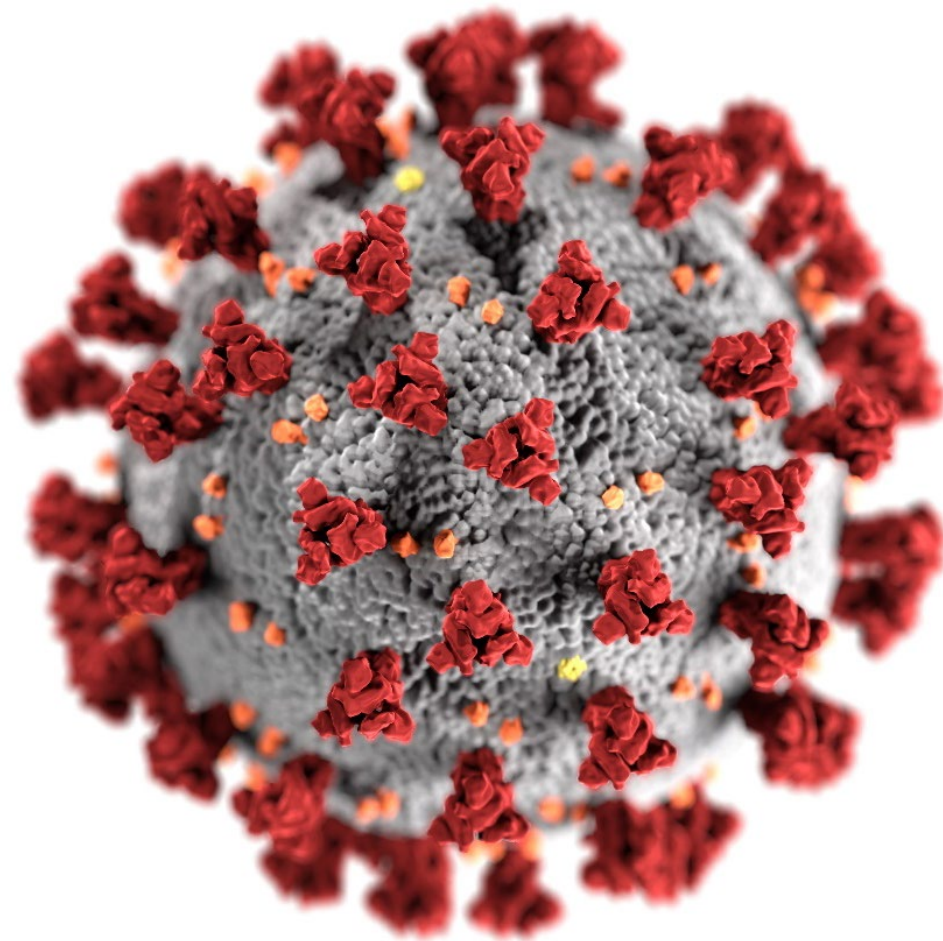


COVID-19 epidemiology in children ages 6 months–4 years

Katherine E. Fleming-Dutra, MD
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
June 17, 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

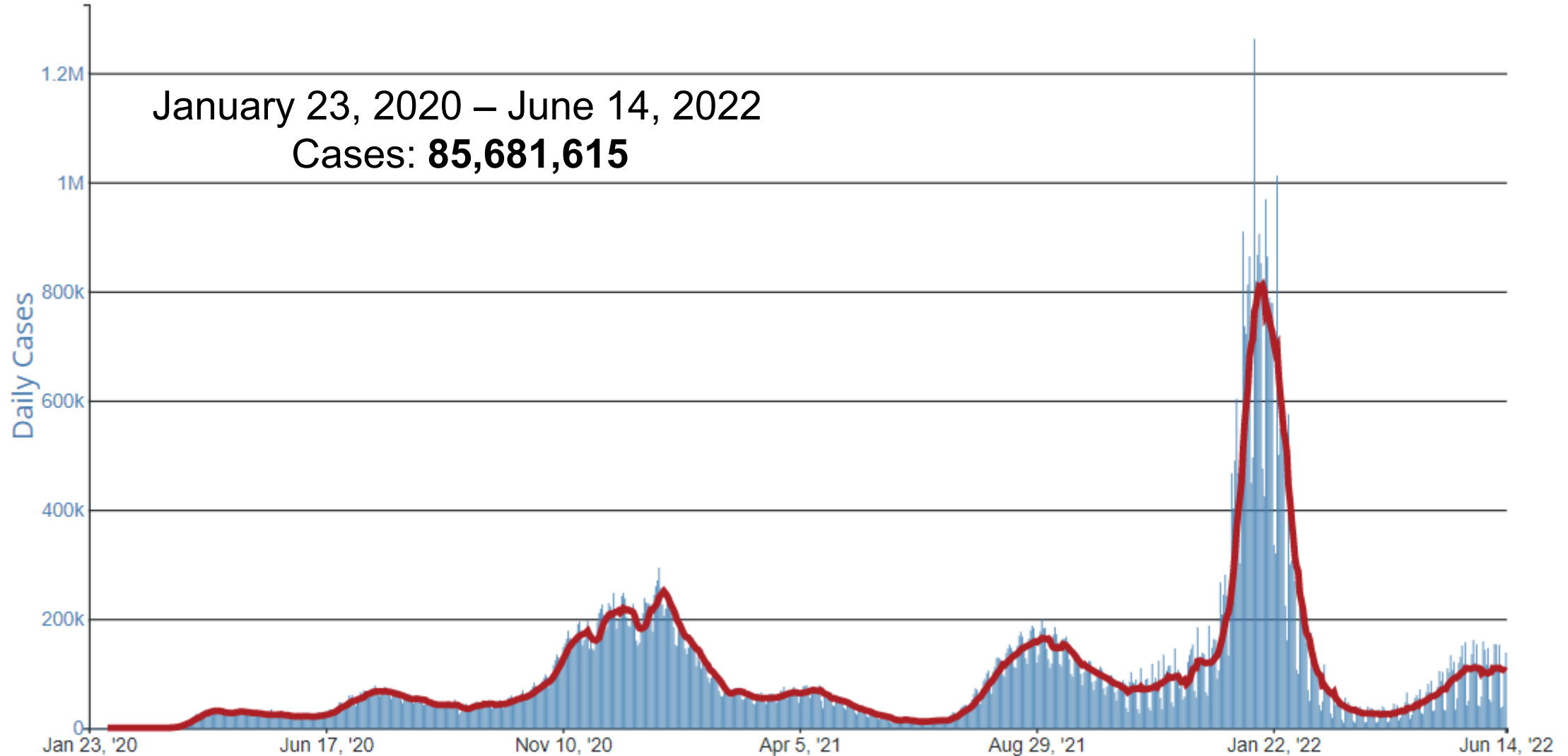


Currently eligible for COVID-19
vaccination

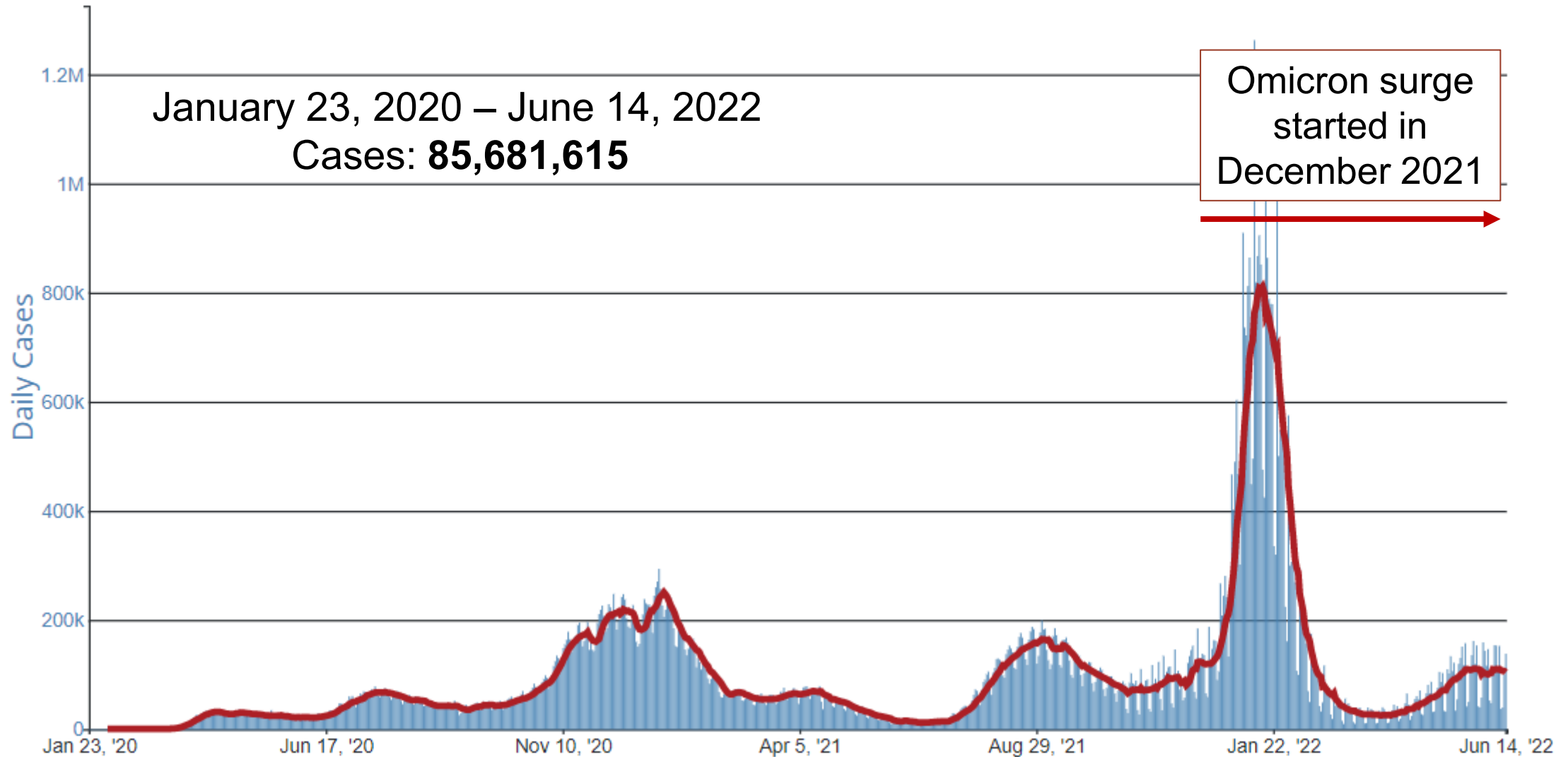
COVID-19 incidence and burden



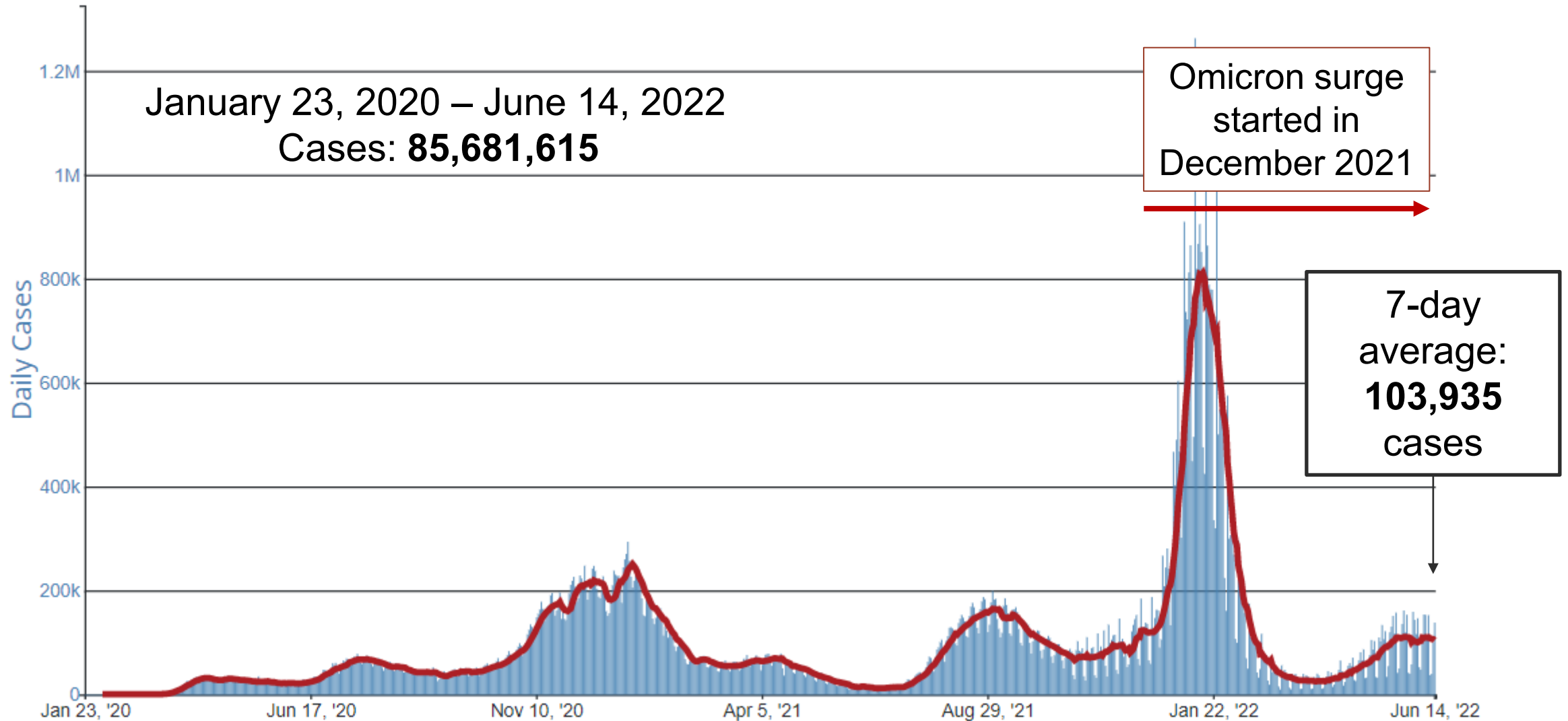
Trends in number of COVID-19 cases in the United States among persons of all ages



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

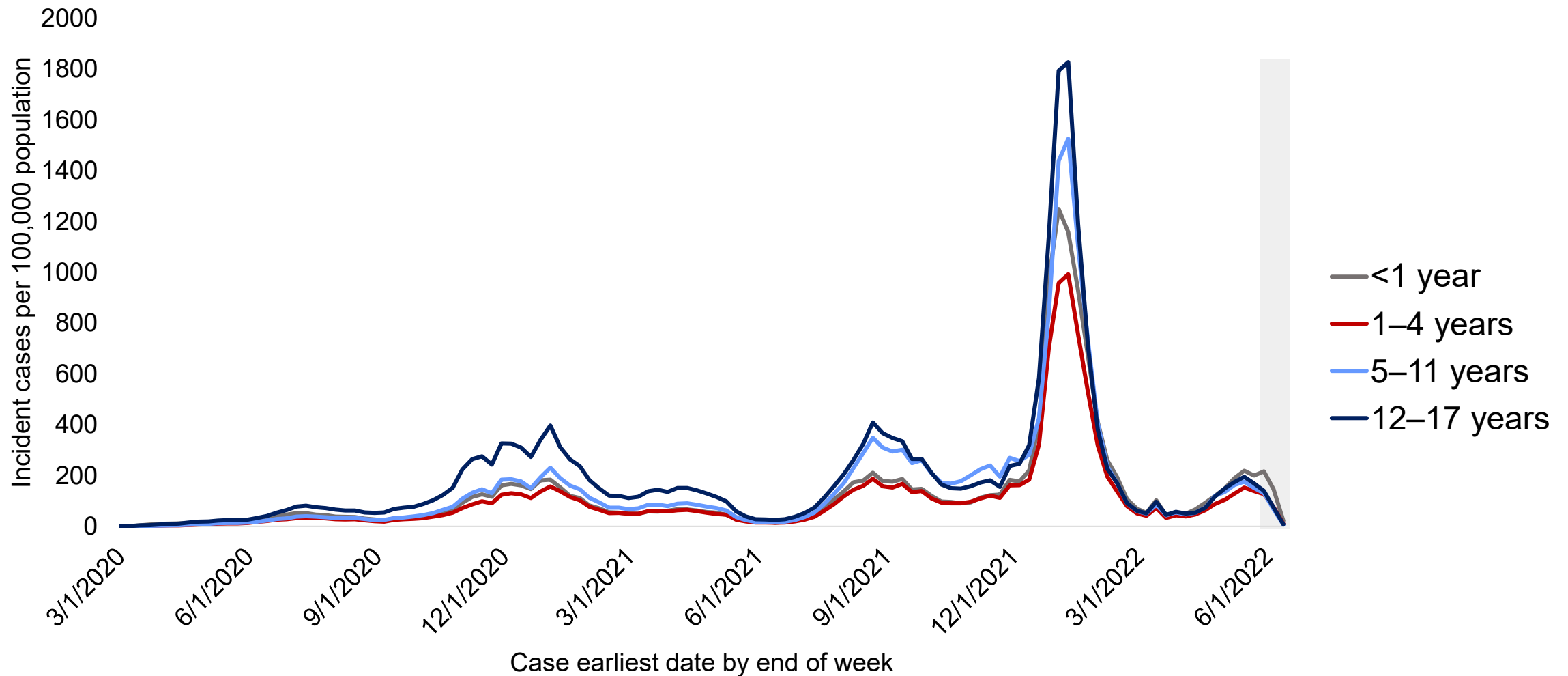


Trends in number of COVID-19 cases in the United States among persons of all ages



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

March 1, 2020 – June 12, 2022

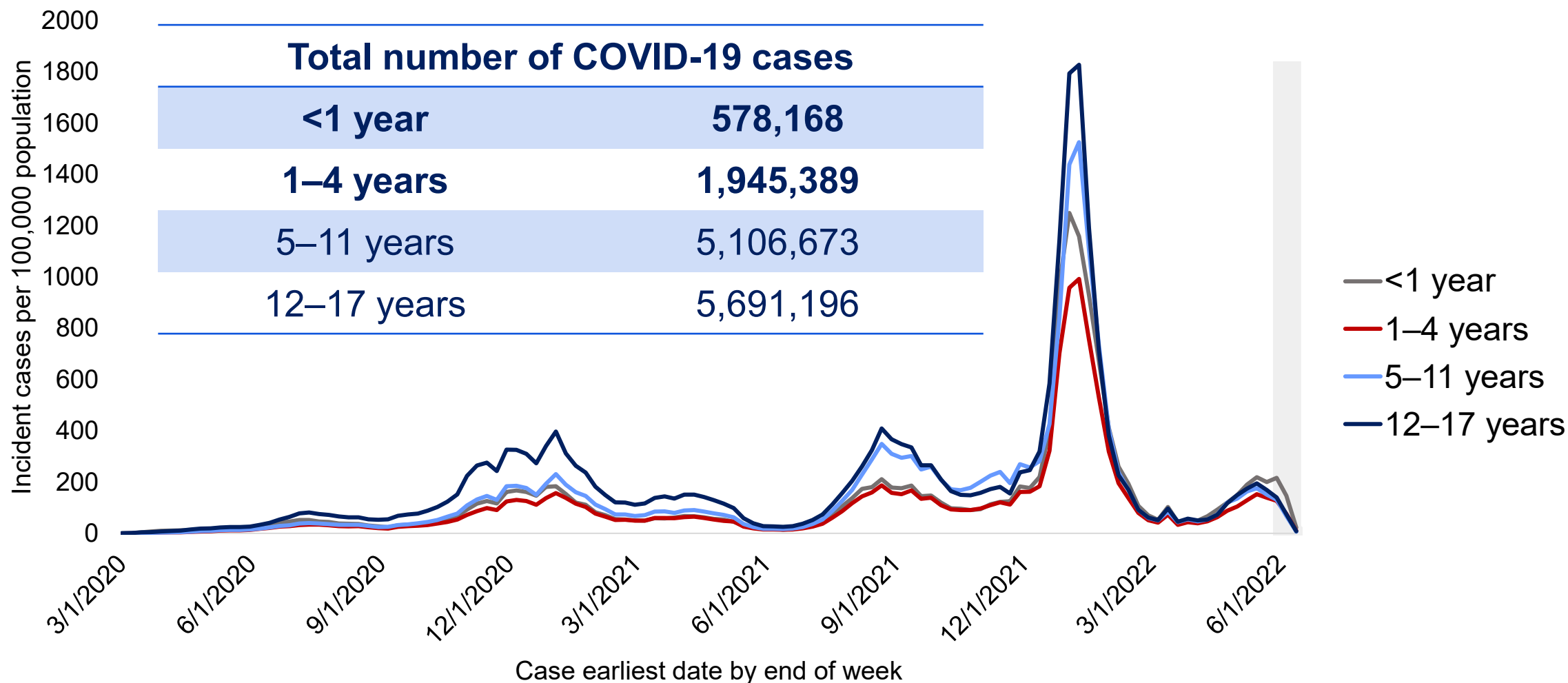


Reporting may be incomplete for the most recent two weeks of data, denoted by the grey box.

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

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

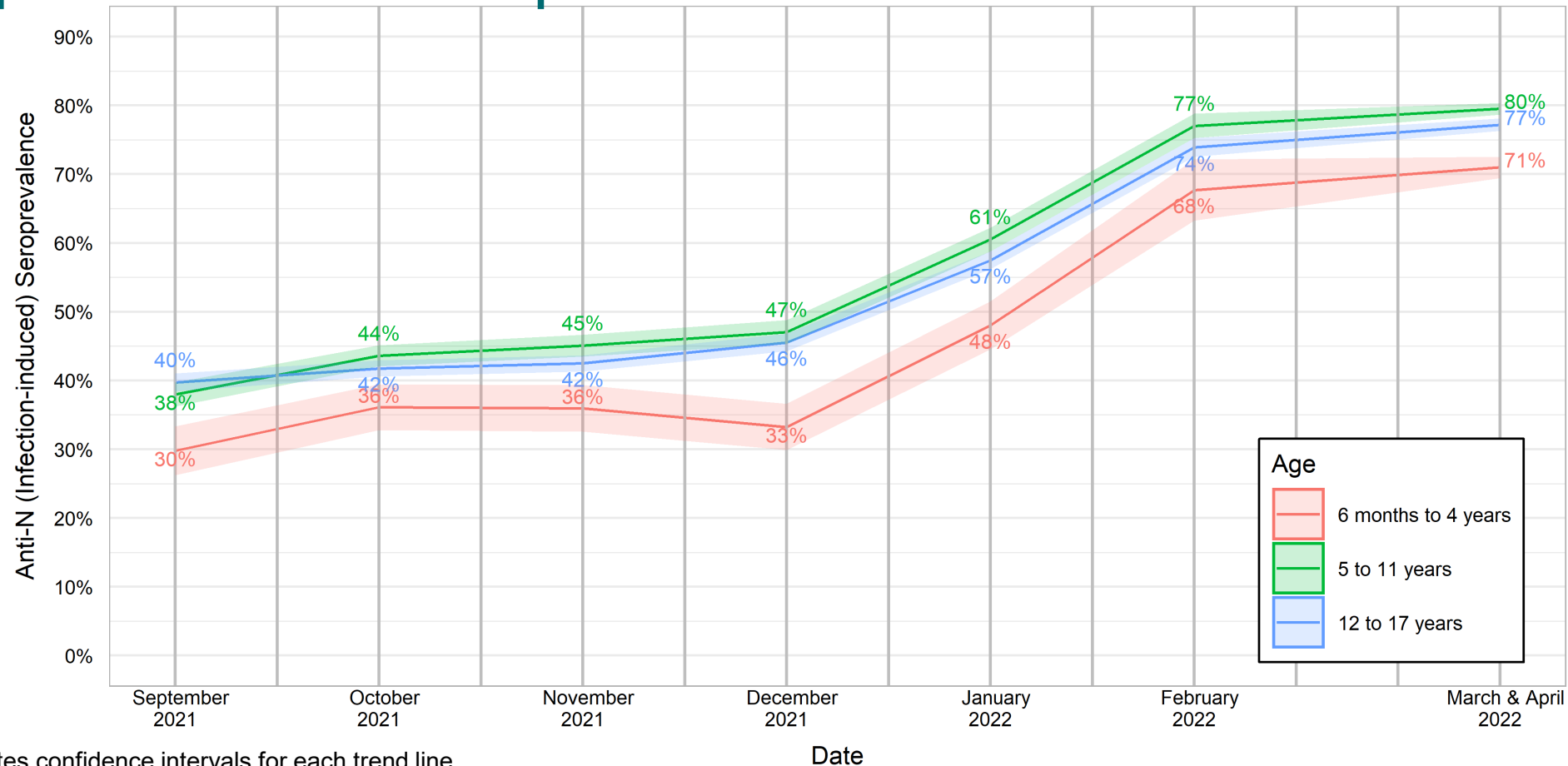
March 1, 2020 – June 12, 2022



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 June 16, 2022

Seroprevalence of infection-induced SARS-CoV-2 antibodies among children ages 6 months–17 years — National Commercial Lab Seroprevalence Study September 2021–April 2022



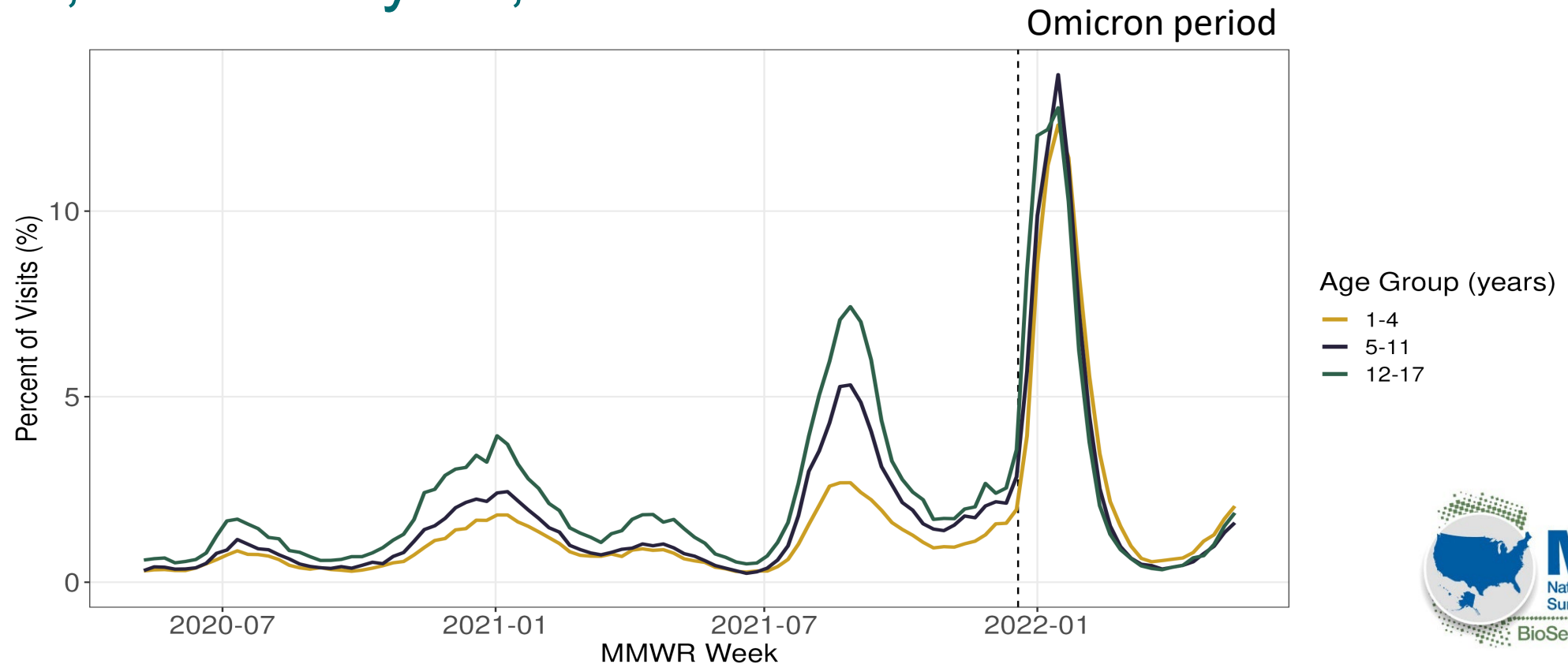
Shading indicates confidence intervals for each trend line.

Data updated for March/April 2022, based on 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). 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



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.

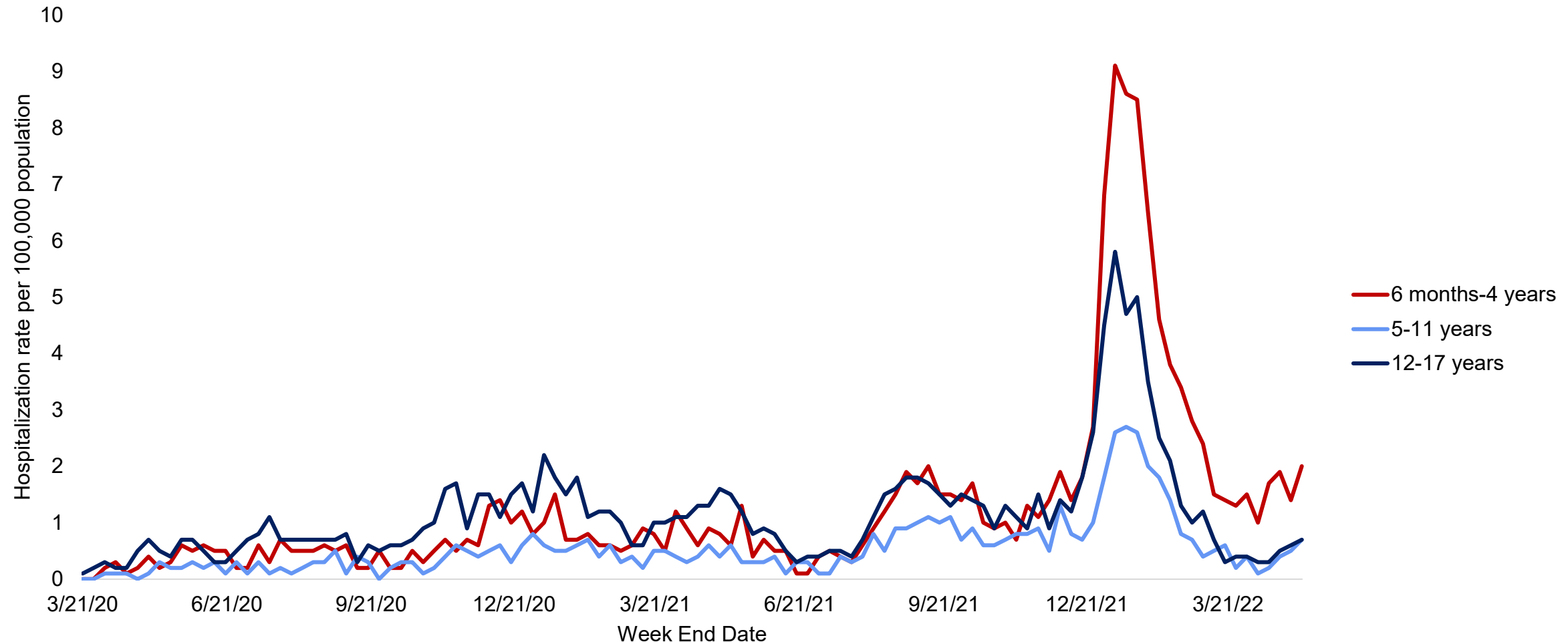
COVID-19-associated hospitalizations

Burden and severity of disease



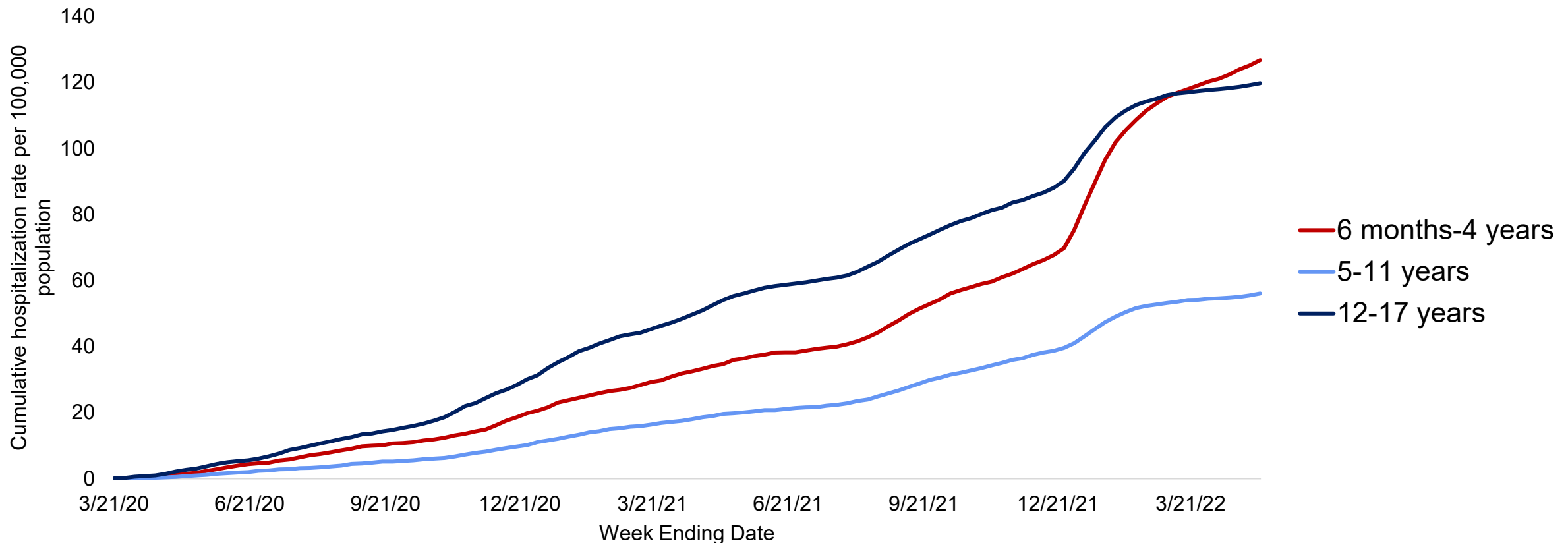
COVID-19-associated hospitalizations among children and adolescents 6 months–17 years, COVID-NET

March 2020 – March 2022



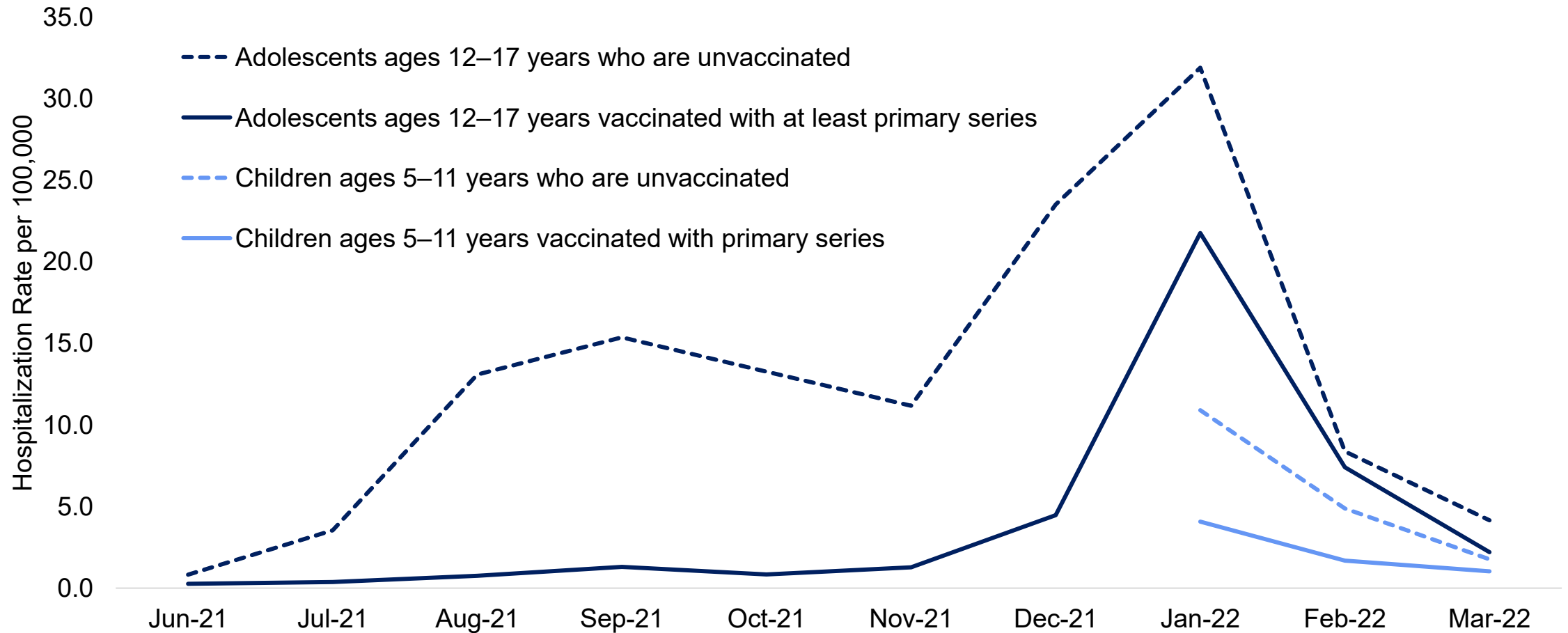
Cumulative COVID-19-associated hospitalizations among children and adolescents 6 months–17 years, COVID-NET

March 2020 – March 2022



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

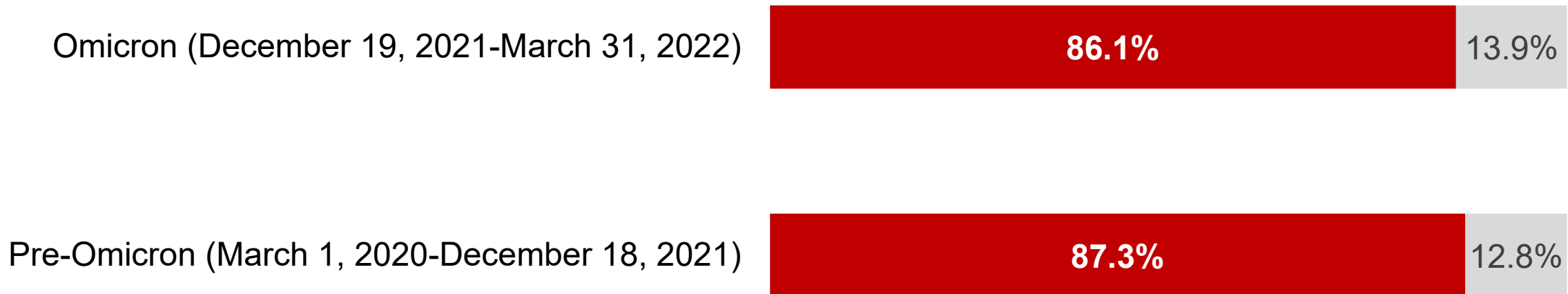
June 2021 – March 2022



Proportion of children ages 6 months–4 years with COVID-19 associated hospitalization who were primarily admitted for COVID-19, COVID-NET March 2020 – March 2022

■ Primarily admitted for COVID-19

■ Other reason for admission



All children in COVID-NET had a positive SARS-CoV-2 test within 14 days of or during hospital admission. “Primarily admitted for COVID-19” was defined based on the “Reason for admission” field from the case report form. If the chief complaint or history of present illness in the medical chart documents fever/respiratory illness, COVID-19-like illness, or a suspicion for COVID-19, a case is categorized as having COVID-19 as the primary reason for admission. Examples of other non-COVID-19-related reasons for admission seen in this age group include admissions for trauma or inpatient surgeries.

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

Percent of children ages 6 months–4 years with COVID-19 associated hospitalization with underlying health conditions

■ At least 1 underlying medical conditions ■ No underlying medical conditions

New Vaccine Surveillance Network, March 2020
– April 2022

46%

54%

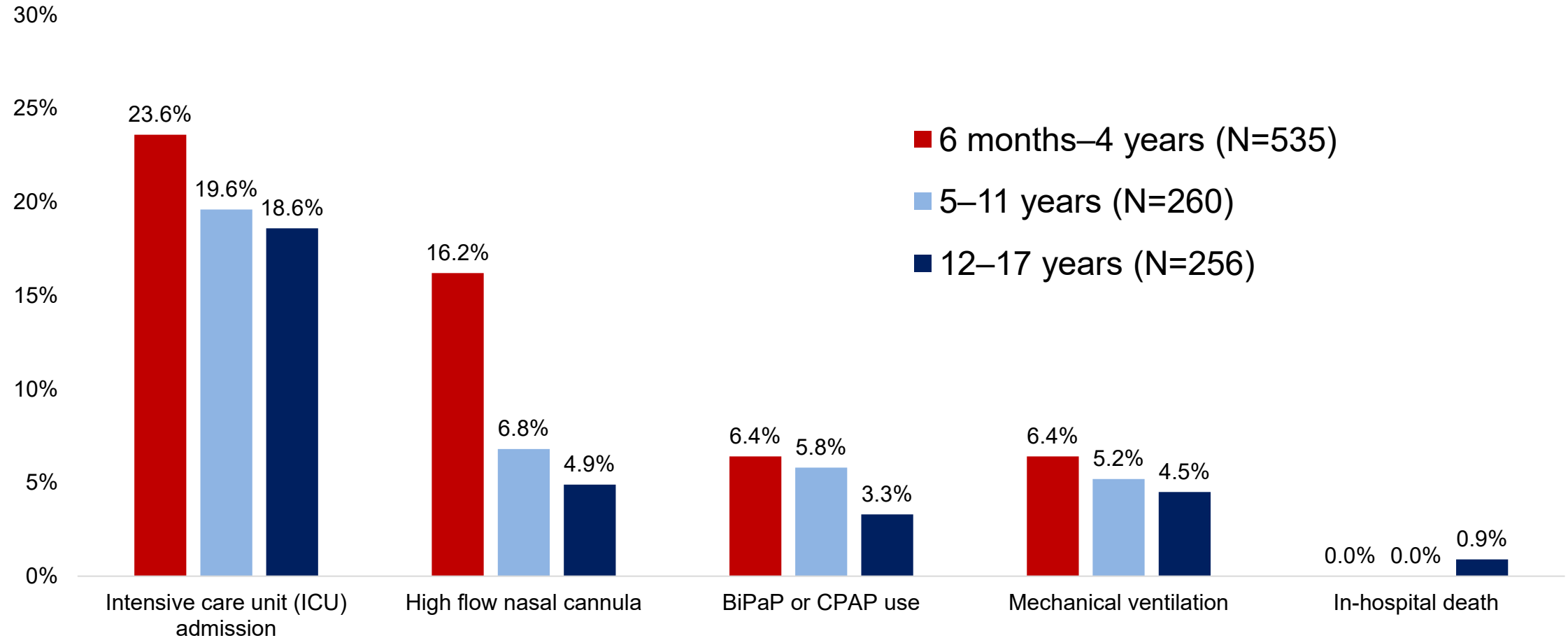
COVID-NET, March 2020 – March 2022

49%

51%

Source: 1. New Vaccine Surveillance Network. Preliminary data as of May 25, 2022, reflecting data from March 2020–April 2022
2. COVID-NET data. Accessed May 21, 2022, reflecting data from March 2020–March 2022

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



BiPaP: bilevel positive pressure, CPAP: continuous positive pressure

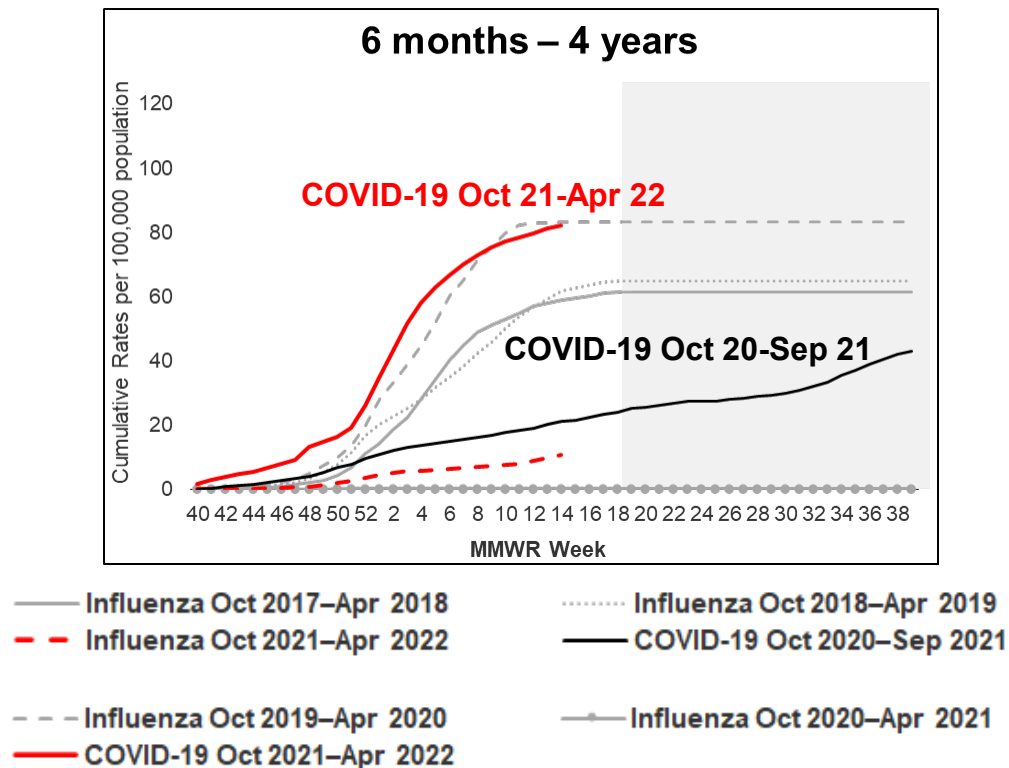
Source: COVID-NET data. Accessed May 21, 2022.

COVID-19-associated hospitalizations

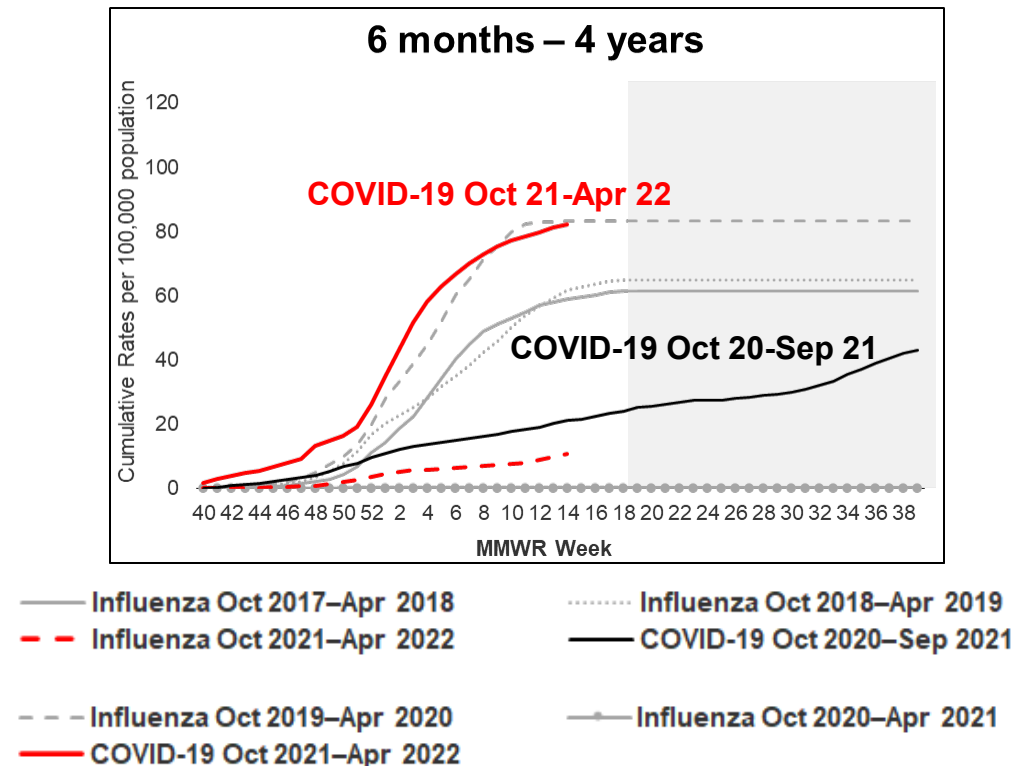
Comparisons to other pediatric infectious diseases



Cumulative influenza- and COVID-19-associated hospitalization rates per 100,000 children ages 6 months–4 years, FluSurv-NET and COVID-NET, 2017–2022



Cumulative influenza- and COVID-19-associated hospitalization rates per 100,000 children ages 6 months–4 years, 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 2017–18 through 2019–20 (pre-pandemic) influenza seasons
- Oct 2021–Apr 2022 COVID-19 hospitalization rates were as high or higher than influenza hospitalization rates during 2017–18 through 2021–22 influenza seasons

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.

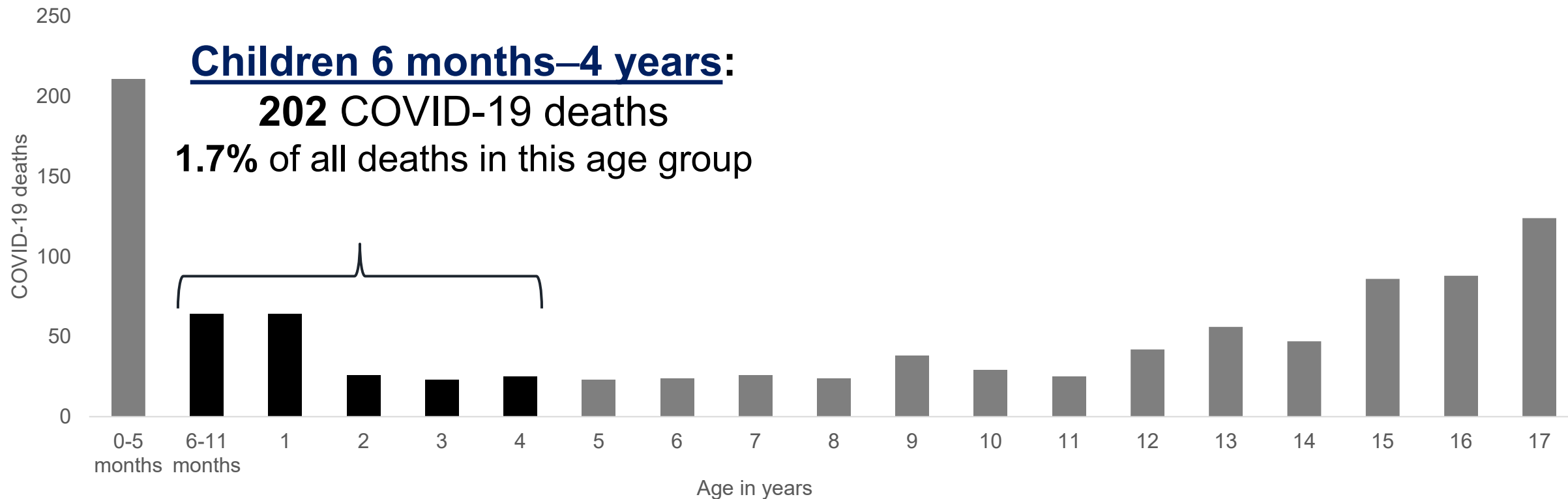
⁴ COVID-NET data, Accessed May 21, 2022.

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



COVID-19 is a leading cause of death among children ages 0–19 years

March 1, 2020–April 30, 2022

Age group	Rank of COVID-19 among causes of death
<1 year	4
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

¹Vogt TM , Wise ME, Bell BP, Finelli L. Declining hepatitis A mortality in the United States during the era of hepatitis A vaccination. J Infect Dis 2008; 197:1282–8.

²National Notifiable Diseases Surveillance System with additional serogroup and outcome data from Enhanced Meningococcal Disease Surveillance for 2015-2019.

³Meyer 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

⁴Roush SW , Murphy TV; Historical comparisons of morbidity and mortality for vaccine-preventable diseases in the United States. JAMA 2007; 298:2155–63.

⁵Glass 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}

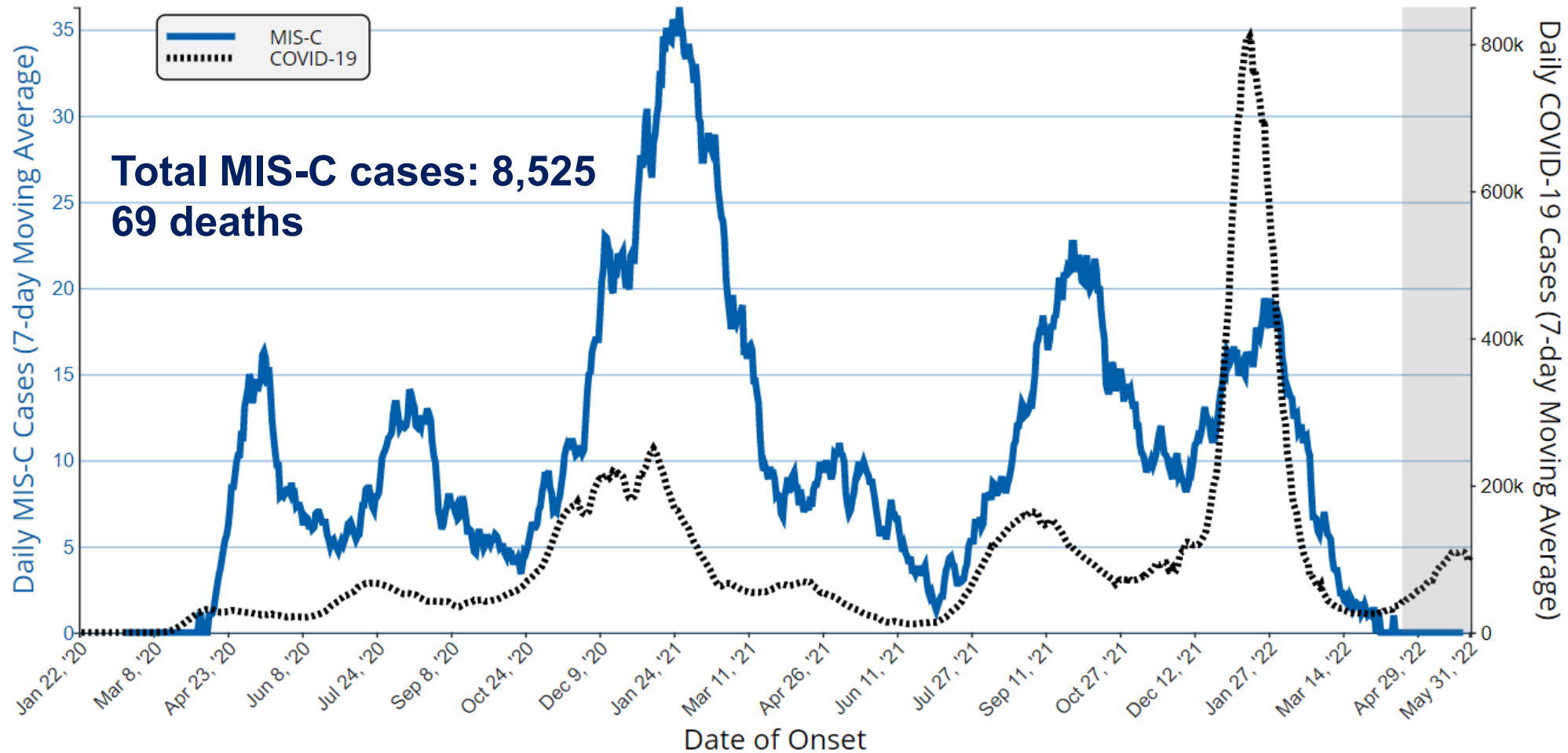
1. https://www.cdc.gov/mis/mis-c/hcp/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fmis%2Fhcp%2Findex.html. Accessed June 7, 2022.

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



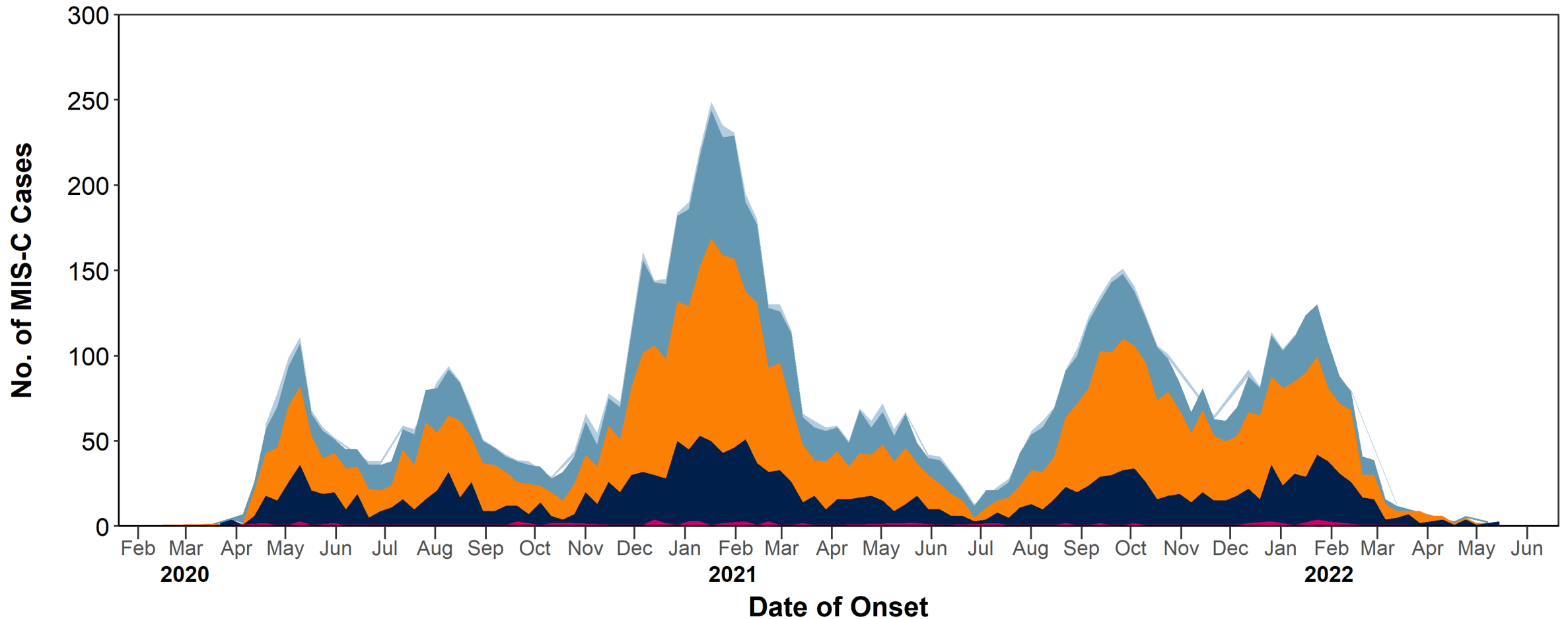
MIS-C cases are among individuals ages <21 years. COVID-19 cases reflect all cases reported to CDC (among individuals of all ages). The grayed-out area on the right side of the figure represents the most recent 6 weeks of data, for which reporting of MIS-C cases is still incomplete. Date of onset was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

Age groups (years) ■ 0-5 mos ■ 6mos-4 years ■ 5-11 years ■ 12-17 years ■ 18-20 years

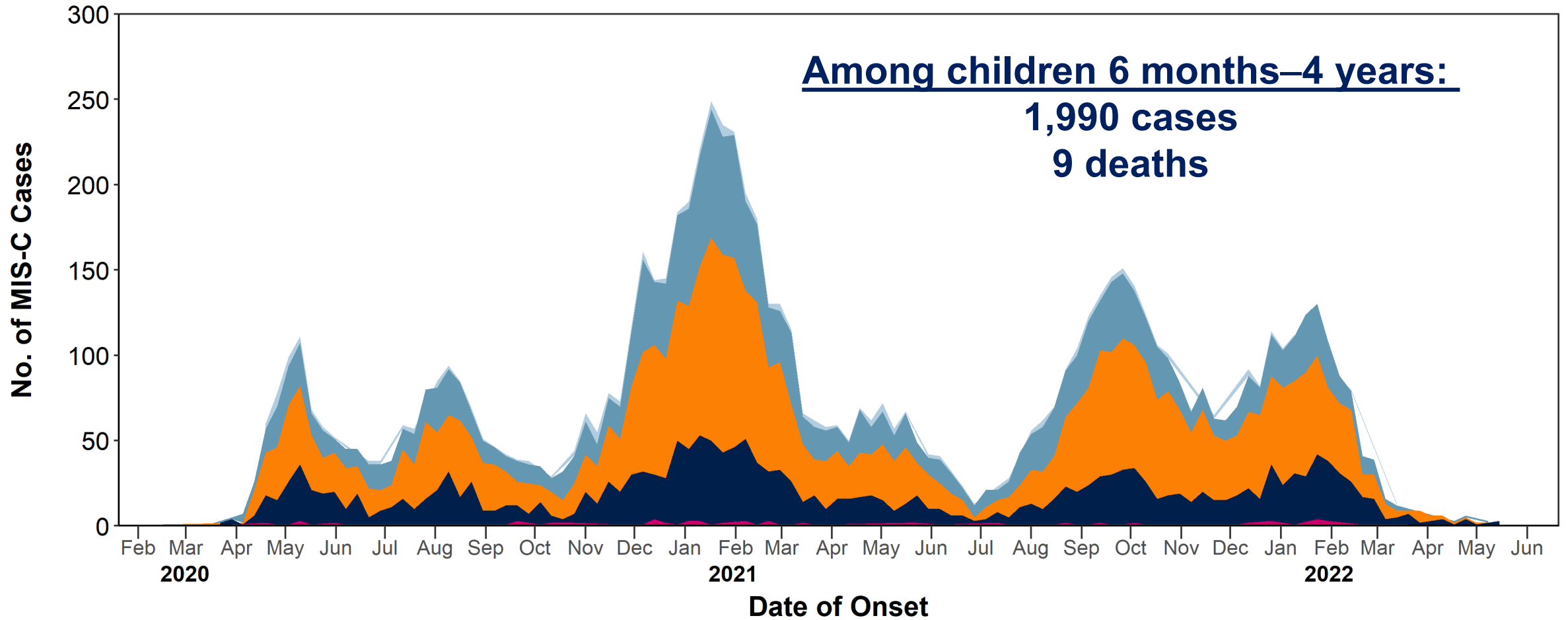


CDC Data. Age is missing for 1 case

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

February 1, 2020 – May 31, 2022

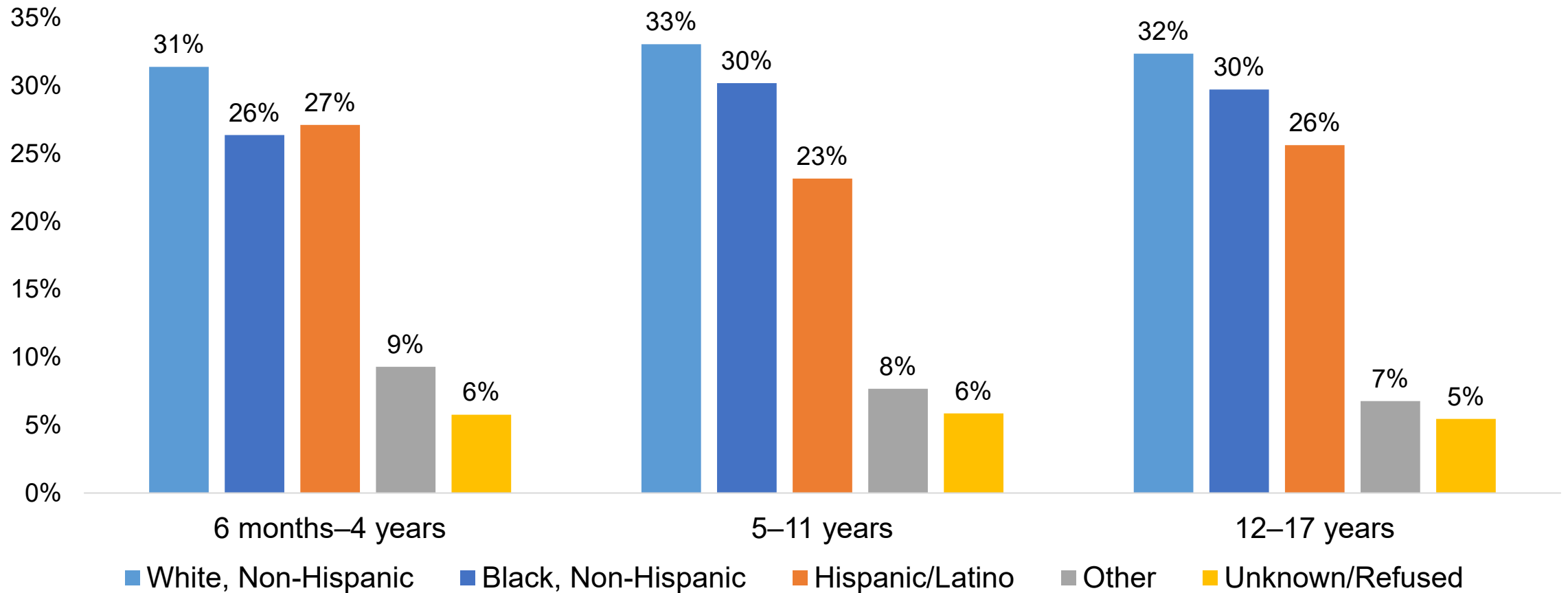
Age groups (years) ■ 0-5 mos ■ 6mos-4 years ■ 5-11 years ■ 12-17 years ■ 18-20 years



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

- A range of new, returning or ongoing, health problems occurring 4 or more weeks after acute SARS-CoV-2 infection¹
- Occur in adults² and children <18 years³⁻⁴
- Children ages 0–5 years with SARS-CoV-2 infection are more likely than controls (without known SARS-CoV-2 infection) to experience the following symptoms lasting more than 4 weeks after acute infection⁴
 - Fatigue
 - Loss of taste
 - Loss of smell

1. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/post-covid-science.html>. Accessed June 13, 2022.

2. Bull-Otterson L, Baca S, Saydah S, et al. Post-COVID Conditions Among Adult COVID-19 Survivors Aged 18–64 and ≥65 Years — United States, March 2020–November 2021. *MMWR Morb Mortal Wkly Rep* 2022;71:713–717. DOI: <http://dx.doi.org/10.15585/mmwr.mm7121e1>

3. Rao S, Lee GM, Razzaghi H, et al. Clinical features and burden of post-acute sequelae of SARS-CoV-2 infection in children and adolescents: an exploratory EHR-based cohort study from the RECOVER program. *medRxiv* 2022.05.24.22275544; doi: <https://doi.org/10.1101/2022.05.24.22275544>

4. Borch L, Holm M, Knudsen M, et al. Long COVID symptoms and duration in SARS-CoV-2 positive children — a nationwide cohort study. *European Journal of Pediatrics*. 2022 2022/04/01;181(4):1597-607.

Post-COVID conditions in children

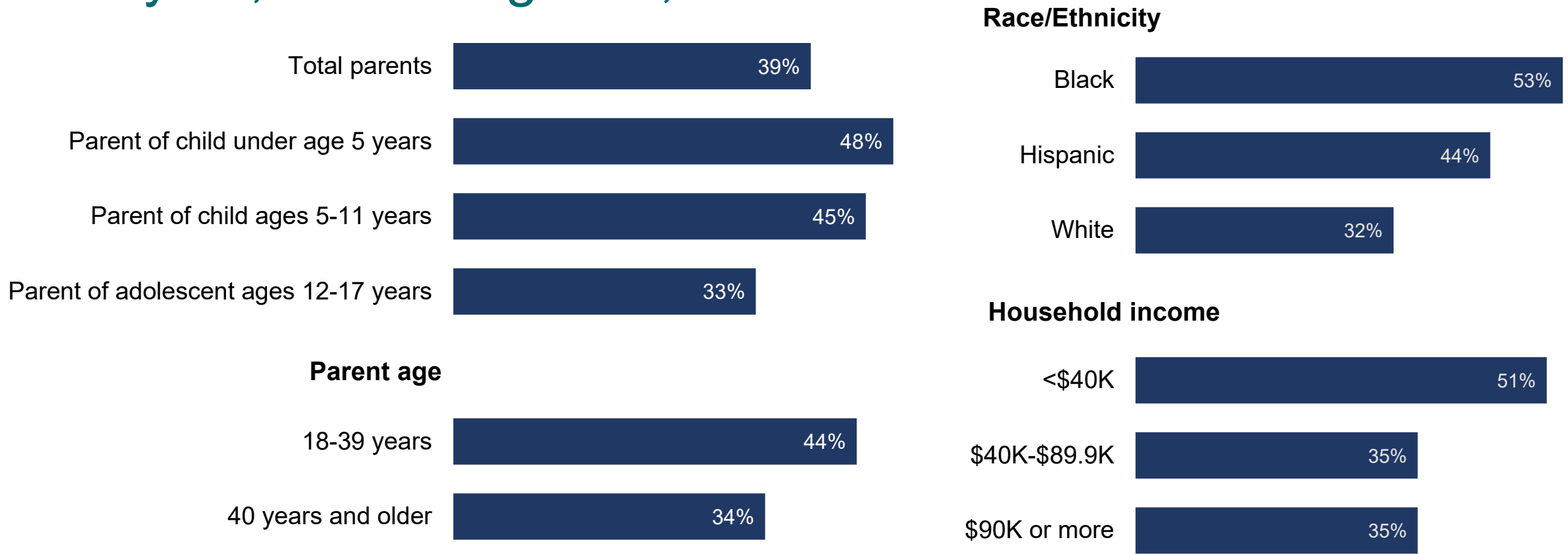
- Evidence regarding the prevalence and spectrum of post-COVID conditions among children, especially young children, is limited by¹
 - Inability of younger children to verbalize symptoms
 - Few studies including children
 - Lack of control groups
 - Symptoms frequently occur in children without known SARS-CoV-2 infection

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



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



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

Total parents 39%

Parent of child under age 5 years 48%

Parent of child ages 5-11 years 45%

Parent of adolescent ages 12-17 years 33%

Parent age

18-39 years 44%

40 years and older 34%

Race/Ethnicity

Black 53%

Hispanic 44%

White 32%

Household income

<\$40K 51%

\$40K-\$89.9K 35%

\$90K or more 35%

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–4 years

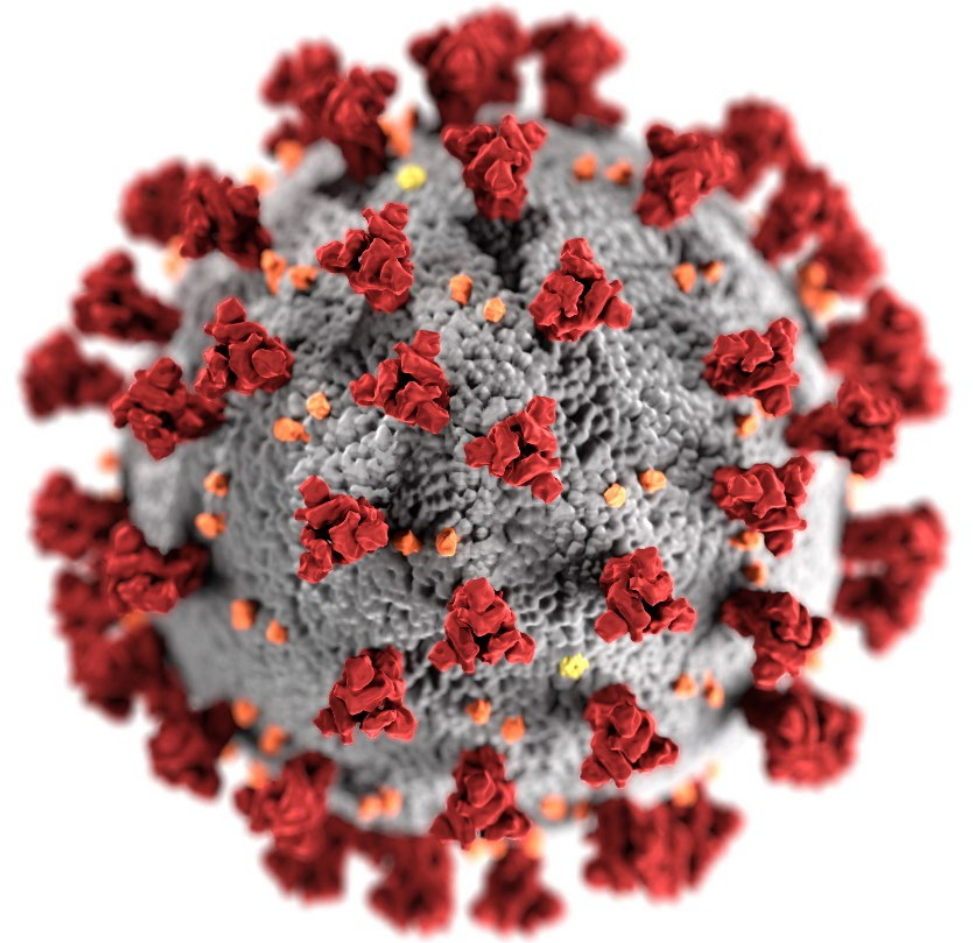
- As of June 12, 2022, COVID-19 has caused **>570,000** cases among infants age <1 year and **>1.9 million** cases among children ages 1–4 years
- Omicron surge in the United States led to the highest numbers of COVID-19 cases, emergency department visits, and hospitalization rates seen during the pandemic

Summary: COVID-19 epidemiology in children and adolescents ages 6 months–4 years

- Children ages 6 months–4 years 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

Acknowledgements

- ACIP COVID-19 Workgroup Team: Sara Oliver, Evelyn Twentyman, Monica Godfrey, Danielle Moulia, Megan Wallace, Lauren Roper, Kate Woodworth
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 - Core Clinical Unit: David Siegel
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- Nssp: Aaron Kite-Powell, Kelly Carey, Kathleen Hartnett, Karl Soetebier
- FluSurv-NET: Shikha Garg, Dawud Ujamaa, Miranda Delahoy
- Division of Vital Statistics, National Center for Health Statistics
- Many more...



For more information, contact CDC
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TTY: 1-888-232-6348 www.cdc.gov

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