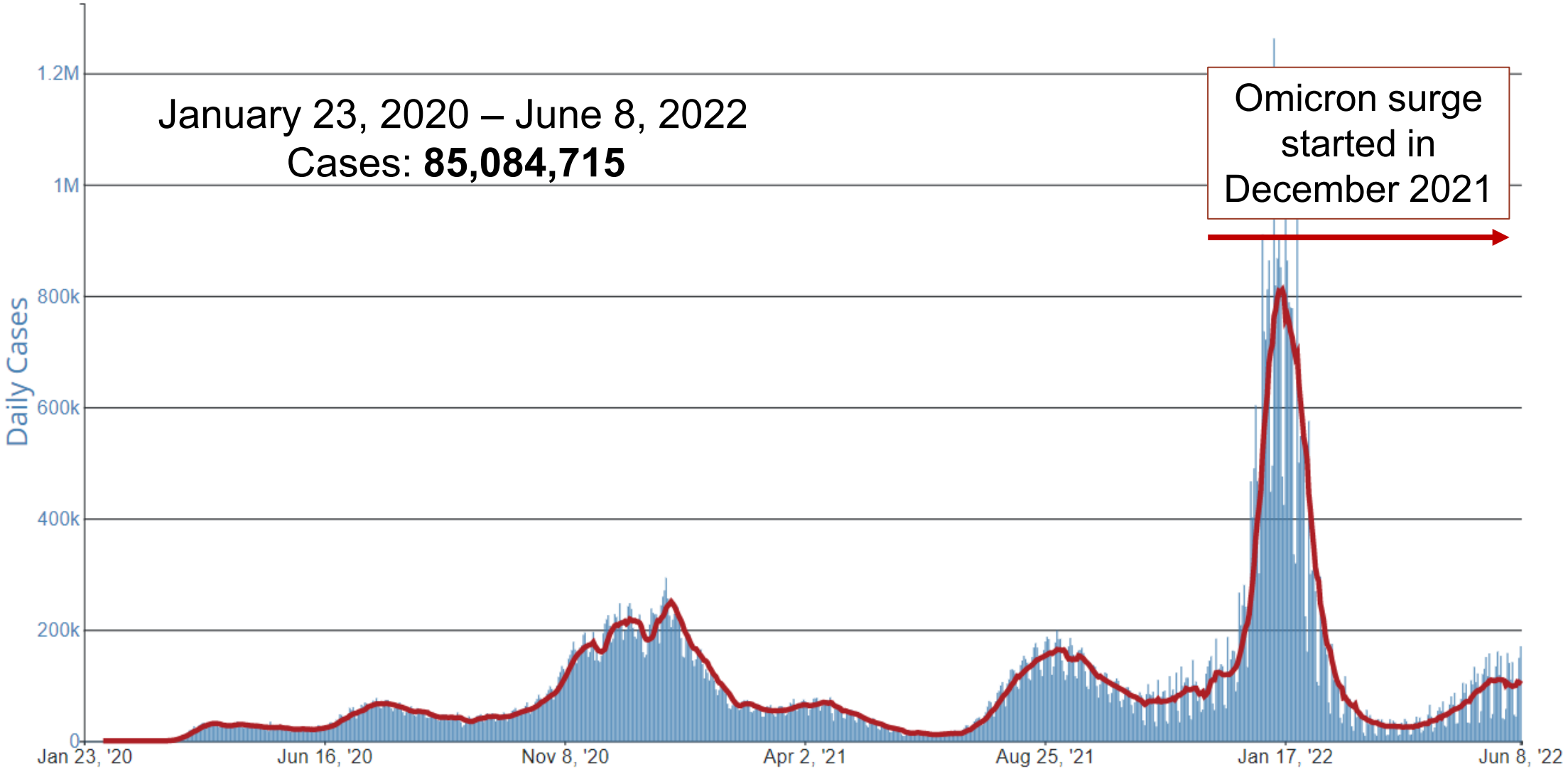

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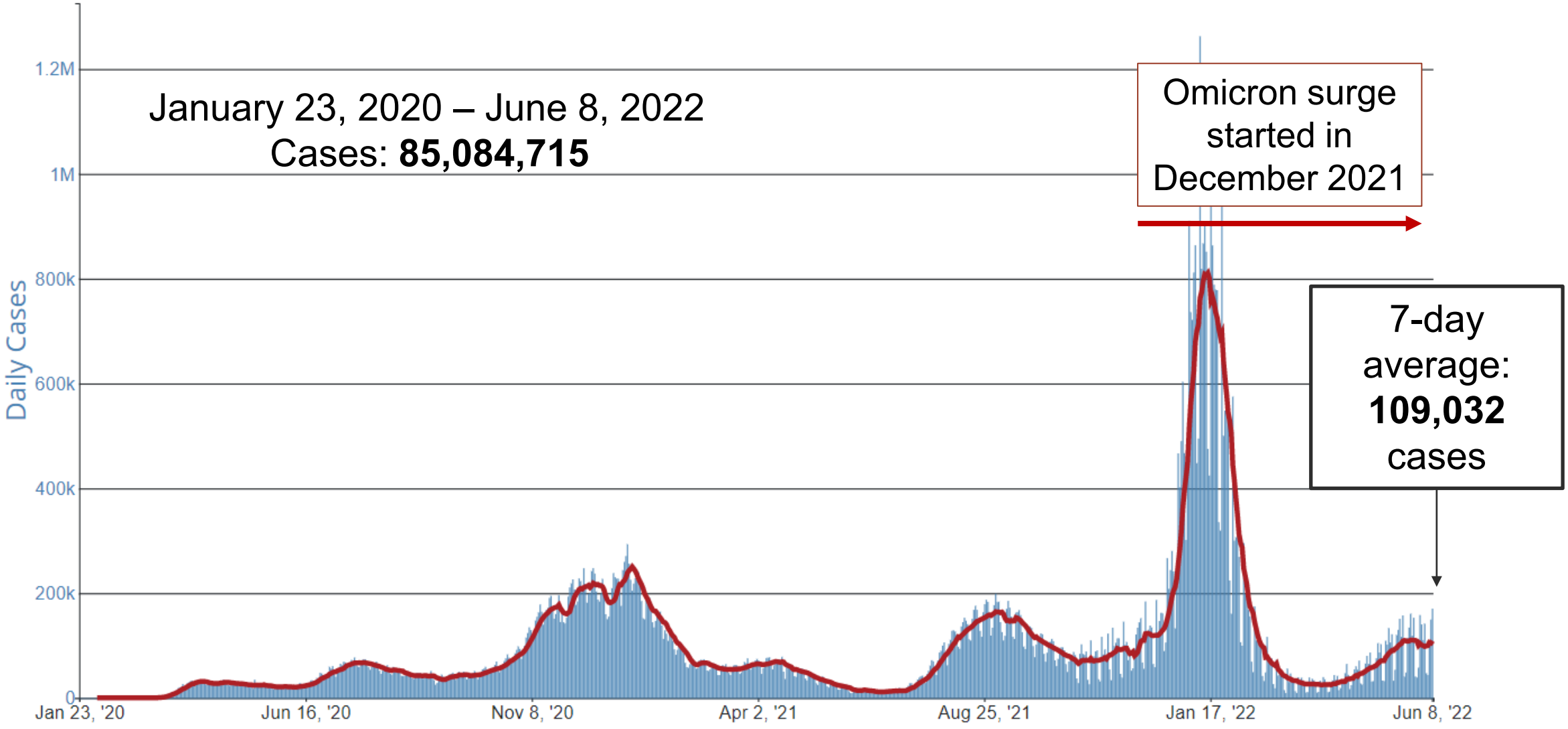
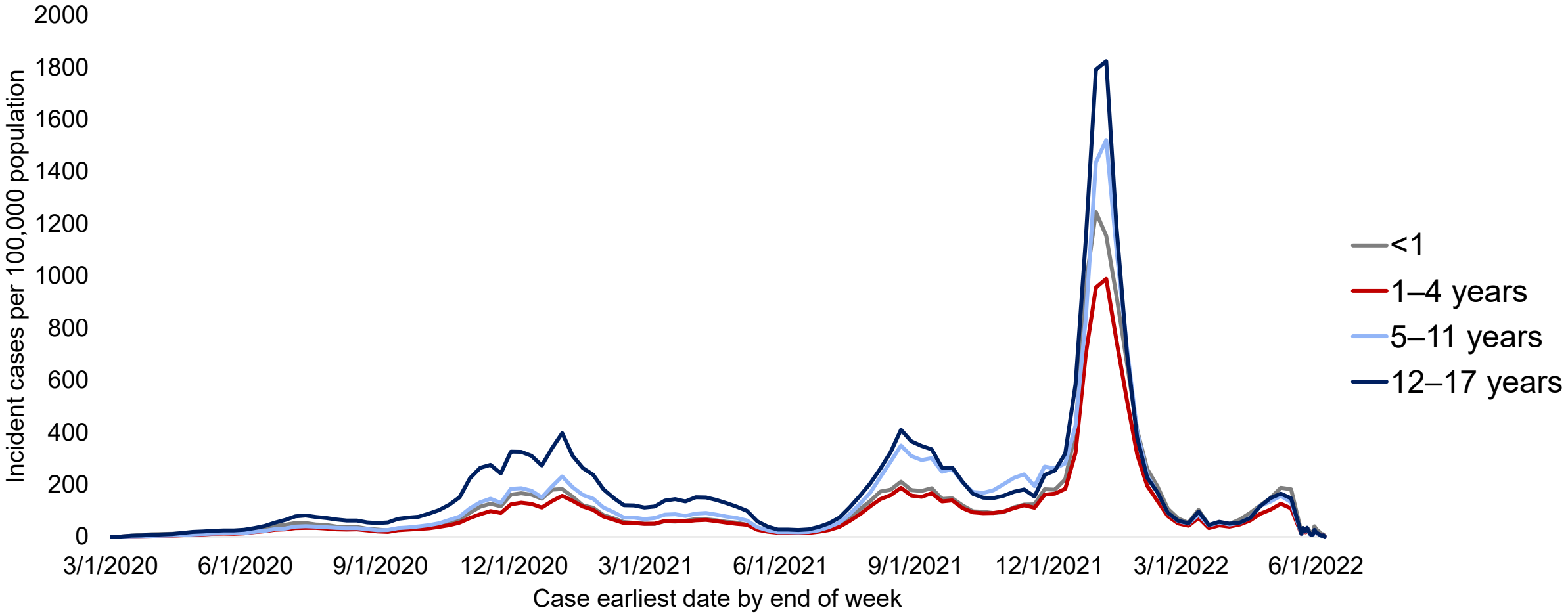


Source: COVID Data Tracker, https://covid.cdc.gov/covid-data-tracker/#trends_dailytrendscases. Accessed June 9, 2022

COVID-19 weekly cases per 100,000 population among children ages 0–17 years by age group — United States

March 1, 2020–June 7, 2022

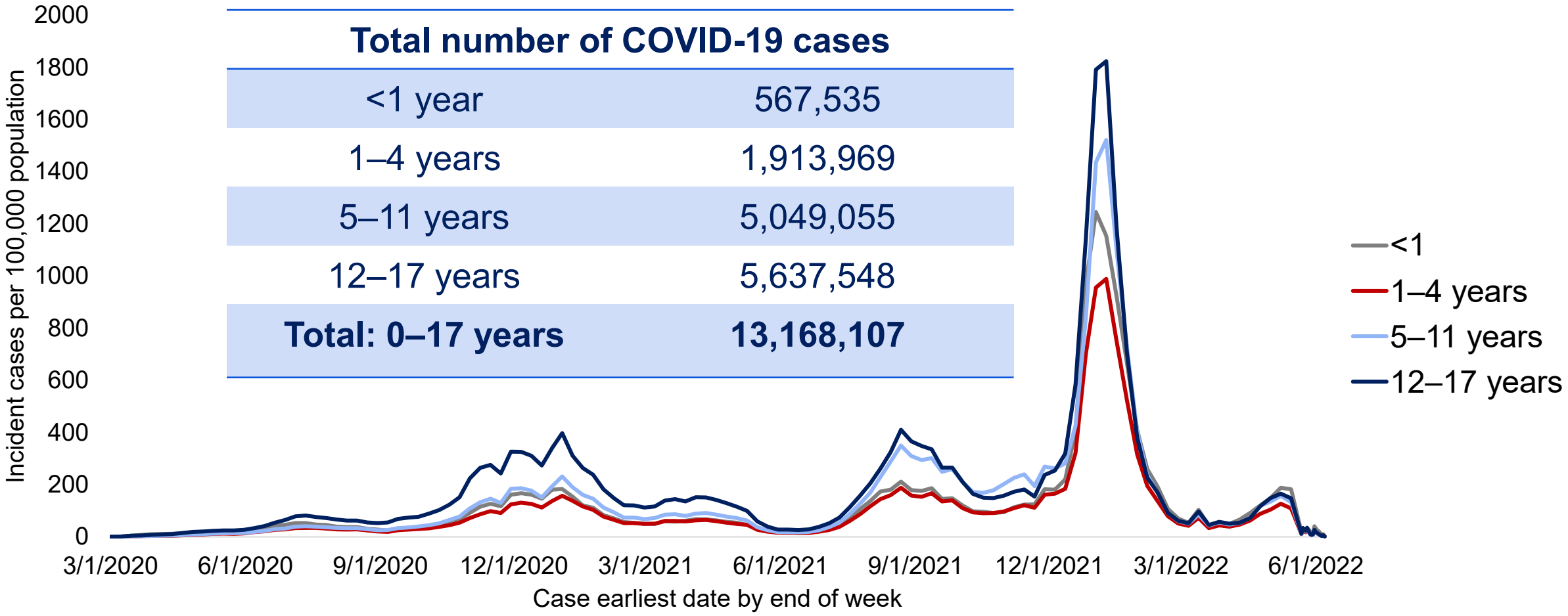


Source: COVID Data Tracker, https://covid.cdc.gov/covid-data-tracker/#demographicsovertime. Accessed June 8, 2022

COVID-19 weekly cases per 100,000 population among children ages 0–17 years by age group — United States

March 1, 2020–June 7, 2022

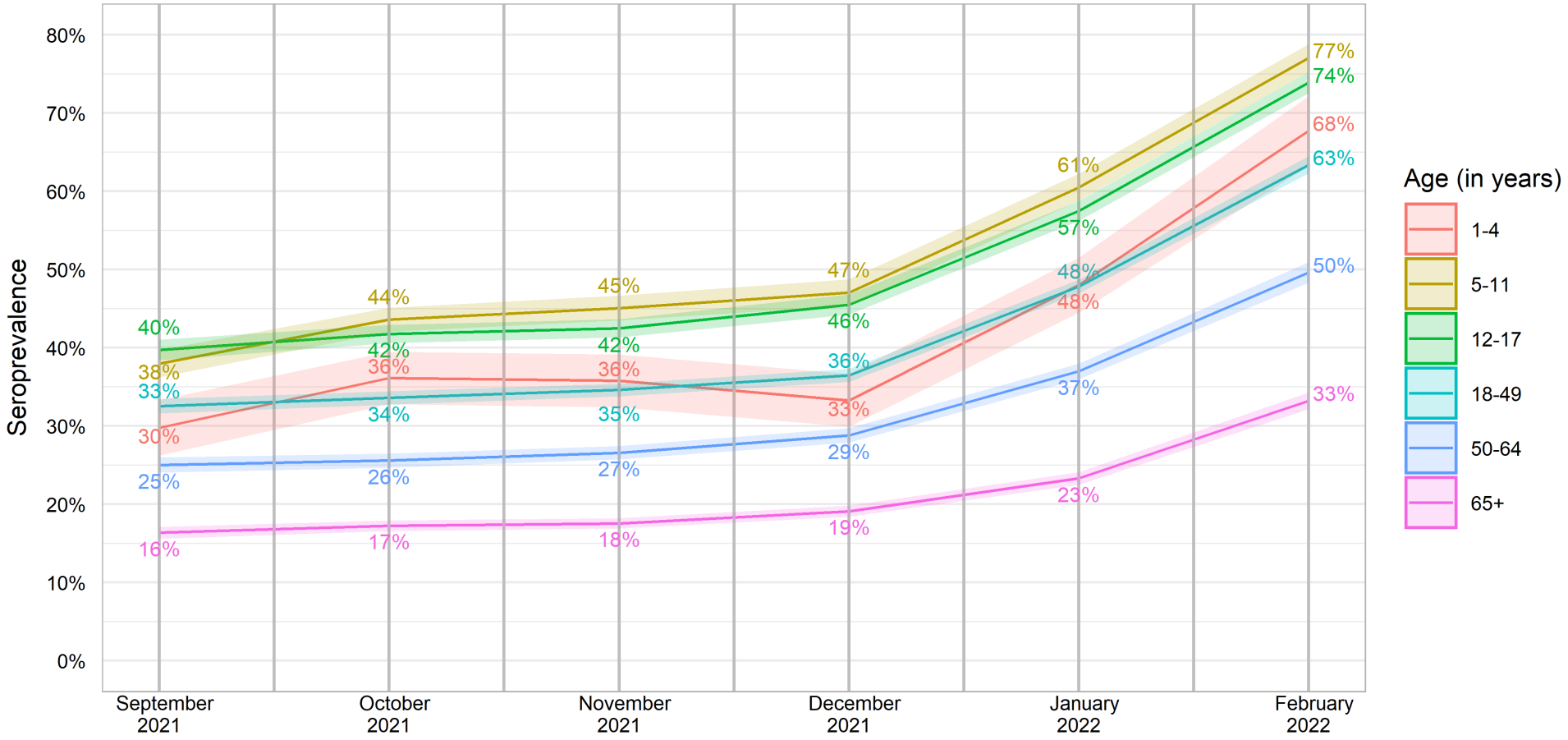
Total number of COVID-19 cases	
<1 year	567,535
1–4 years	1,913,969
5–11 years	5,049,055
12–17 years	5,637,548
Total: 0–17 years	**13,168,107**



Source: COVID Data Tracker, https://covid.cdc.gov/covid-data-tracker/#demographicsovertime. Accessed June 8, 2022

Seroprevalence of infection-induced SARS-CoV-2 antibodies among all ages — National Commercial Lab Seroprevalence Study

September 2021–February 2022



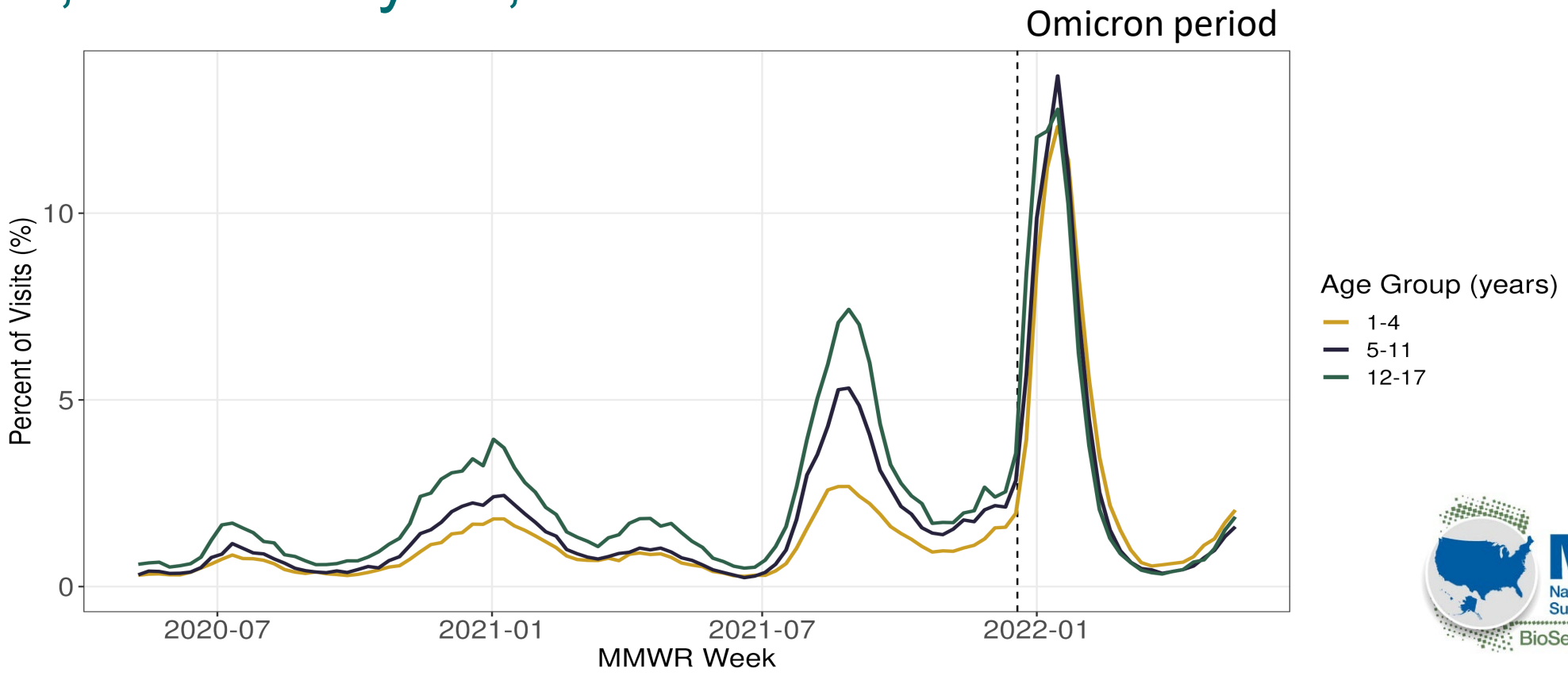
Shading indicates confidence intervals for each trend line.

Source: Clarke K, Kim Y, Jones J et al. Pediatric Infection-Induced SARS-CoV-2 Seroprevalence Estimation Using Commercial Laboratory Specimens: How Representative Is It of the General U.S. Pediatric Population? (April 26, 2022). Available at SSRN: https://ssrn.com/abstract=4092074 or http://dx.doi.org/10.2139/ssrn.4092074

COVID-19-associated emergency department (ED) visits

Weekly percent of emergency department visits diagnosed with COVID-19 among children ages 1–17 years, National Syndromic Surveillance Program

May 3, 2020–May 14, 2022



NSSP National Syndromic Surveillance Program BioSense Platform

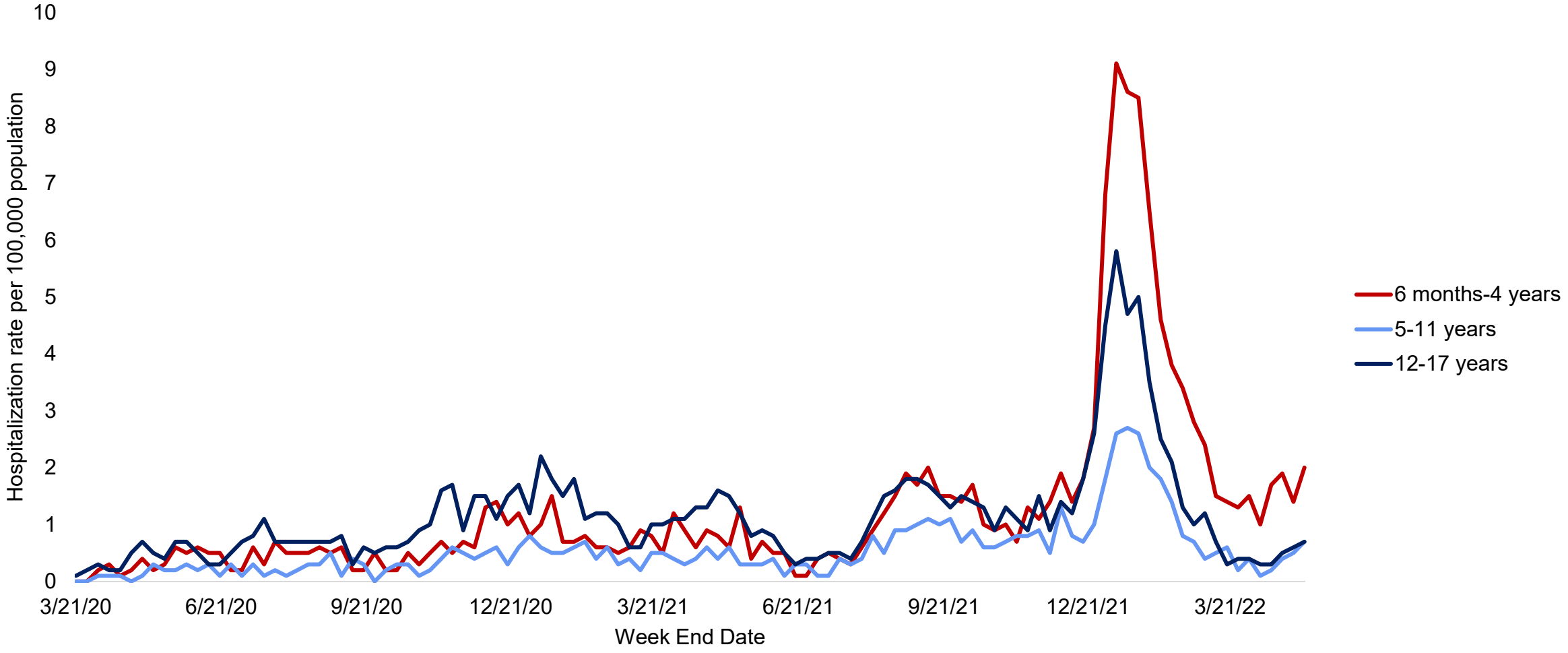
Dashed line, on December 19, 2021, represents the first date when >50% of nationally sequenced SARS-CoV-2 specimens were Omicron variant. Data contains emergency department visits from NSSP ED data feeds consistently reporting data from 2020-2022. The data contains visits with an ICD-10 or SNOMED code for COVID-19.

COVID-19-associated hospitalizations

Burden and severity of disease

COVID-19-associated hospitalizations among children and adolescents 6 months–17 years, COVID-NET

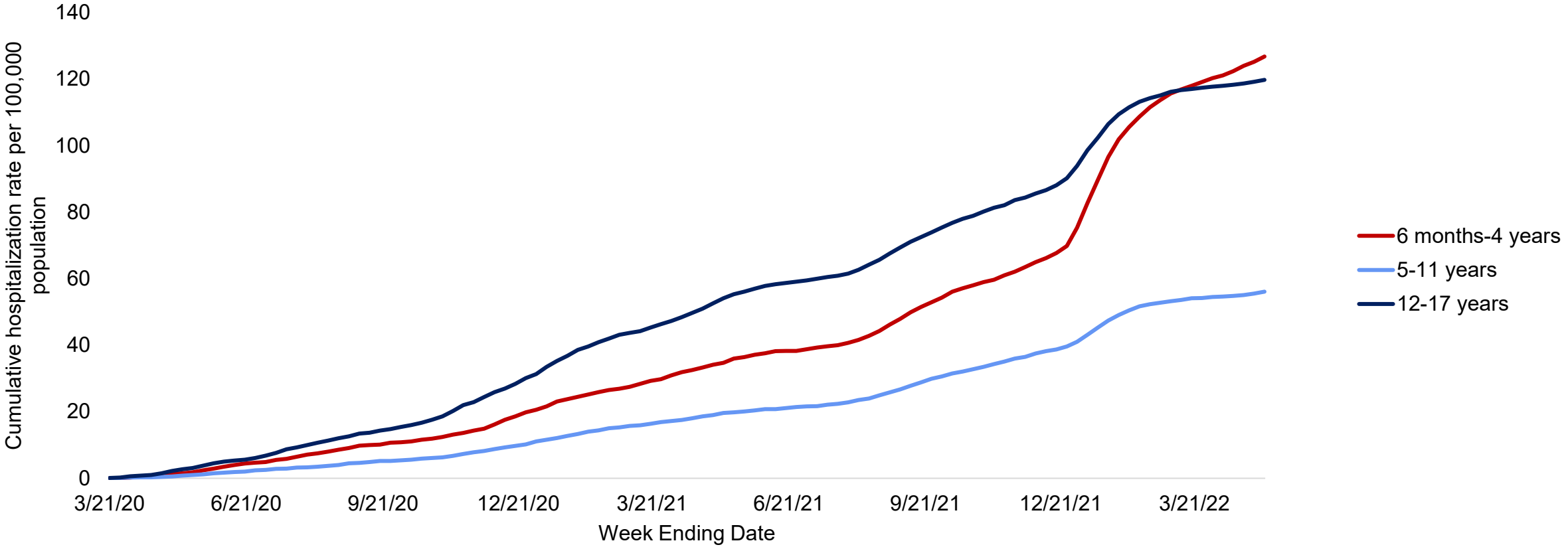
March 2020 – March 2022



Source: COVID-NET, https://gis.cdc.gov/grasp/COVIDNet/COVID19_3.html. Accessed May 21, 2022.

Cumulative COVID-19-associated hospitalizations among children and adolescents 6 months–17 years, COVID-NET

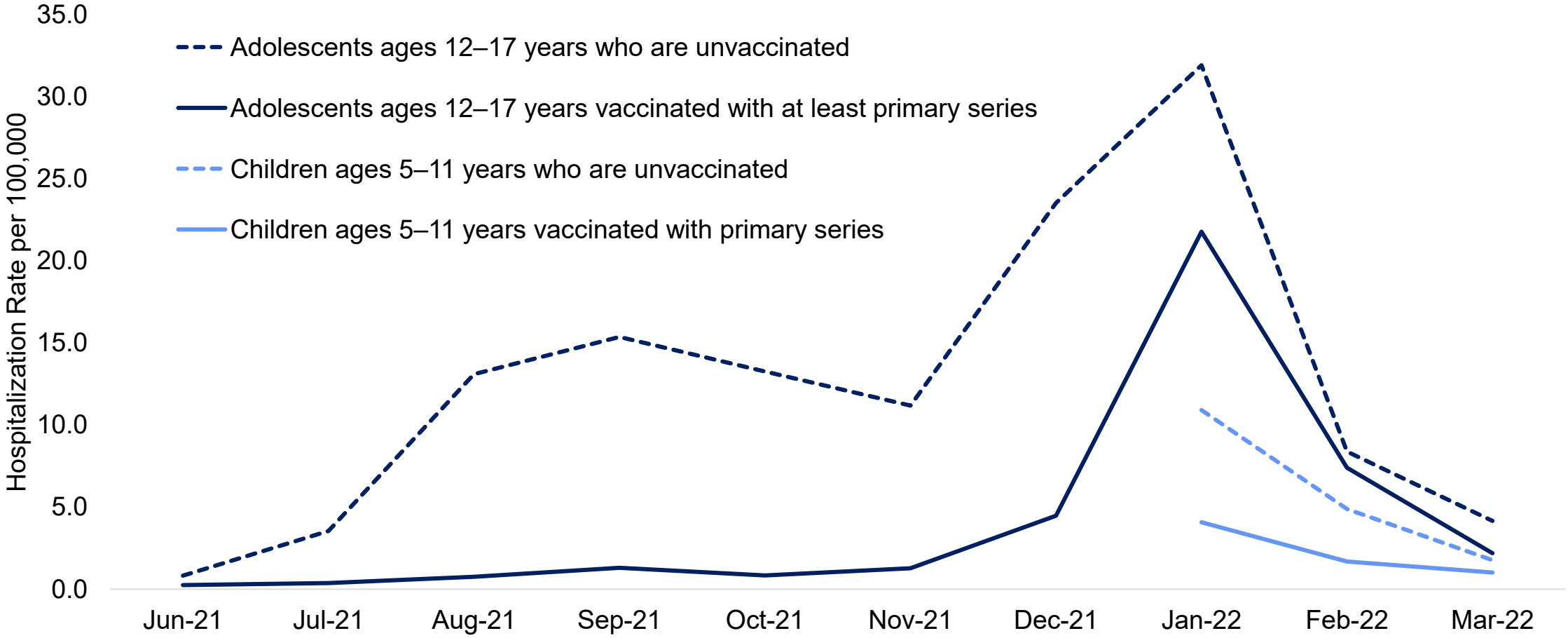
March 2020 – March 2022



Source: COVID-NET, https://gis.cdc.gov/grasp/COVIDNet/COVID19_3.html. May 21, 2022.

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

June 2022 – March 2022



Source: CDC COVID Data Tracker: COVID-NET Hospitalizations by Vaccination Status. Accessed May 12, 2022.

Percent of children ages 6 months–17 years with COVID-19 associated hospitalization with at least one underlying health condition by surveillance platform

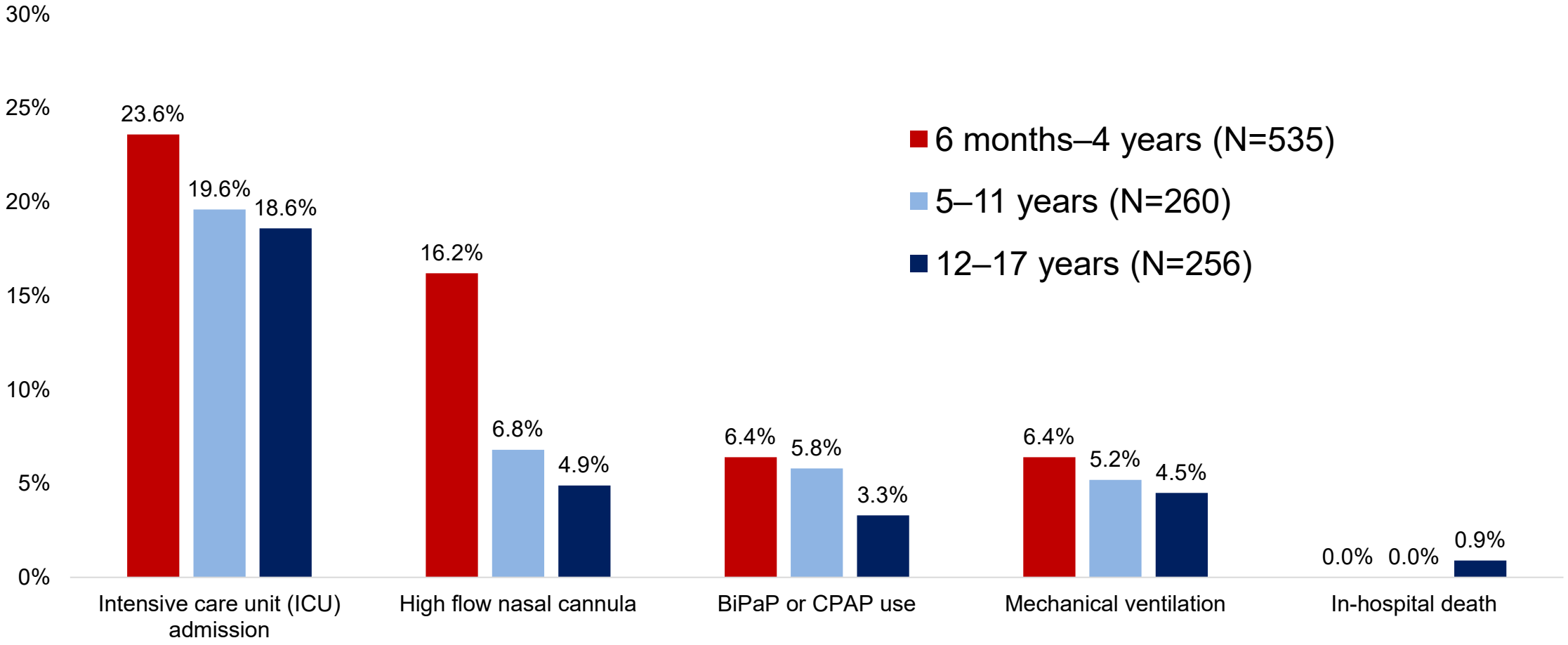
Age group	COVID-NET [1, 2] March 2020 – March 2022	New Vaccine Surveillance Network [3] March 2020 – April 2022
6 months–4 years	49%	46%
5–11 years	67%	68%
12–17 years	68%	60%

1. COVID-NET data. Accessed May 21, 2022, reflecting data from March 2020–March 2022.

2. Shi DS, Whitaker M, Marks KJ, et al. Hospitalizations of Children Aged 5-11 Years with Laboratory-Confirmed COVID-19 – COVID-NET, 14 States, March 2020-February 2022. MMWR Morb Mortal Wkly Rep 2022;71:574-581. DOI: http://dx.doi.org/10.15585/mmwr.mm7116e1

3. New Vaccine Surveillance Network. Preliminary data as of May 25, 2022, reflecting data from March 2020–April 2022

Severity of COVID-19-associated hospitalizations among children and adolescents 6 months–17 years, COVID-NET, December 19, 2021 – March 31, 2022 (Omicron)



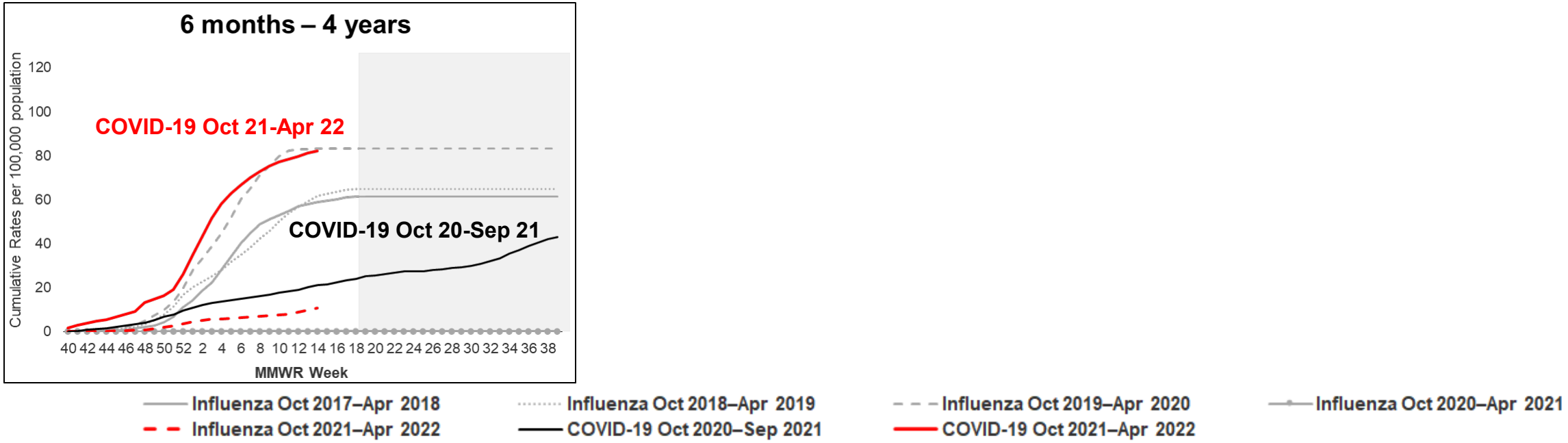
BiPAP: bilevel positive pressure, CPAP: continuous positive pressure

Source: COVID-NET data. Accessed May 21, 2022.

COVID-19-associated hospitalizations

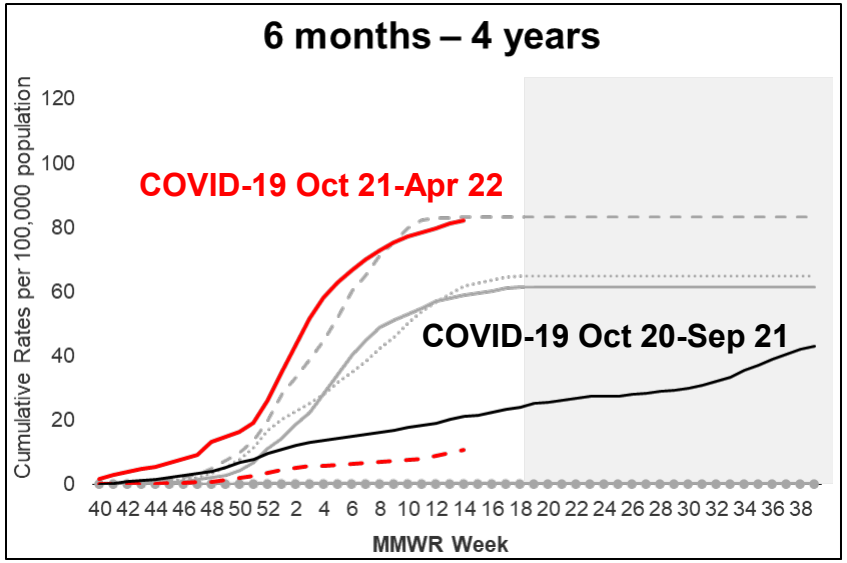
Comparisons to other pediatric infectious diseases

Cumulative influenza- and COVID-19-associated hospitalization rates per 100,000 children, FluSurv-NET and COVID-NET, 2017–2022



Source: 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, FluSurv-NET and COVID-NET, 2017–2022



Among children ages 6 months–4 years

- Oct 2020 – Sep 2021 COVID-19 hospitalization rates were lower than influenza hospitalization rates during pre-pandemic influenza seasons
- Oct 2021 – Apr 2022 COVID-19 hospitalization rates were as high or higher than influenza hospitalization rates during all influenza seasons

Source: 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.

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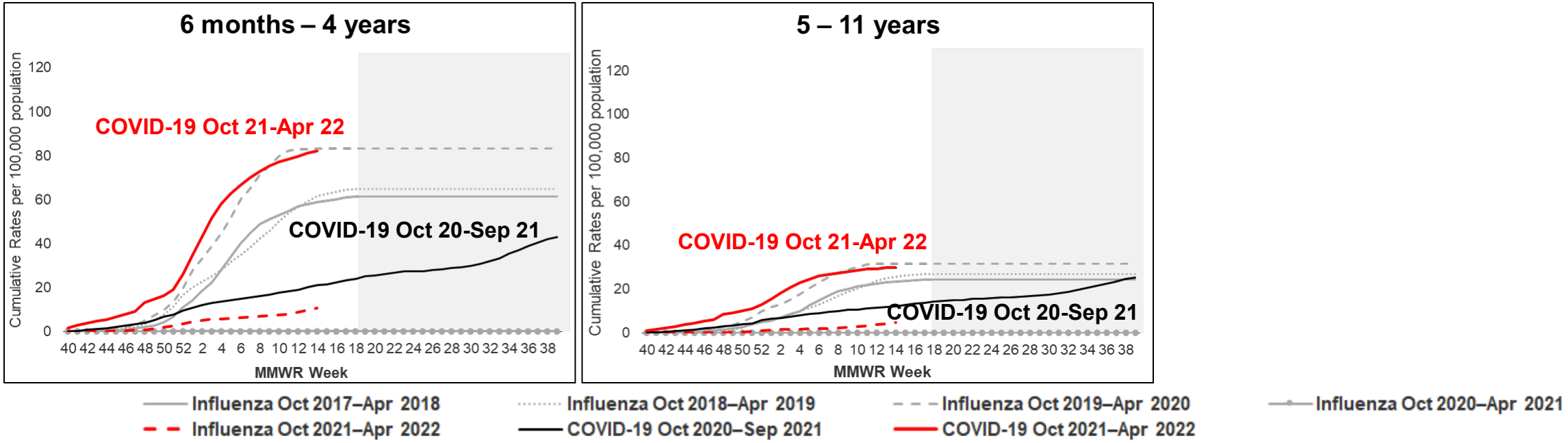

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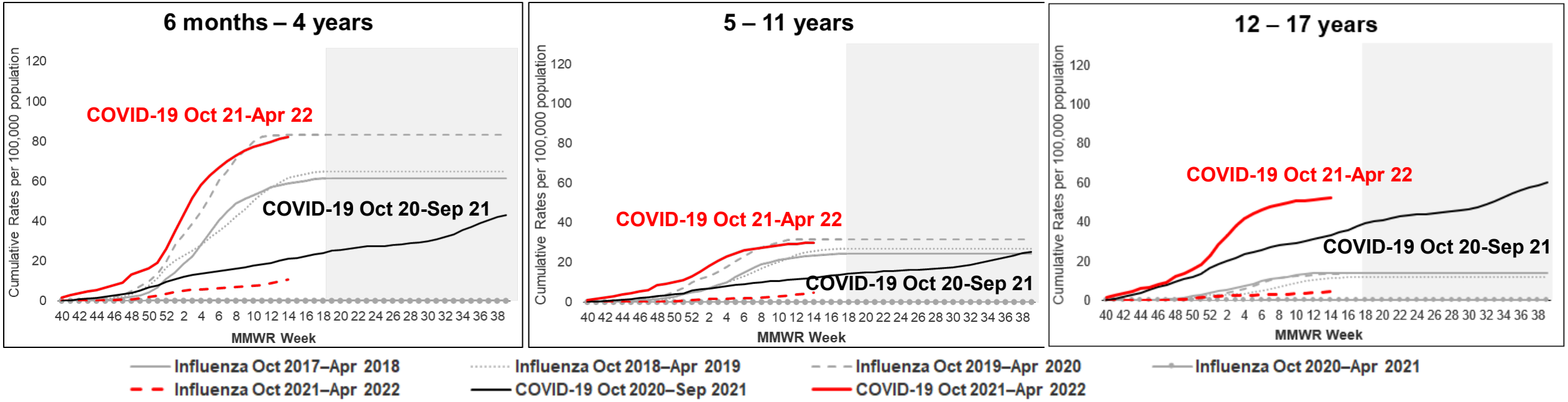


Among adolescents ages 12–17 years COVID-19 hospitalization rates in both years were higher than influenza hospitalization rates during all influenza seasons

Source: 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.

Other Pediatric Vaccine Preventable Diseases:

Hospitalizations per Year Prior to Recommended Vaccines

	Hepatitis A[1]	Varicella[2] (Chickenpox)	Vaccine-type Invasive Pneumococcal Disease[3]	COVID-19[4]
Age	**5–14 years**	**0–4 years**	**0–4 years**	**6 months–4 years**
Time period	2005	1993–1995	1998–1999	Year 1: April 2020–March 2021 Year 2: April 2021–March 2022
Hospitalization Burden (Annual rate per 100,000 population)	**<1**	**29-42**	**40** [5]	Year 1: **29.8** Year 2: **89.3**

[1] https://www.cdc.gov/mmwr/preview/mmwrhtml/ss5603a1.htm

[2] Davis MM, Patel MS, Gebremariam A. Decline in varicella-related hospitalizations and expenditures for children and adults after introduction of varicella vaccine in the United States. Pediatrics. 2004;114(3):786-792. doi:10.1542/peds.2004-0012

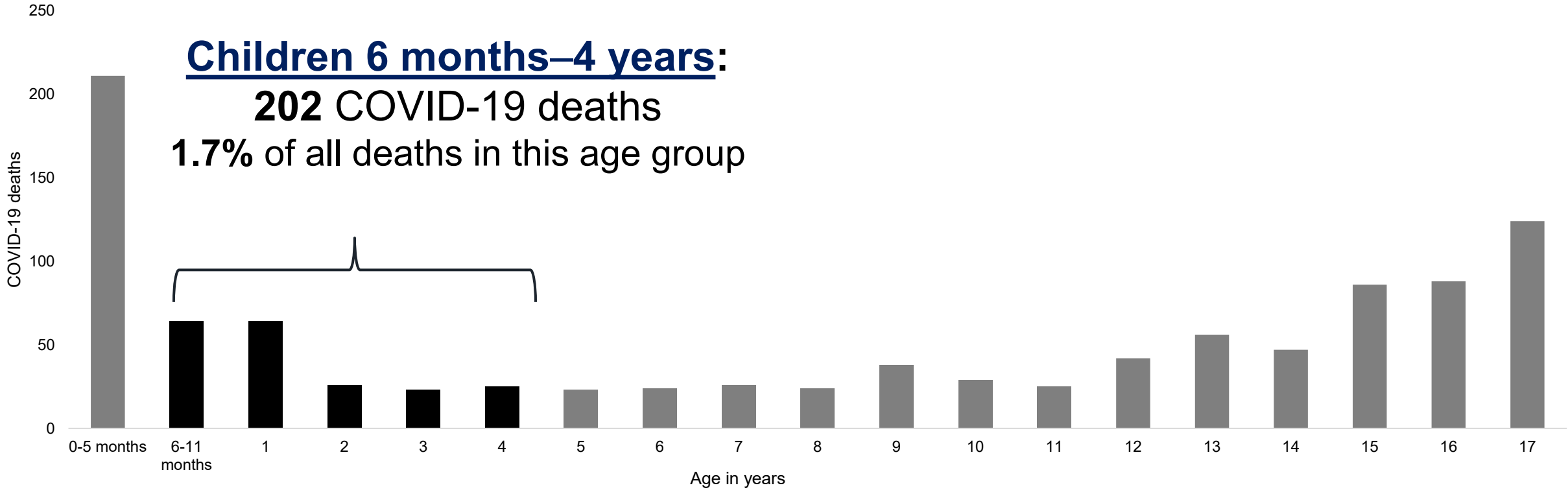
[3] Centers for Disease Control and Prevention (CDC). Direct and indirect effects of routine vaccination of children with 7-valent pneumococcal conjugate vaccine on incidence of invasive pneumococcal disease--United States, 1998-2003. MMWR Morb Mortal Wkly Rep. 2005 Sep 16;54(36):893-7. PMID: 16163262.

[4] COVID-NET data, Accessed May 21, 2022.

[5] Vaccine-type invasive pneumococcal disease annual rate for children <5 years in 1998-1999 was 80 per 100,000, of which about 50% were hospitalized.

COVID-19-associated mortality

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



Source: https://data.cdc.gov/NCHS/Provisional-COVID-19-Deaths-Counts-by-Age-in-Years/3apk-4u4f/data. Accessed May 14, 2022.

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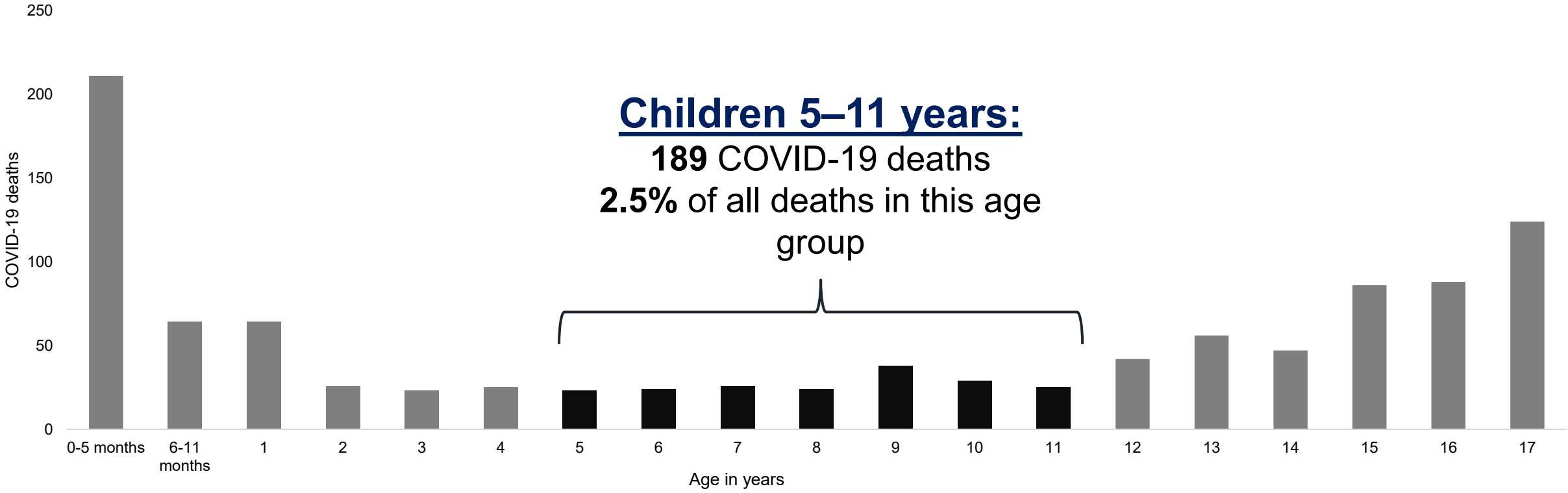

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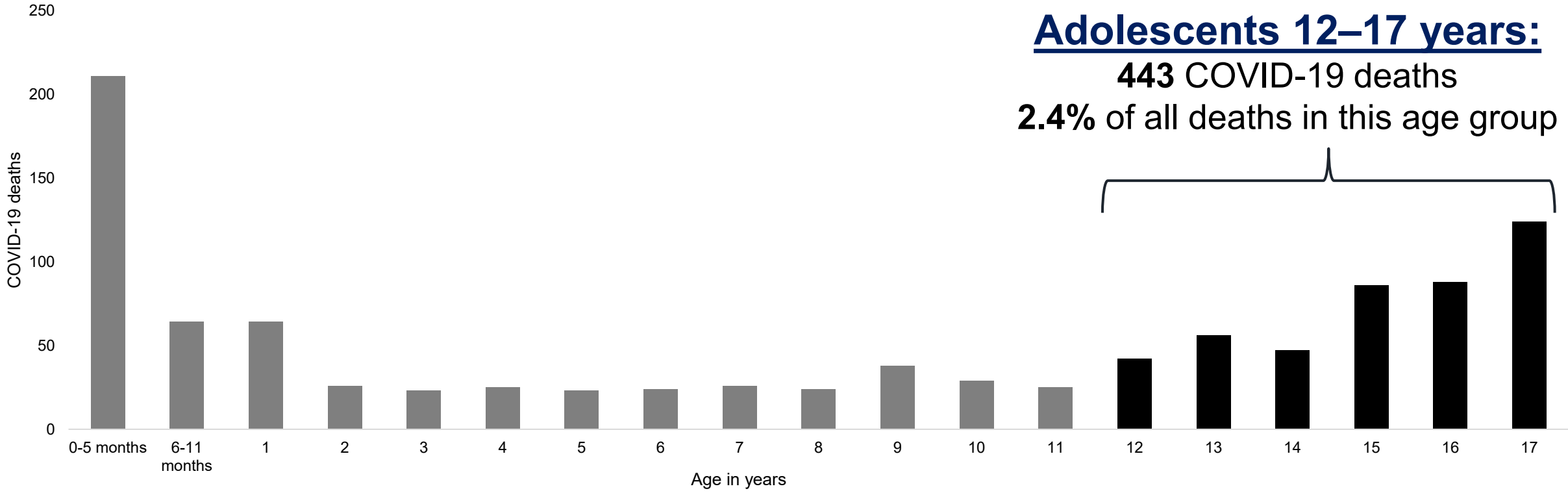


Source: https://data.cdc.gov/NCHS/Provisional-COVID-19-Deaths-Counts-by-Age-in-Years/3apk-4u4f/data. Accessed May 14, 2022.

COVID-19 is a leading cause of death among children and adolescents ages 1–19 years

March 1, 2020–April 30, 2022

Age group	Rank of COVID-19 among causes of death
1–4 years	5
5–9 years	5
10–14 years	4
15–19 years	4

Based on death certificate data from the National Center for Health Statistics. COVID-19 based on cumulative total incidence of COVID-19 deaths from March 1, 2020-April 30, 2022.

Source: Flaxman S, Whittaker C, Semenova E et al. Covid-19 is a leading cause of death in children and young people ages 0-19 years in the United States. medRxiv 2022.05.23.22275458; doi: https://doi.org/10.1101/2022.05.23.22275458

Pediatric vaccine preventable diseases: Deaths per year in the United States prior to recommended vaccines

	Hepatitis A[1]	Meningococcal (ACWY)[2]	Varicella[3]	Rubella[4]	Rotavirus[5]	COVID-19[6]
Age	**<20 years**	**11–18 years**	**5–9 years**	**All ages**	**<5 years**	**6 months – 4 years**
Time period	1990–1995	2000–2004	1990–1994	1966–1968	1985–1991	Jan 2020–May 2022
Average deaths per year	**3**	**8**	**16**	**17**	**20**	**86**

[1]Vogt TM , Wise ME, Bell BP, Finelli L. Declining hepatitis A mortality in the United States during the era of hepatitis A vaccination. J Infect Dis2008; 197:1282–8.
[2]National Notifiable Diseases Surveillance System with additional serogroup and outcome data from Enhanced Meningococcal Disease Surveillance for 2015-2019.
[3]Meyer PA, Seward JF, Jumaan AO, Wharton M. Varicella mortality: trends before vaccine licensure in the United States, 1970-1994. J Infect Dis. 2000;182(2):383-390. doi:10.1086/315714
[4]Roush SW , Murphy TV; Historical comparisons of morbidity and mortality for vaccine-preventable diseases in the United States. JAMA 2007; 298:2155–63.
[5] Glass RI, Kilgore PE, Holman RC, et al. The epidemiology of rotavirus diarrhea in the United States: surveillance and estimates of disease burden. J Infect Dis. 1996 Sep;174 Suppl 1:S5-11.
[6] https://data.cdc.gov/NCHS/Provisional-COVID-19-Deaths-Counts-by-Age-in-Years/3apk-4u4f/data. Accessed May 14, 2022

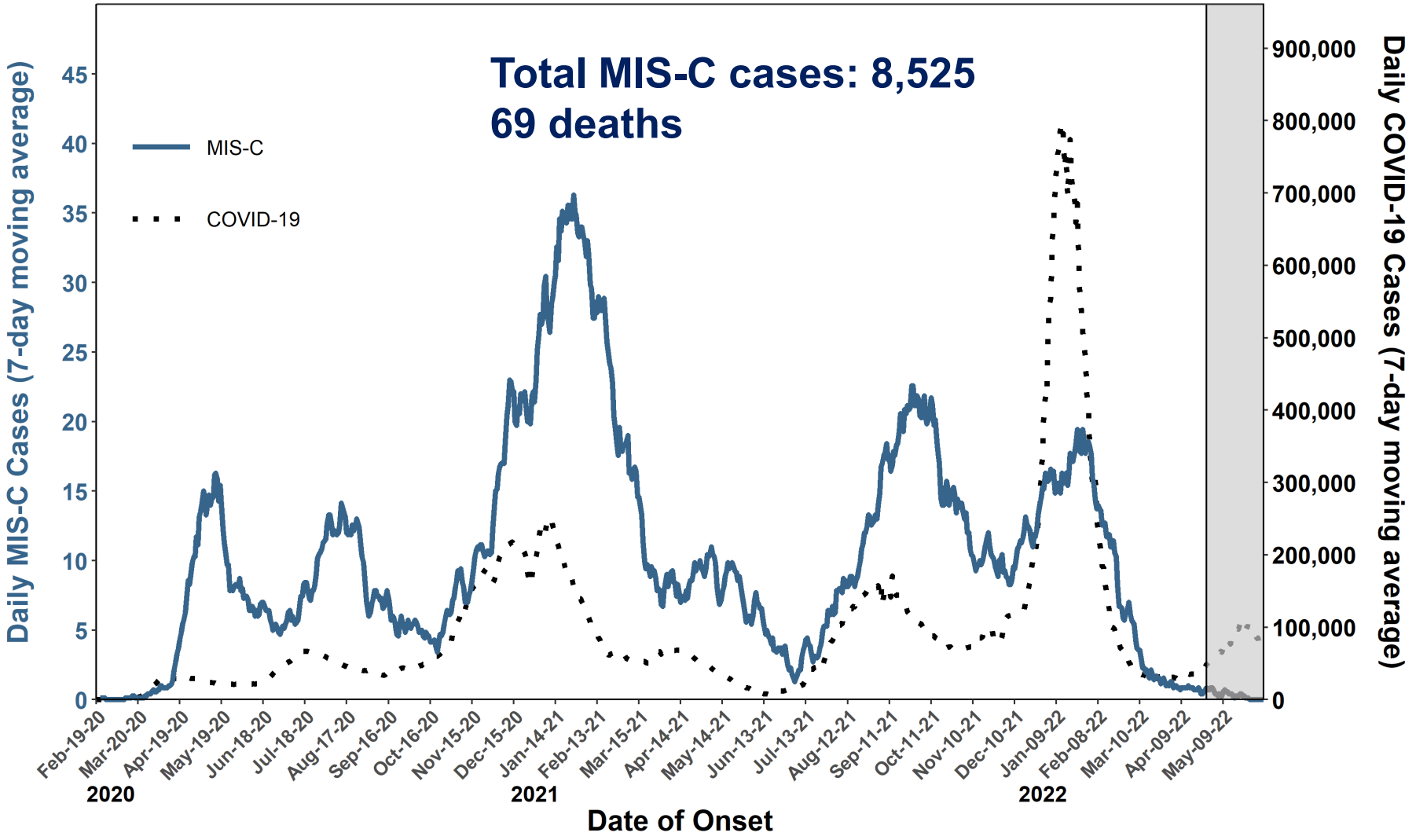
Multisystem Inflammatory Syndrome in Children (MIS-C)

Multisystem Inflammatory Syndrome in Children (MIS-C)

- Severe illness in **persons ages 0–20 years** characterized by fever, multisystem organ involvement, laboratory evidence of inflammation, and SARS-CoV-2 infection with no alternative plausible diagnosis
- Occurring 2-6 weeks after acute SARS-CoV-2 infection [1]
  - 60–70% of patients are admitted to intensive care [2, 3, 4]
  - 1–2% die [2, 3, 4]

1. https://www.cdc.gov/mis/mis-c/hcp/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fmis%2Fhcp%2Findex.html. Accessed June 7, 2022.
2. Feldstein LR, et al. Characteristics and Outcomes of US Children and Adolescents With Multisystem Inflammatory Syndrome in Children (MIS-C) Compared With Severe Acute COVID-19. JAMA. 2021;325(11):1074-1087. doi:10.1001/jama.2021.2091
3. Belay ED, et al. Trends in Geographic and Temporal Distribution of US Children With Multisystem Inflammatory Syndrome During the COVID-19 Pandemic [published online ahead of print, 2021 Apr 6]. JAMA Pediatr. 2021;e210630. doi:10.1001/jamapediatrics.2021.0630
4. Miller AD, Zambrano LD, Yousaf AR, Abrams JY, Meng L, Wu MJ, Melgar M, Oster ME, Godfred Cato SE, Belay ED, Campbell AP; MIS-C Surveillance Authorship Group. Multisystem Inflammatory Syndrome in Children-United States, February 2020-July 2021. Clin Infect Dis. 2021 Dec 5:ciab1007. doi: 10.1093/cid/ciab1007. Epub ahead of print. Erratum in: Clin Infect Dis. 2022 Apr 27;: PMID: 34864955; PMCID: PMC8689703.

Daily MIS-C and COVID-19 cases reported to CDC (7-day moving average), onset February 19, 2020–May 21, 2022

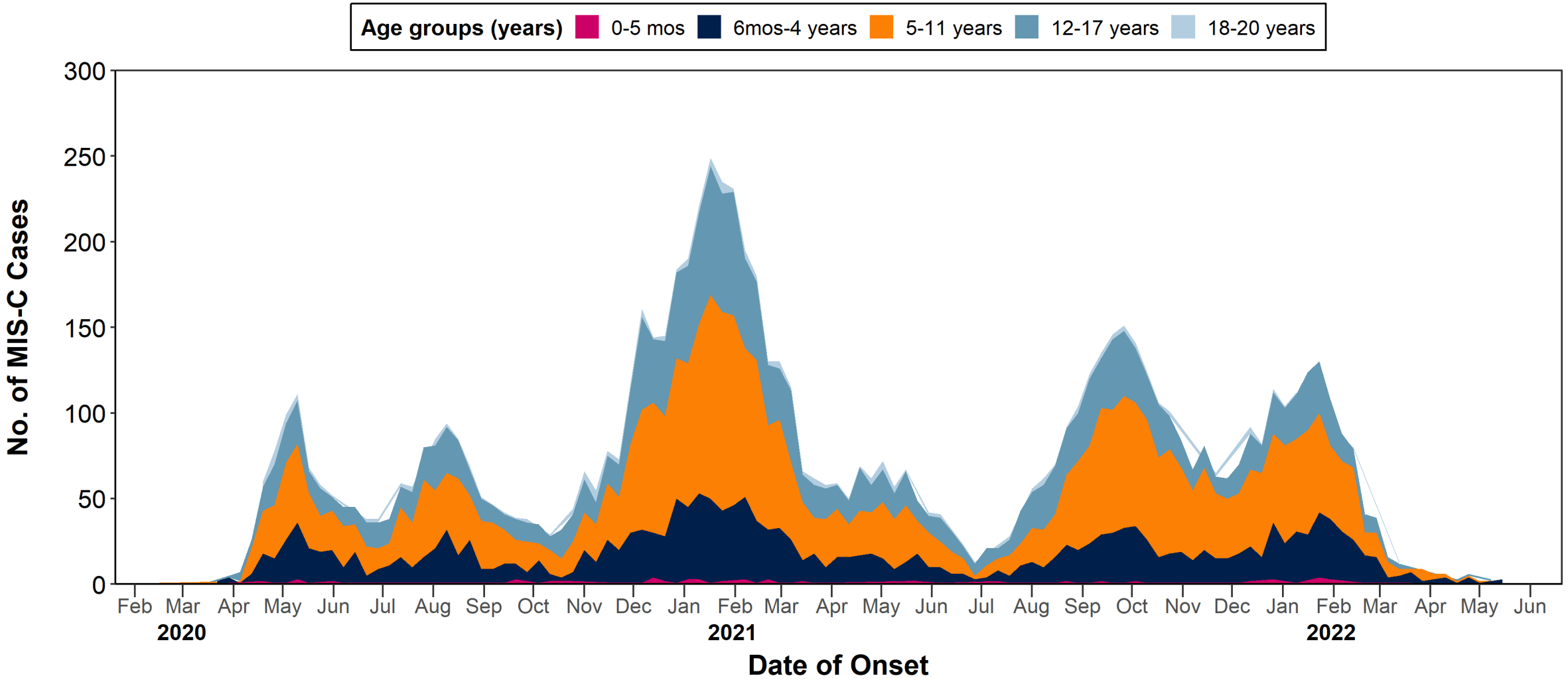


MIS-C cases are among individuals ages <21 years. COVID-19 cases reflect all cases reported to CDC (among individuals of all ages). The grayed-out area on the right side of the figure represents the most recent 6 weeks of data, for which reporting of MIS-C cases is still incomplete. Date of onset was missing for 1 of the 8,525 cases.

https://covid.cdc.gov/covid-data-tracker/#mis-national-surveillance. Accessed June 7, 2022.

Weekly MIS-C case counts among persons ages 0–20 years by age group (N=8,525)

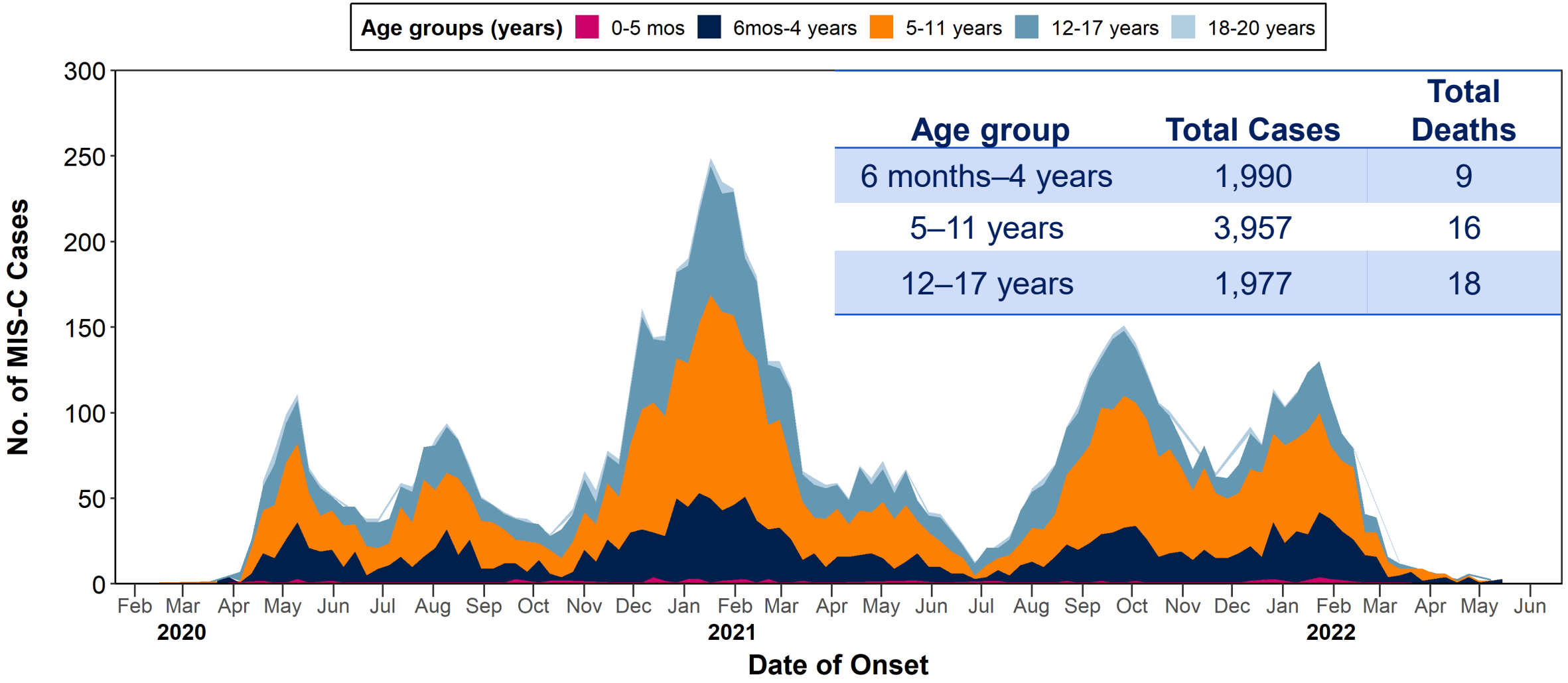
February 1, 2020 – May 31, 2022



CDC Data. Age is missing for 1 case

Weekly MIS-C case counts among persons ages 0–20 years by age group (N=8,525)

February 1, 2020 – May 31, 2022

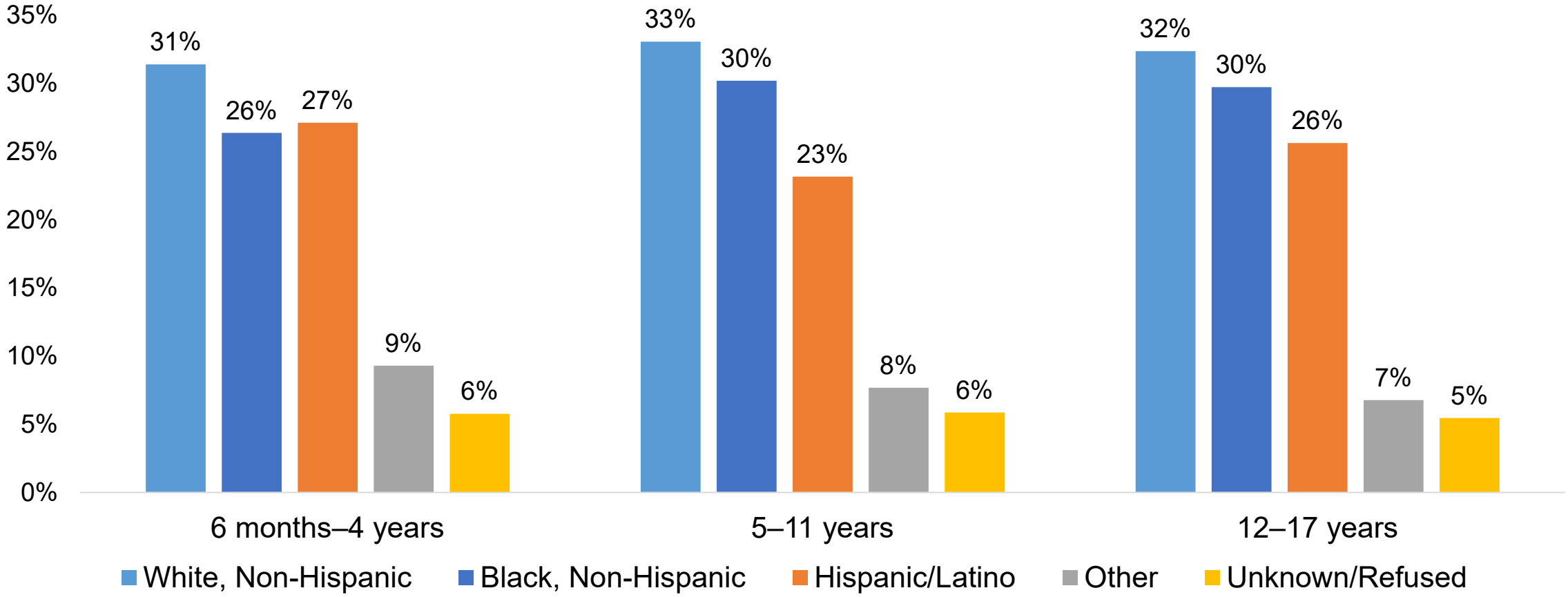


Age group	Total Cases	Total Deaths
6 months–4 years	1,990	9
5–11 years	3,957	16
12–17 years	1,977	18

CDC Data. Age is missing for 1 case

MIS-C patients by race & ethnicity for children and adolescents ages 6 months–17 years by age group

February 1, 2020 – May 31, 2022



Age is missing for 1 case.

Source: CDC data. Accessed June 7, 2022

Post-COVID Conditions in Children

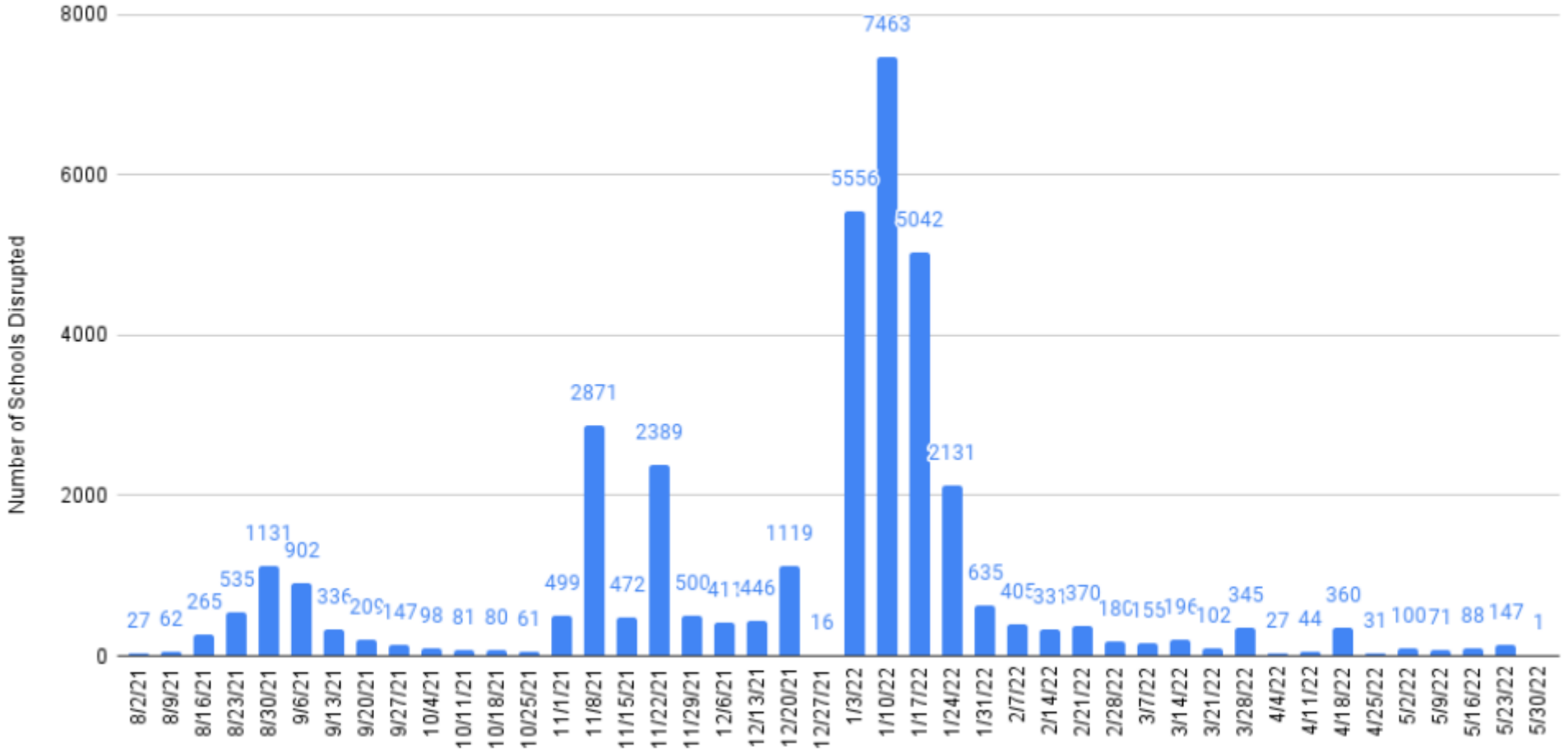
Post-COVID conditions in children

- **Post-COVID conditions in children**
  - Appear to be less common in children than in adults
  - A national survey in the UK found **7-8%** of children with COVID-19 reported continued symptoms >12 weeks[1]
  - Can appear after mild to severe infections and after MIS-C
- **Most common symptoms**: Similar to adults and include fatigue, headache, insomnia, trouble concentrating, muscle and joint pain, and cough [2,3]
- **Impact on quality of life**: Limitations of physical activity, feeling distressed about symptoms, mental health challenges, decreased school attendance/participation[2]

[1]Office for National Statistics United Kingdom. (2021) Prevalence of ongoing symptoms following coronavirus (COVID-19) infection in the UK. Retrieved on September 17, 2021 from Office for National Statistics' website.
https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/prevalenceofongoingsymptomsfollowingcoronaviruscovid19infectionintheuk/1april2021
[2]Buonsenso D, Munblit D, De Rose C, et al. Preliminary evidence on long COVID in children. Acta Paediatr. 2021;110(7):2208-2211. doi:10.1111/apa.15870.
[3]Molteni E, Sudre CH, Canas LS, et al. Illness duration and symptom profile in symptomatic UK school-aged children tested for SARS-CoV-2. Lancet Child Adolesc Health 2021; 5: 708–18.
https://www.thelancet.com/action/showPdf?pii=S2352-4642%2821%2900198-X

Other impacts of the COVID-19 pandemic on children and families

COVID-19 related K-12 school disruptions by week, August 2, 2021 – May 30, 2022

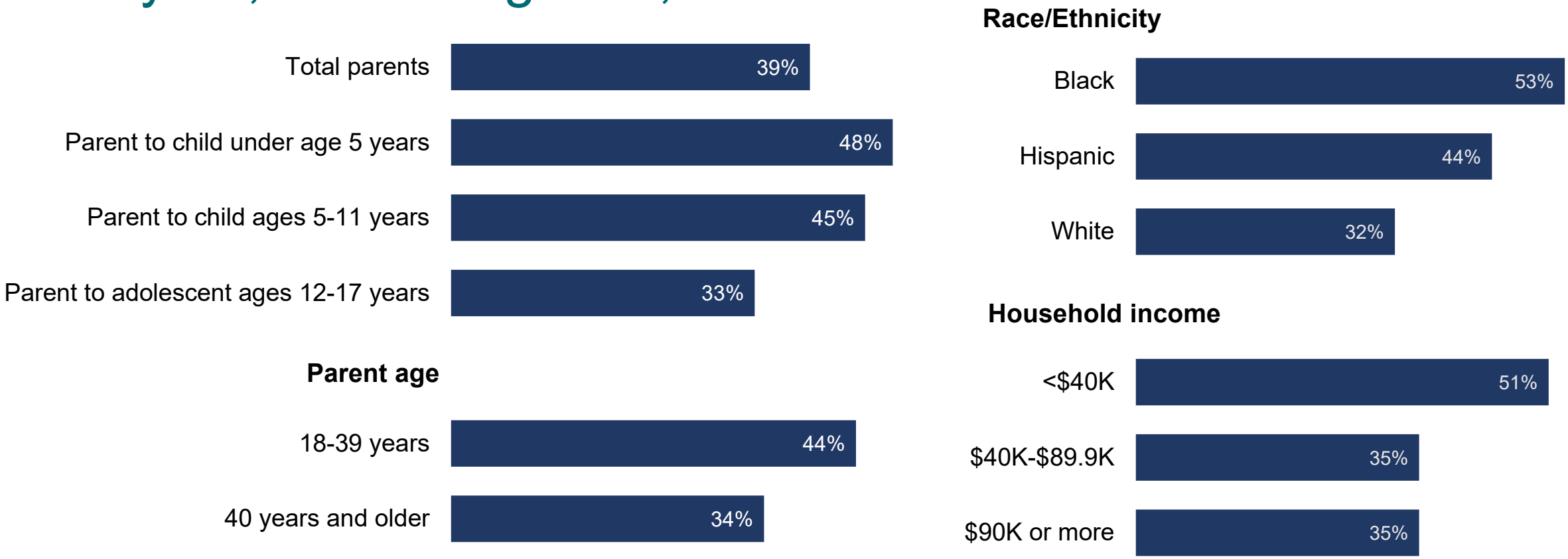


Data from burbio: https://cai.burbio.com/school-opening-tracker/. Accessed June 7, 2022.

* A COVID-19 related school disruption is defined as a school moving away from regular in-person instruction caused in some way by the pandemic

Percent of parents who say in the past year, they or another adult in their household left a job or changed work schedules to take care of their children

July 15, 2021–August 2, 2021



Source: KFF COVID-19 Vaccine Monitor: The Impact Of The Coronavirus Pandemic On The Wellbeing Of Parents And Children | KFF. Accessed May 24, 2022.

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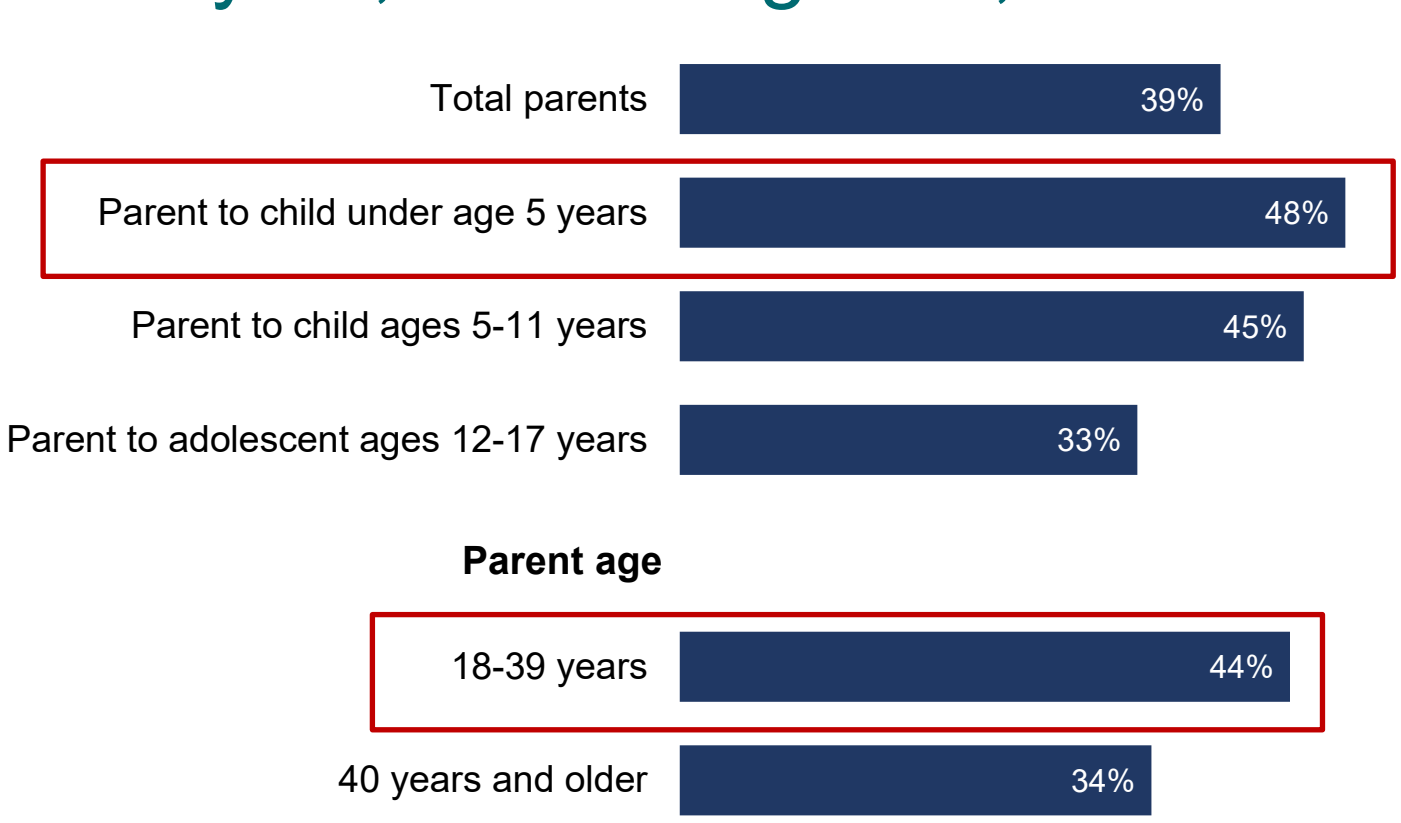

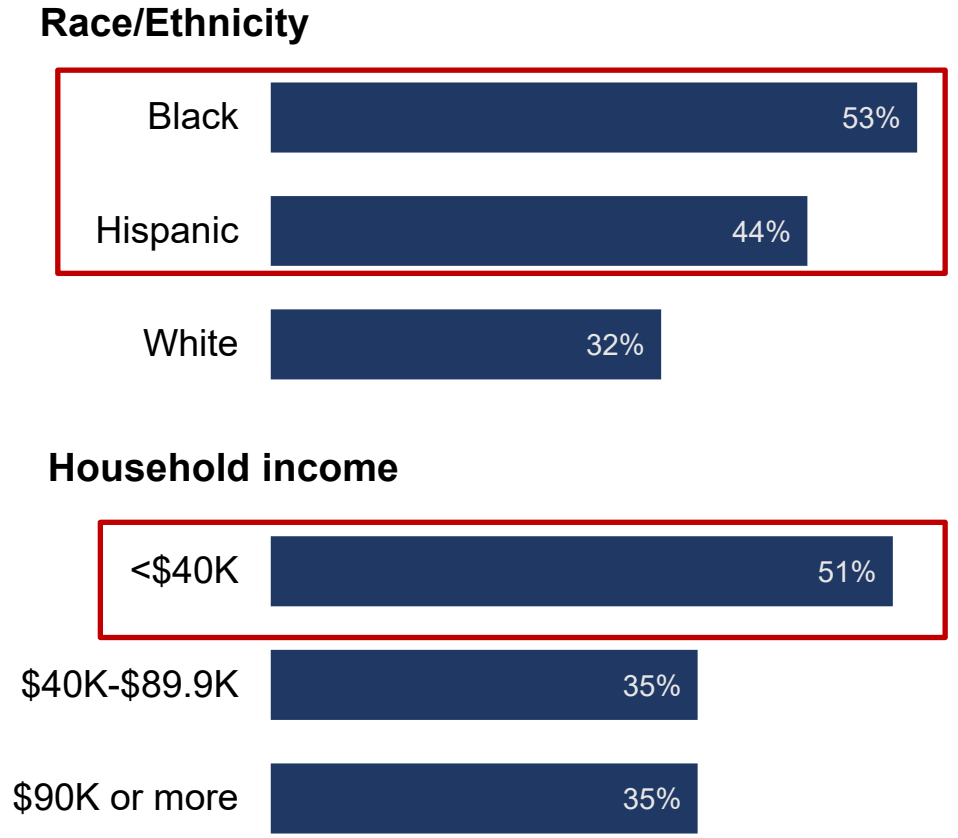

Source: KFF COVID-19 Vaccine Monitor: The Impact Of The Coronavirus Pandemic On The Wellbeing Of Parents And Children | KFF. Accessed May 24, 2022.

Other indirect impacts of COVID-19 pandemic on children

- Worsening of mental or emotional health

- Widening of existing education gaps

- Decreased physical activity and increased body mass index (BMI)

- Decreased healthcare utilization

- Decreased routine immunizations

- Increase in Adverse Childhood Experiences (ACEs)

Conclusion

Summary: COVID-19 epidemiology in children and adolescents ages 6 months–17 years

- As of June 7, 2022, COVID-19 has caused >13.1 million cases among children and adolescents ages 0–17 years

- Omicron surge led to the highest numbers of COVID-19 cases, emergency department visits, and hospitalization rates seen during the pandemic

Summary: COVID-19 epidemiology in children and adolescents ages 6 months–17 years

- Children and adolescents are at risk of severe illness from COVID-19
  - More than half of hospitalized children ages 6 months–4 years had no underlying conditions
  - During Omicron predominance, COVID-19 associated hospitalizations among children ages 6 months–4 years have similar or increased severity compared to older children and adolescents
  - Burden of COVID-19 hospitalization is similar to or exceeds that of other pediatric vaccine preventable diseases

- COVID-19 pandemic continues to have significant impact on families and increases disparities

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- ACIP COVID-19 Workgroup Team: Sara Oliver, Evelyn Twentyman, Monica Godfrey, Danielle Moulia, Megan Wallace, Lauren Roper, Kate Woodworth
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  - MIS-C unit: Angie Campbell, Laura Zambrano, Allison Miller
  - NVSN: Heidi Moline, Meredith McMorrow, Ariana Perez, Benjamin Clopper, Aaron Curns
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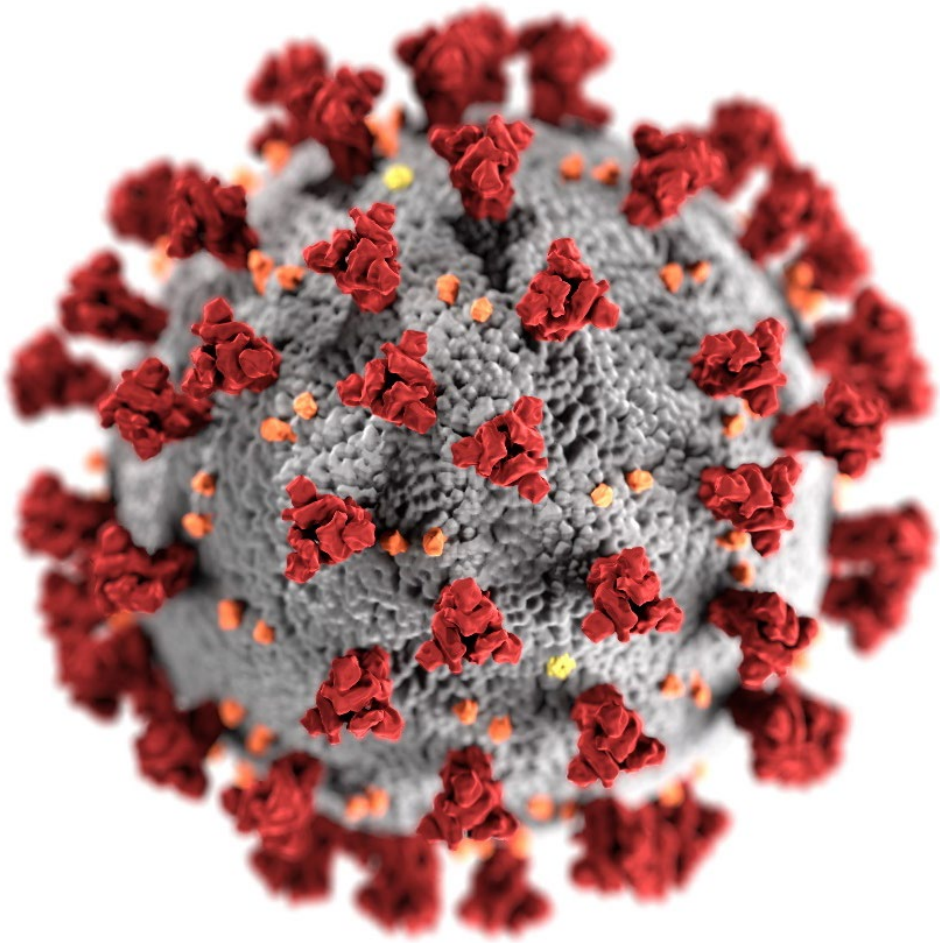
- FluSurv-NET: Shikha Garg, Dawud Ujamaa, Miranda Delahoy
- Division of Vital Statistics, National Center for Health Statistics
- Many more…



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

Additional slide footnotes

Slides 21-24: Cumulative influenza- and COVID-19-associated hospitalization rates per 100,000 children, FluSurv-NET and COVID-NET, 2017–2022

FluSurv-NET = Influenza Hospitalization Surveillance Network; COVID-NET = COVID-19-Associated Hospitalization Surveillance Network

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.

Slides 27-29: 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

The provisional counts for 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 can take several weeks for death records to be submitted to National Center for Health Statistics (NCHS), processed, coded, and tabulated. Therefore, the data may be incomplete, and will likely not include all deaths that occurred during a given time period, especially for the more recent time periods.