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

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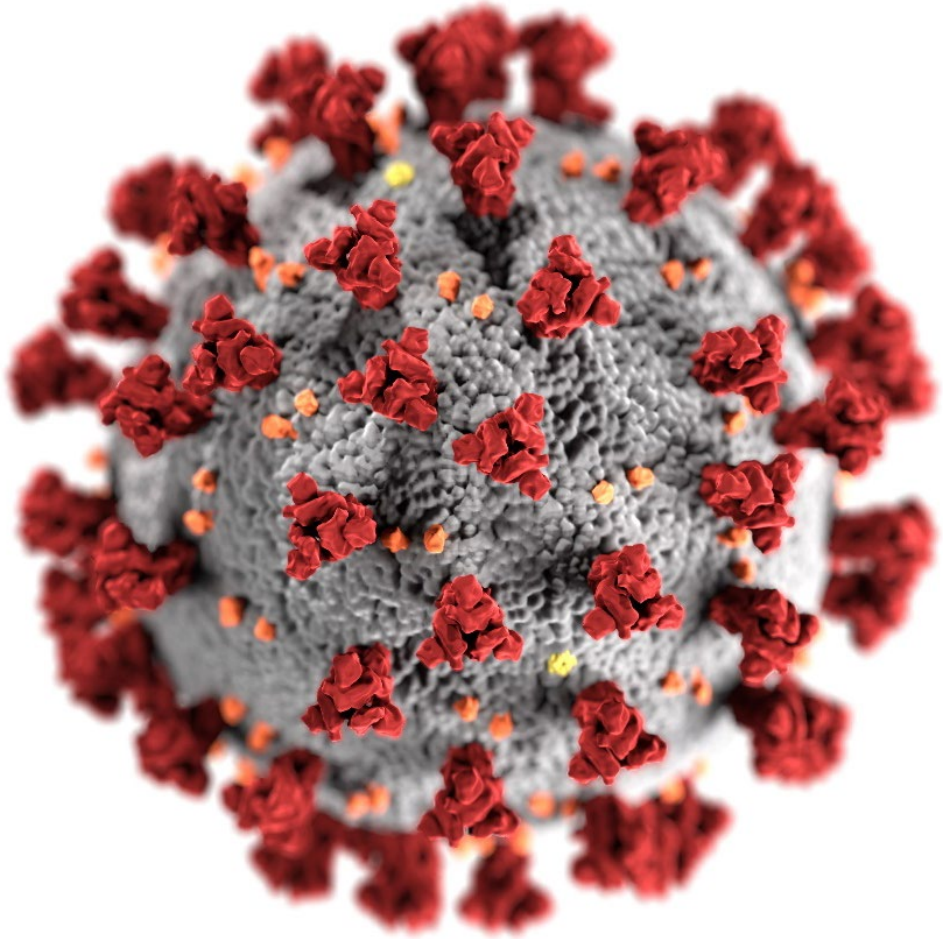
Centers for Disease Control and Prevention
June 17, 2022



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

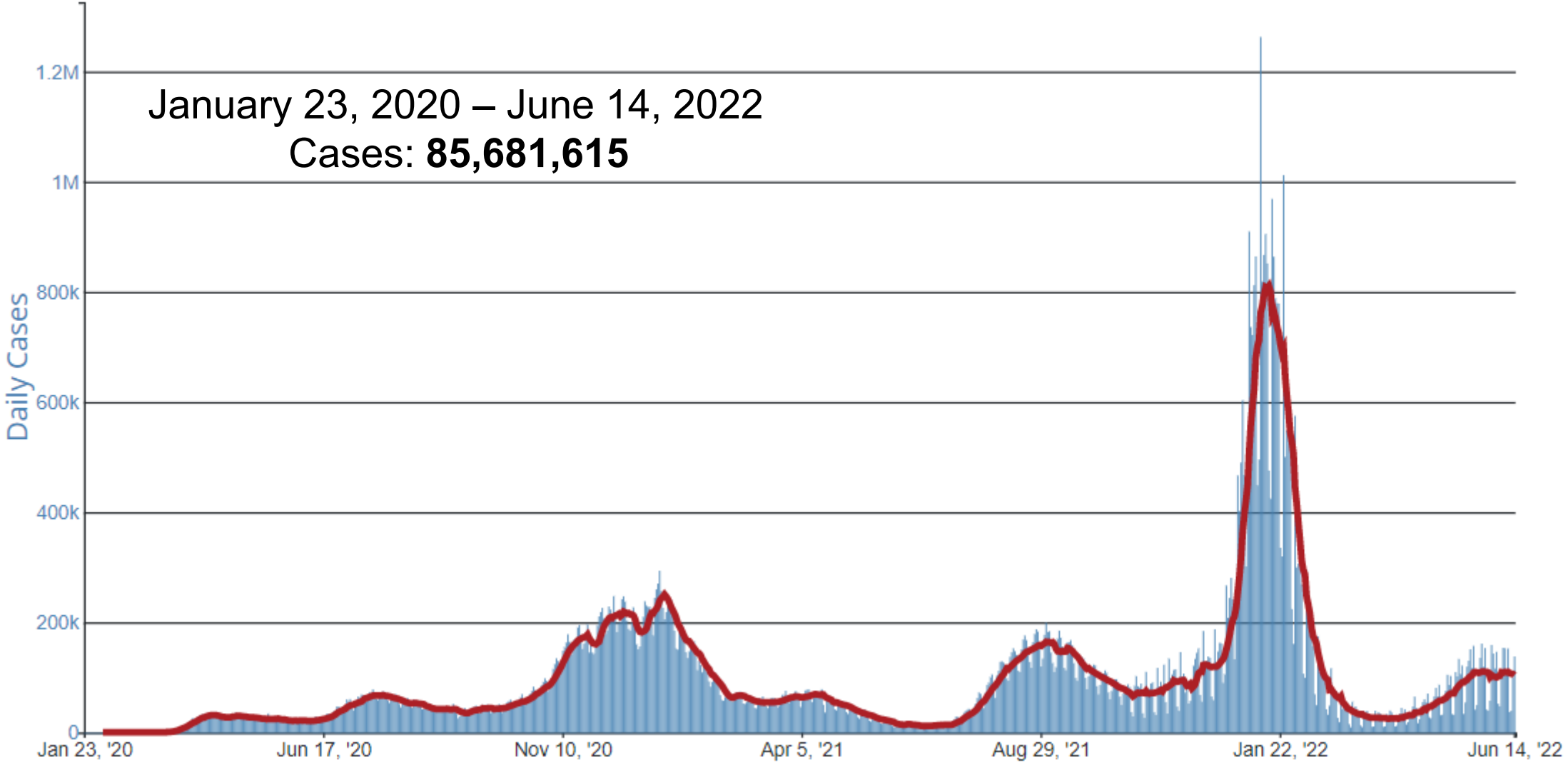
5–11 years

12–17 years

Currently eligible for COVID-19 vaccination

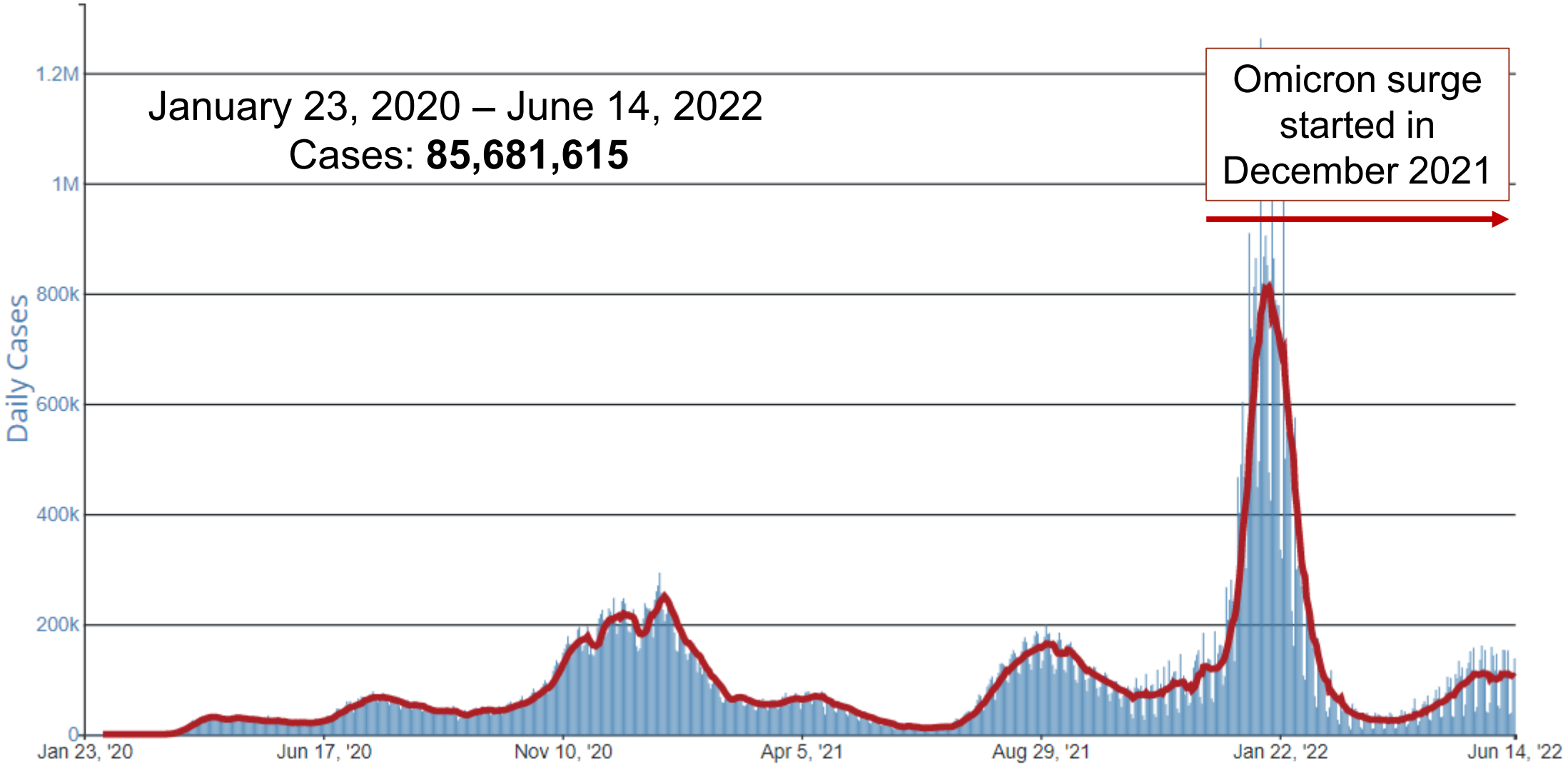
COVID-19 incidence and burden

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



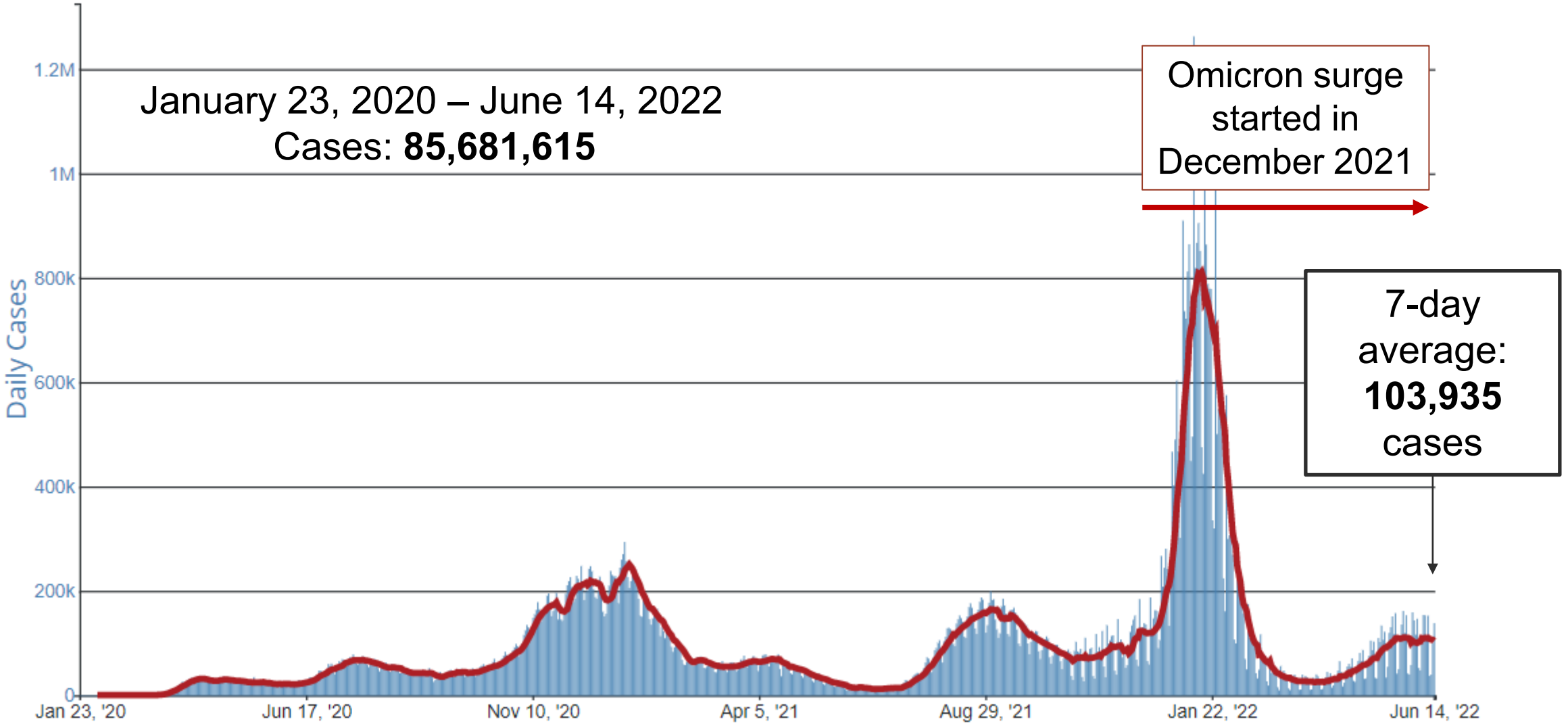
Source: COVID Data Tracker, https://covid.cdc.gov/covid-data-tracker/#trends_dailytrendscases. Accessed June 16, 2022

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 16, 2022

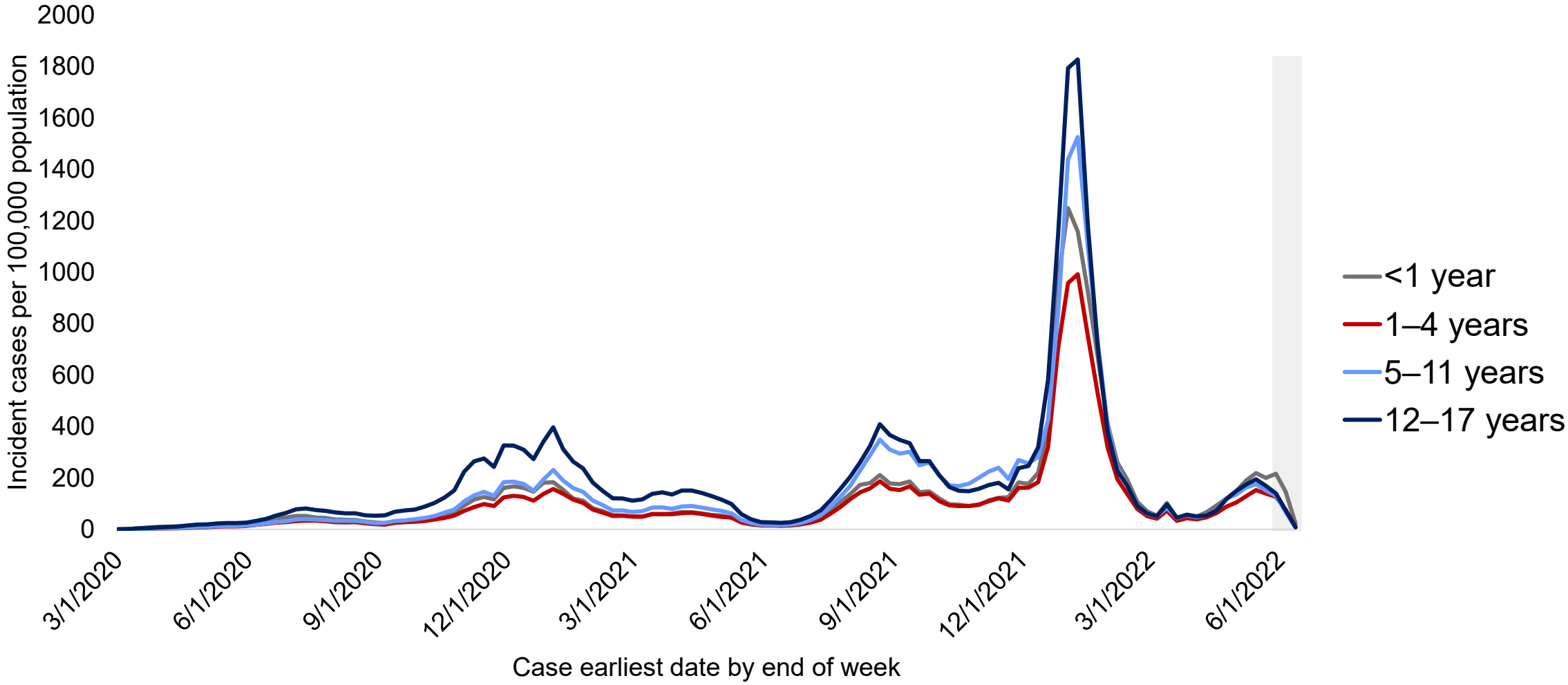
Trends in number of COVID-19 cases in the United States among persons of all ages



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



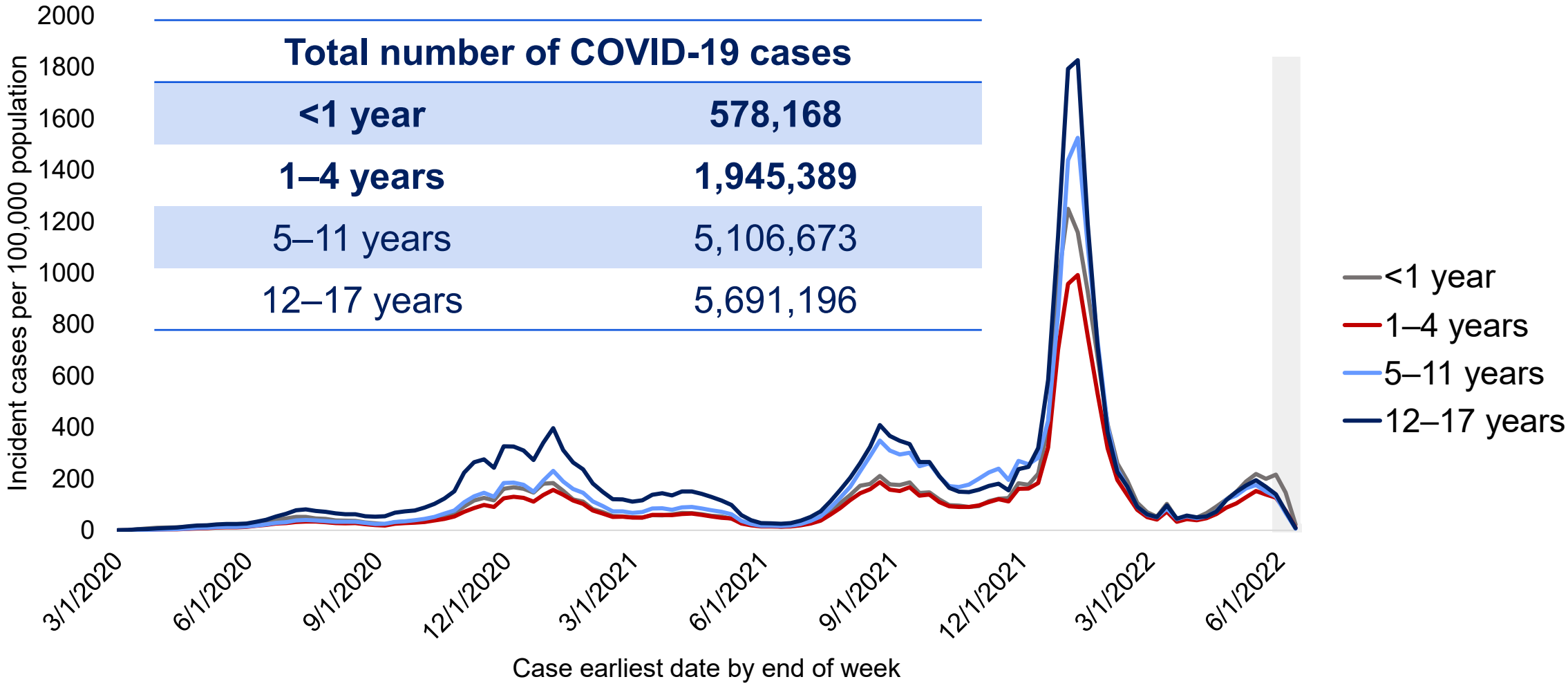
Reporting may be incomplete for the most recent two weeks of data, denoted by the grey box.

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

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

Total number of COVID-19 cases	
<1 year	**578,168**
1–4 years	**1,945,389**
5–11 years	5,106,673
12–17 years	5,691,196

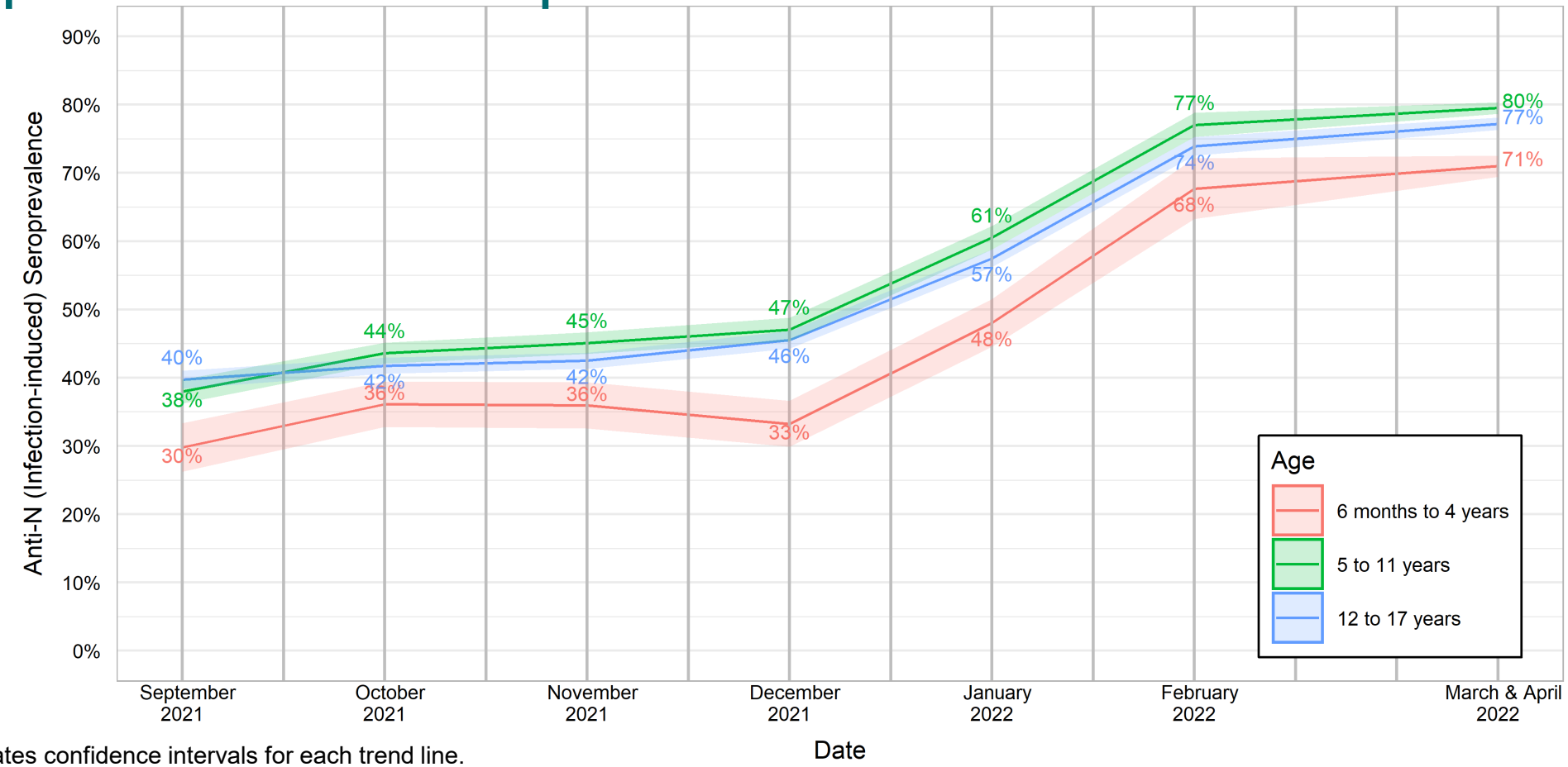


Reporting may be incomplete for the most recent two weeks of data, denoted by the grey box.

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



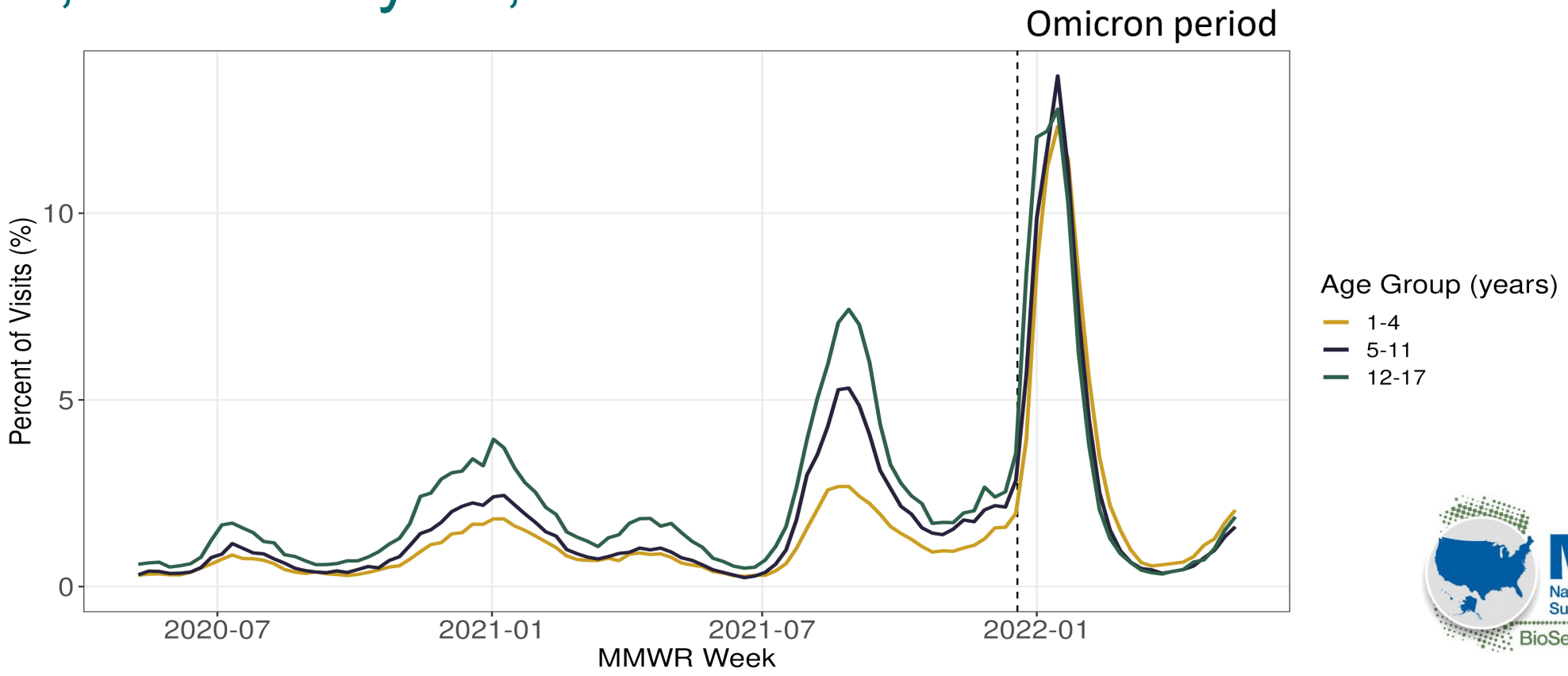
Shading indicates confidence intervals for each trend line.

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



NSSP National Syndromic Surveillance Program BioSense Platform

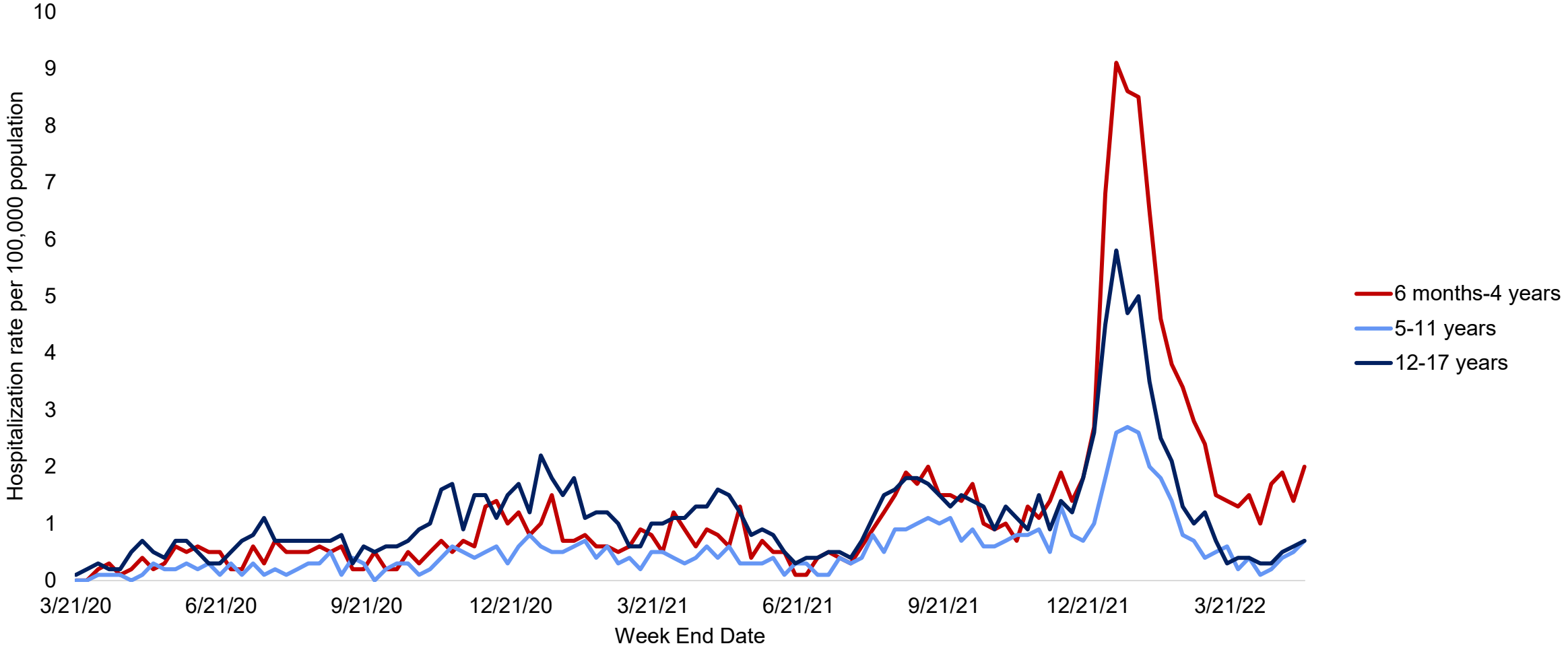
Dashed line, on December 19, 2021, represents the first date when >50% of nationally sequenced SARS-CoV-2 specimens were Omicron variant. Data contains emergency department visits from NSSP ED data feeds consistently reporting data from 2020-2022. The data contains visits with an ICD-10 or SNOMED code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

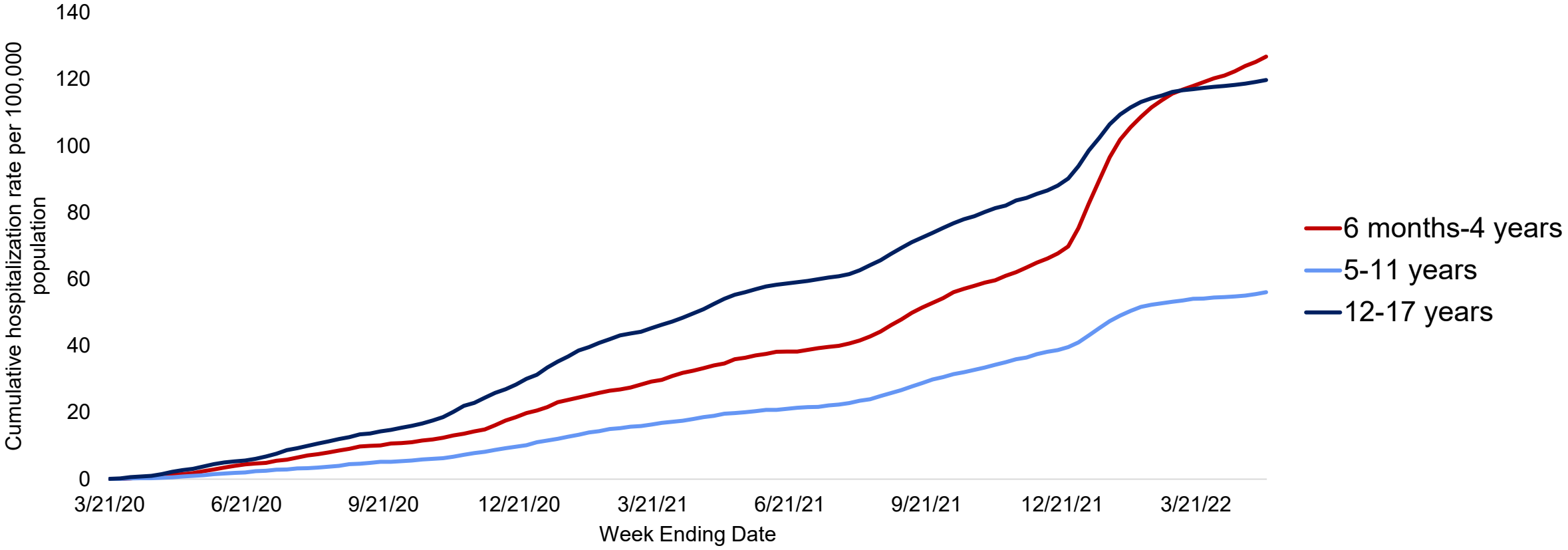
March 2020 – March 2022



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

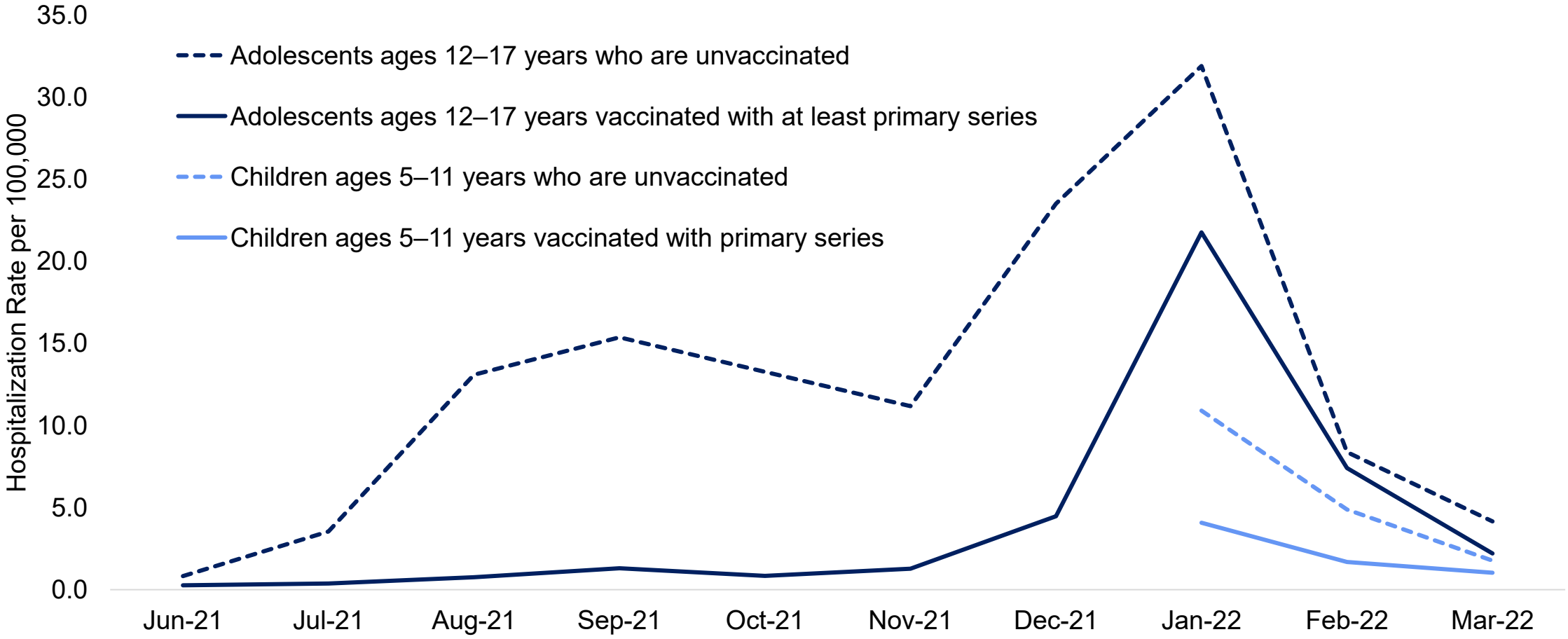
March 2020 – March 2022



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

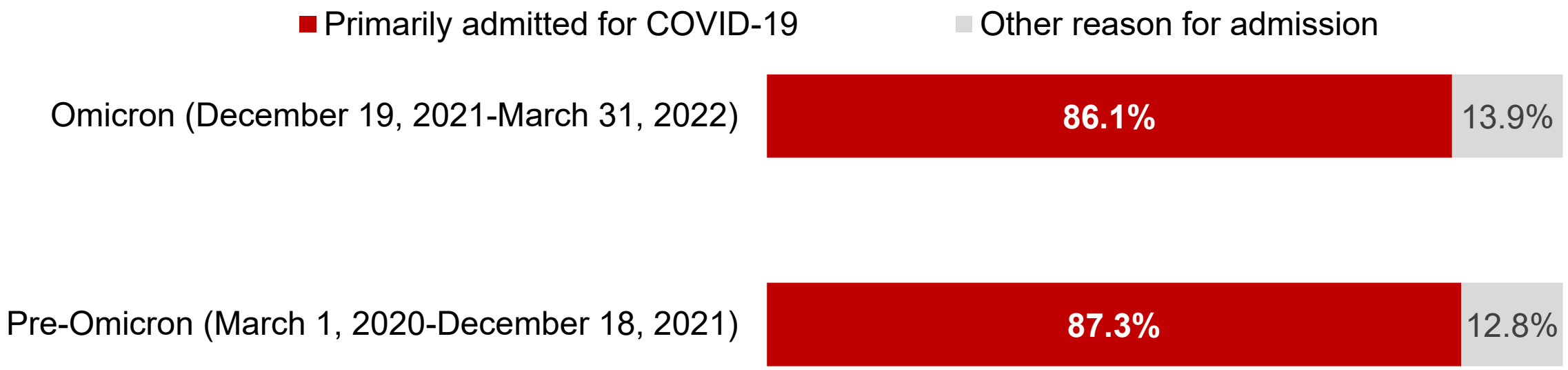
June 2021 – March 2022



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

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

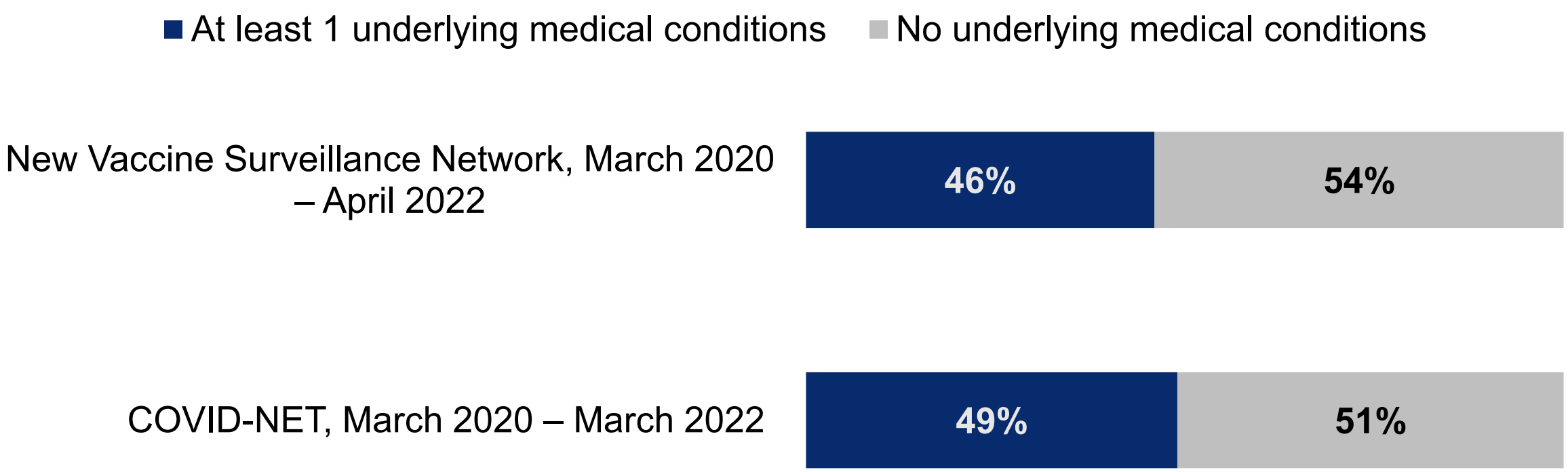
March 2020 – March 2022



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.

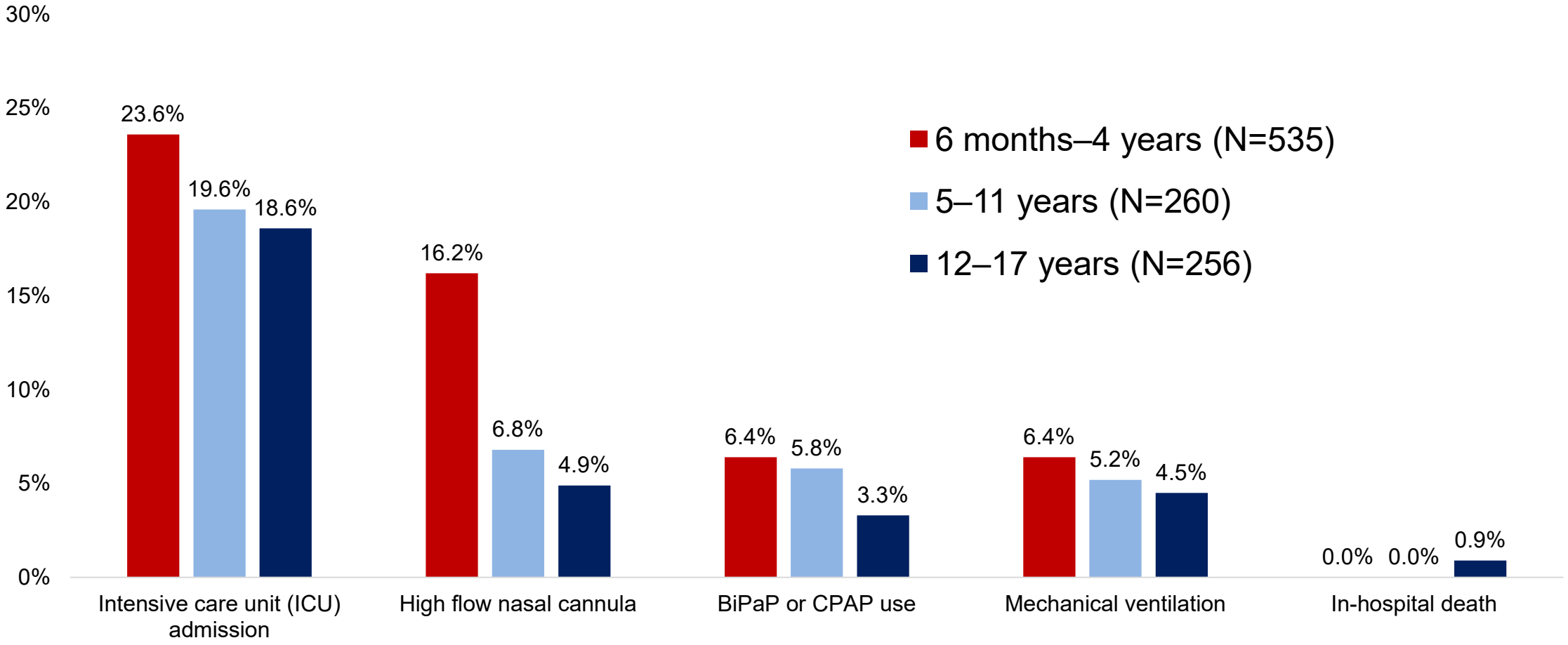
Source: COVID-NET data, Accessed May 21, 2022.

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



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)



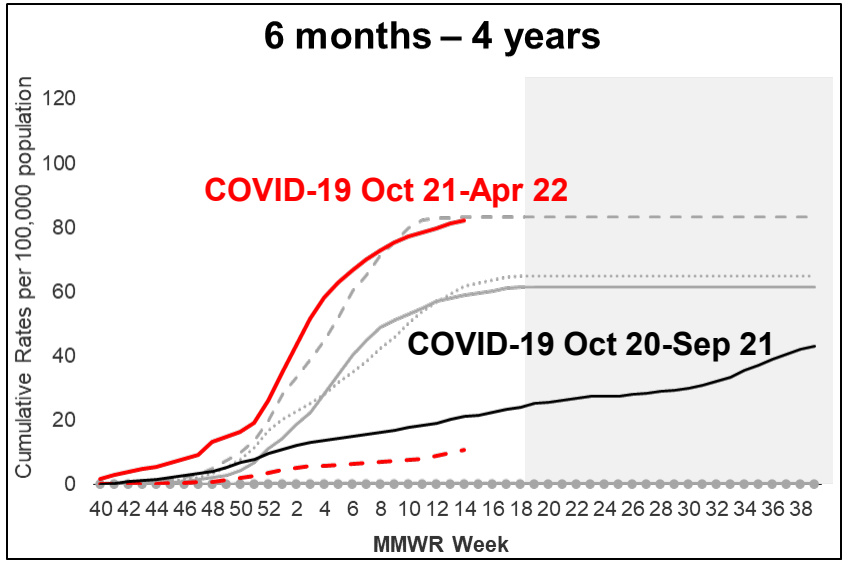
BiPAP: bilevel positive pressure, CPAP: continuous positive pressure

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

COVID-19-associated hospitalizations

Comparisons to other pediatric infectious diseases

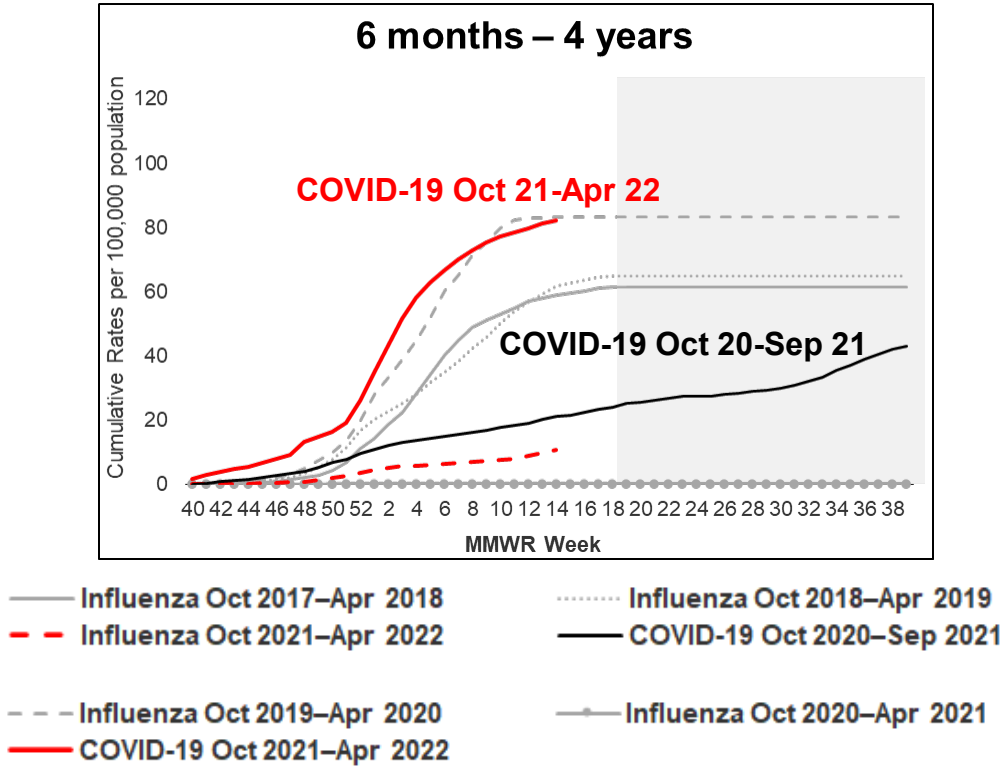
Cumulative influenza- and COVID-19-associated hospitalization rates per 100,000 children ages 6 months–4 years, FluSurv-NET and COVID-NET, 2017–2022



Influenza Oct 2017–Apr 2018
Influenza Oct 2018–Apr 2019
Influenza Oct 2021–Apr 2022
COVID-19 Oct 2020–Sep 2021
Influenza Oct 2019–Apr 2020
Influenza Oct 2020–Apr 2021
COVID-19 Oct 2021–Apr 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 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

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.

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**

[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

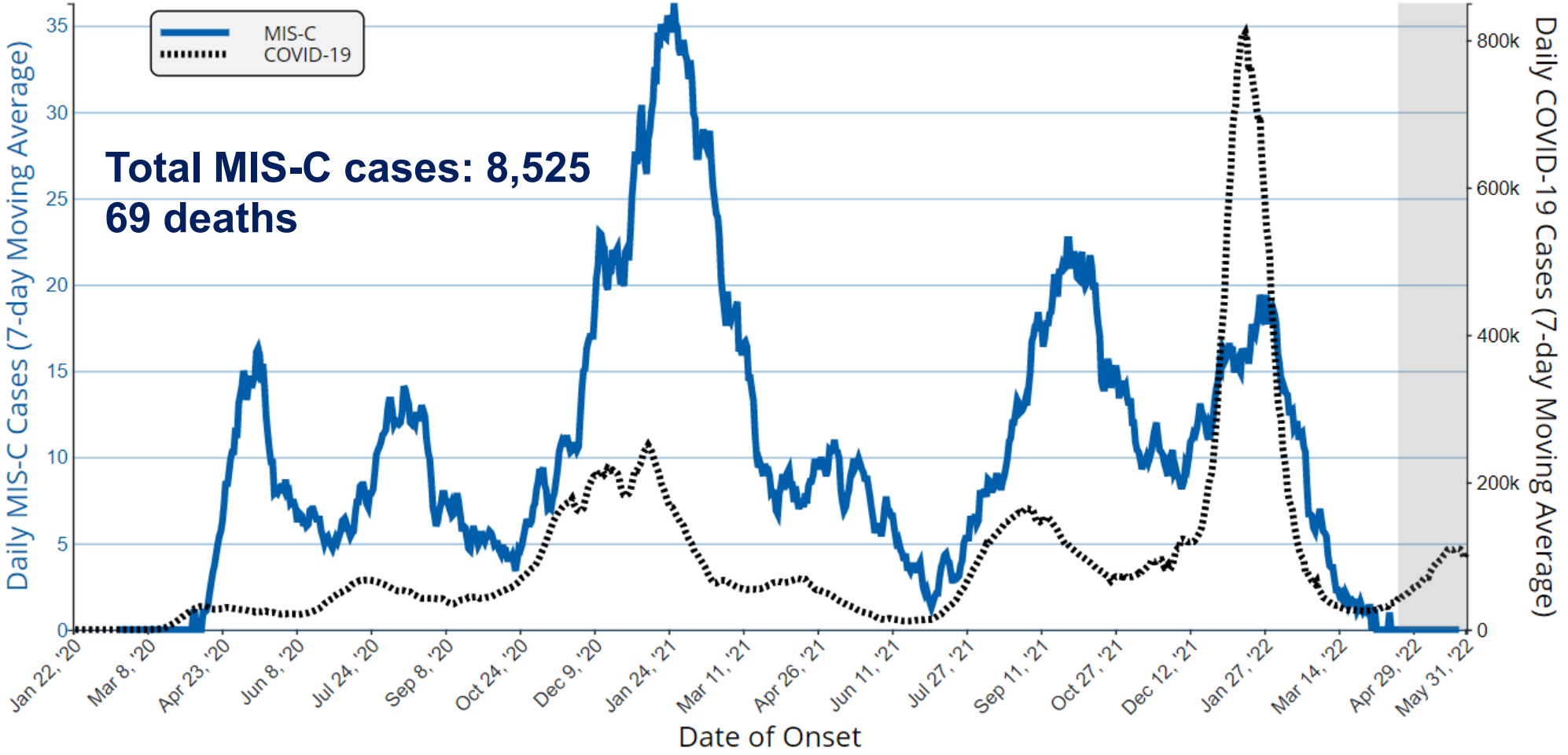
Multisystem Inflammatory Syndrome in Children (MIS-C)

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

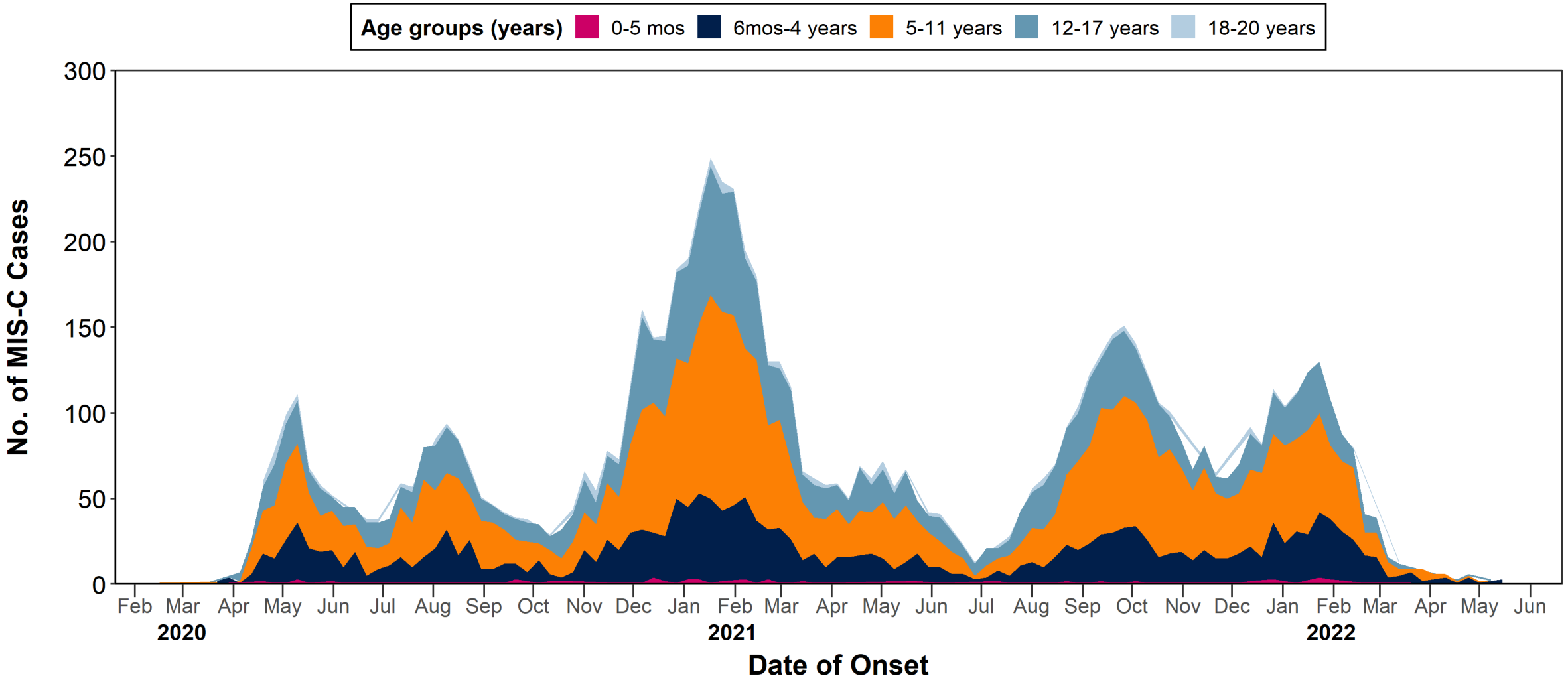


MIS-C cases are among individuals ages <21 years. COVID-19 cases reflect all cases reported to CDC (among individuals of all ages). The grayed-out area on the right side of the figure represents the most recent 6 weeks of data, for which reporting of MIS-C cases is still incomplete. Date of onset was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

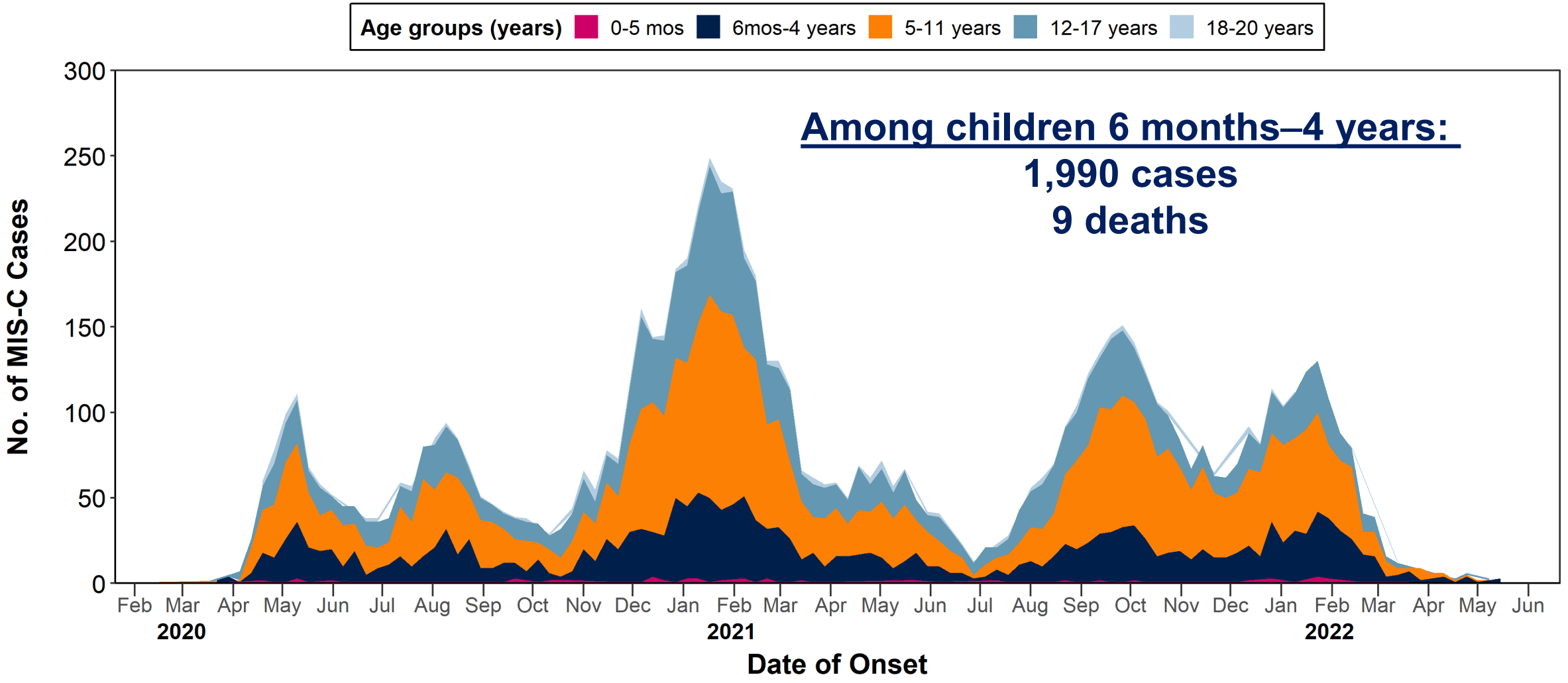
February 1, 2020 – May 31, 2022



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)

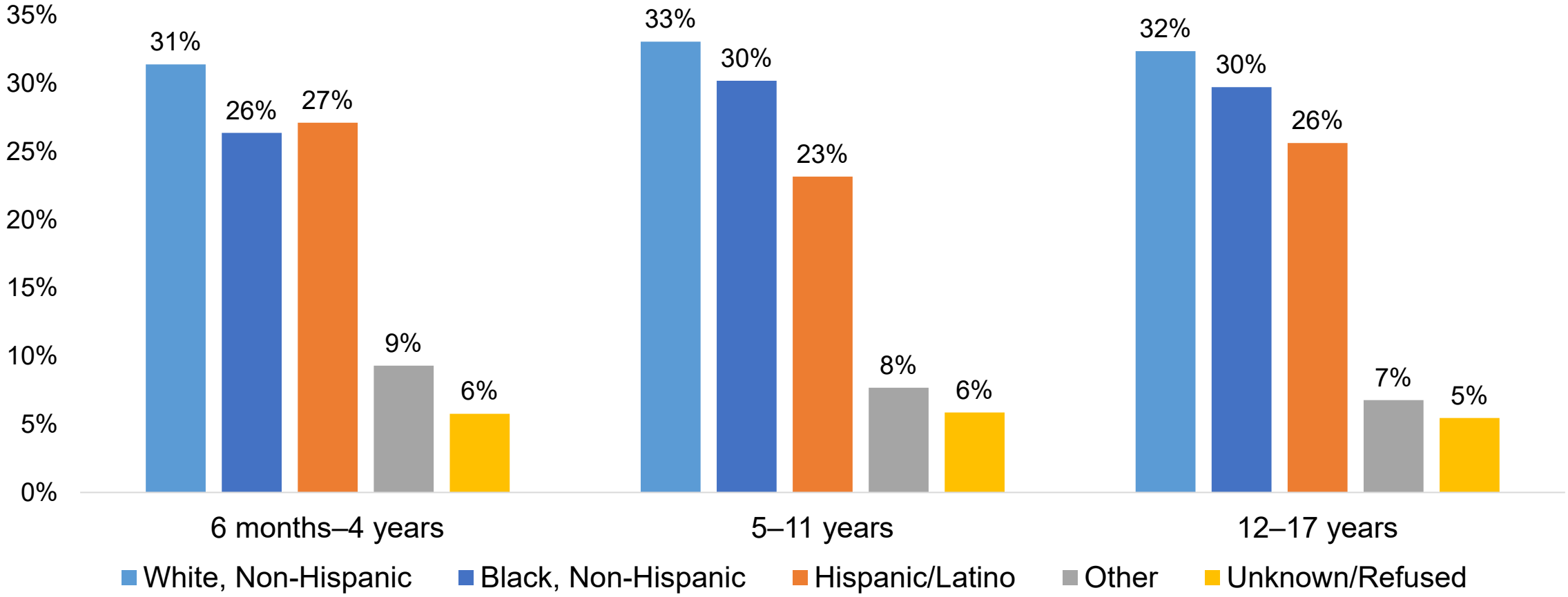
February 1, 2020 – May 31, 2022



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 infection[1]
- Occur in adults[2] and children <18 years[3-4]
- 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 infection[4]
  - 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

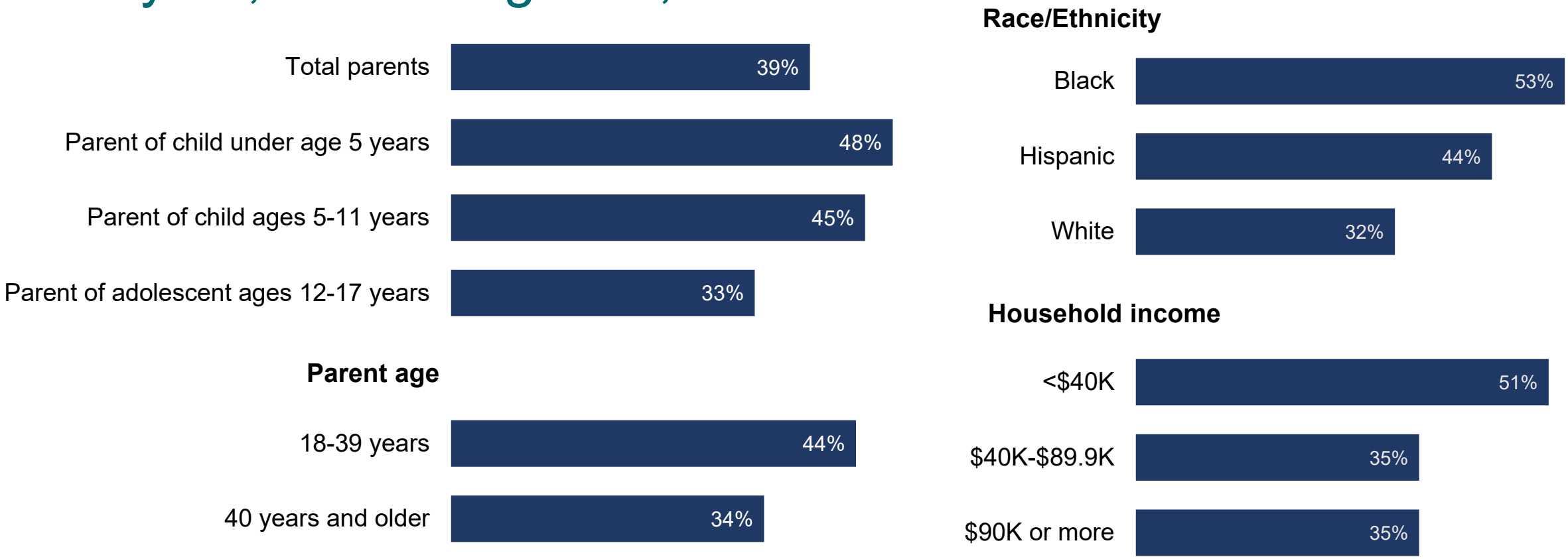
- Evidence regarding the prevalence and spectrum of post-COVID conditions among children, especially young children, is limited by[1]
  - Inability of younger children to verbalize symptoms
  - Few studies including children
  - Lack of control groups
  - Symptoms frequently occur in children without known SARS-CoV-2 infection

1. Zimmermann P, Pittet LF, Curtis N. The Challenge of Studying Long COVID: An Updated Review. The Pediatric infectious disease journal. 2022;41(5):424-6.

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



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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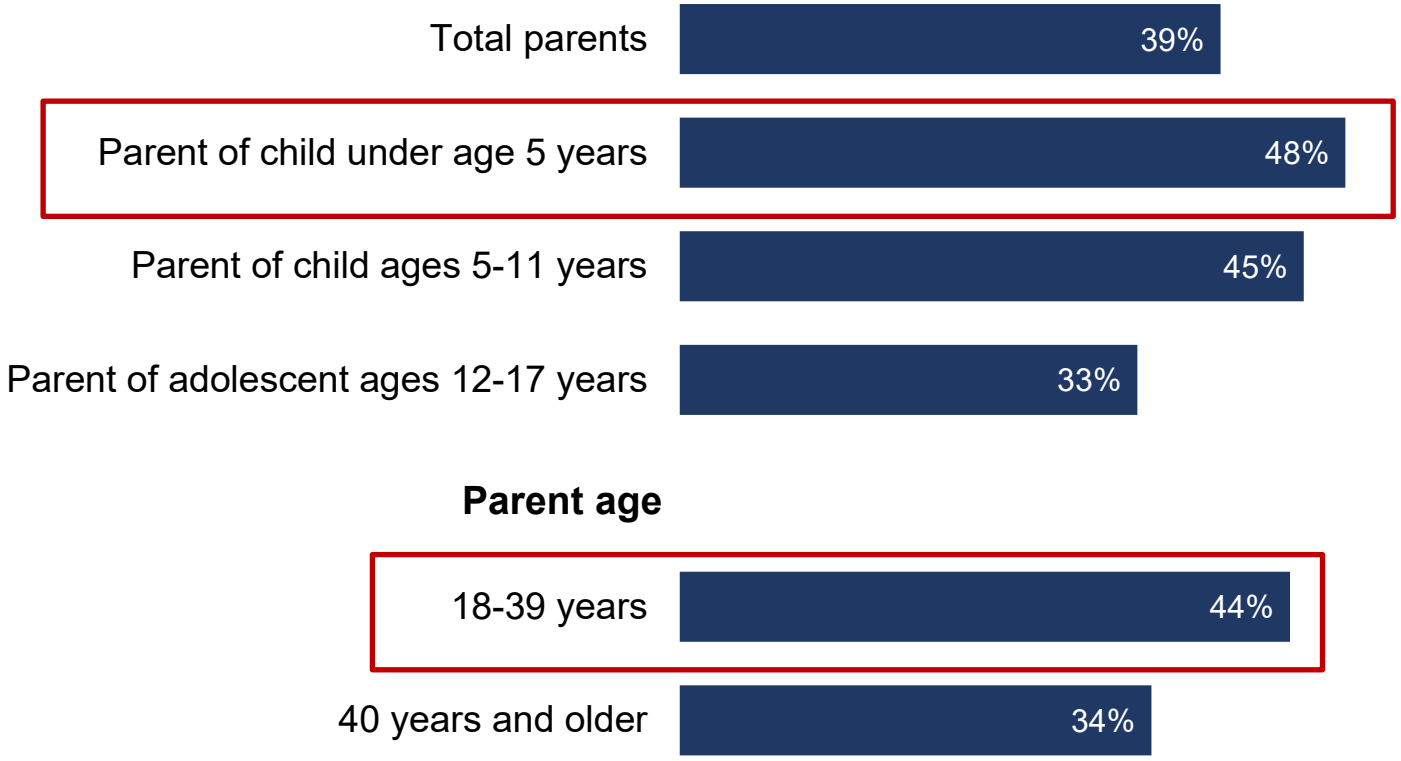

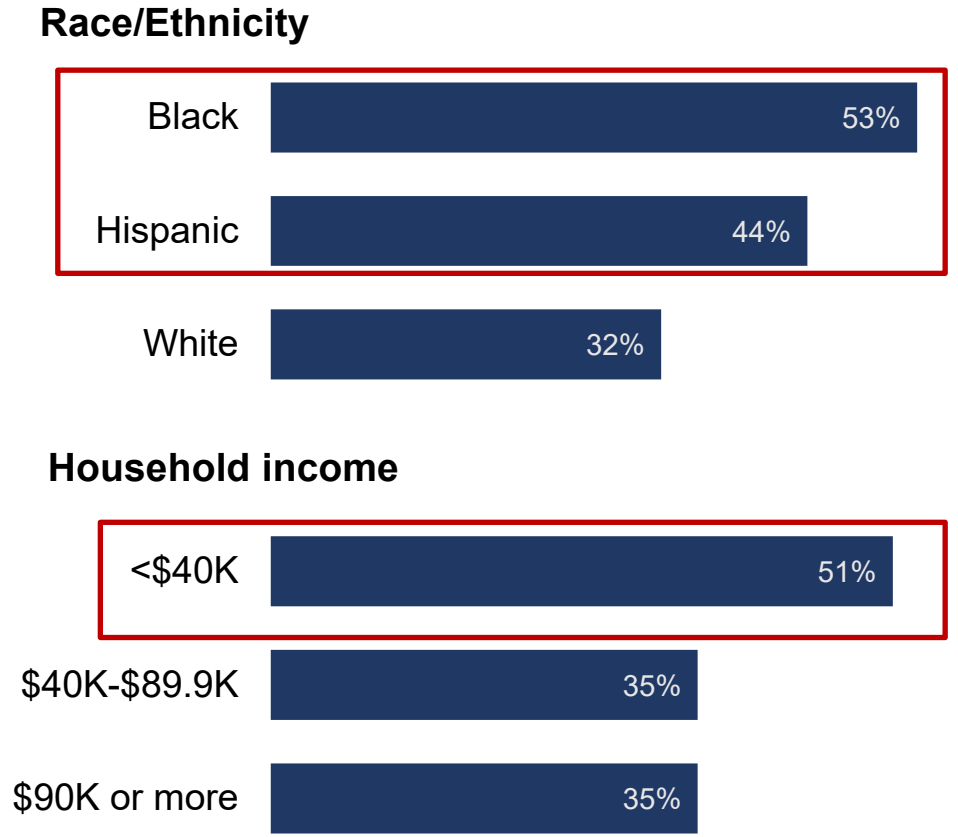

Source: KFF COVID-19 Vaccine Monitor: The Impact Of The Coronavirus Pandemic On The Wellbeing Of Parents And Children | KFF. Accessed May 24, 2022.

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–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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  - COVID-NET: Fiona Havers, Chris Taylor, Rebecca Woodruff, Kristin Marks, Kadam Patel, Michael Whitaker, Huong Pham, Jenny Milucky, Onika Anglin, Dallas Shi
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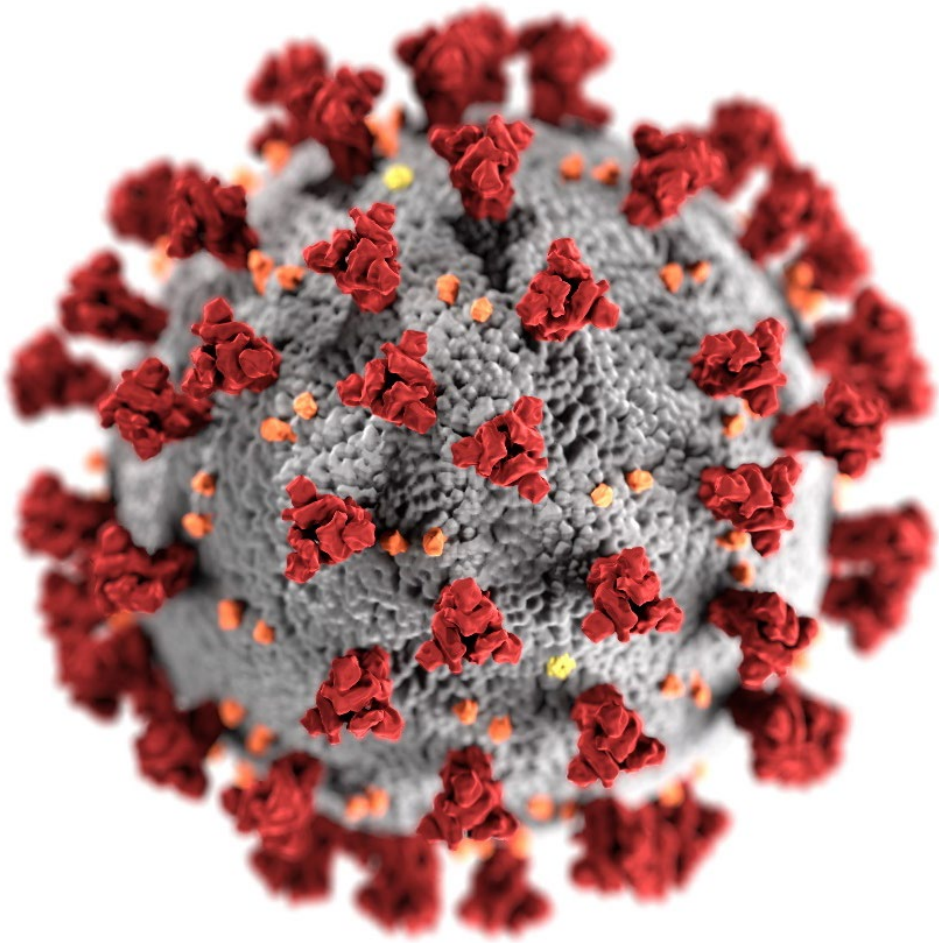
  - NVSN: Heidi Moline, Meredith McMorrow, Ariana Perez, Benjamin Clopper, Aaron Curns
  - Core Clinical Unit: David Siegel
- Data, Analytics and Visualization Task Force: Casey Lyons, Susan Wacaster, Kingsley Iyawe, Vaccine Data Section
- NSSP: Aaron Kite-Powell, Kelly Carey, Kathleen Hartnett, Karl Soetebier
- FluSurv-NET: Shikha Garg, Dawud Ujamaa, Miranda Delahoy
- Division of Vital Statistics, National Center for Health Statistics
- Many more…



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