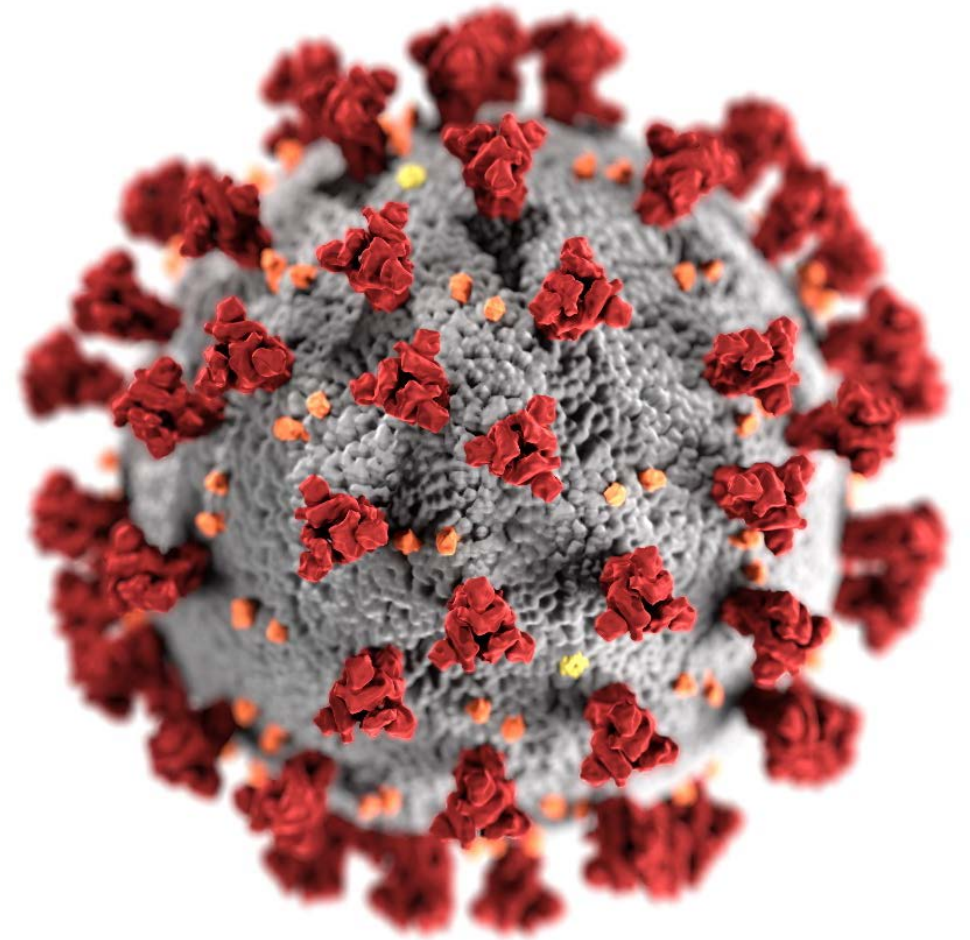


Epidemiology of COVID-19 in Children and Teens

Angela Campbell, MD, MPH, FPIDS, FIDSA

Virtual ACIP Emergency Meeting

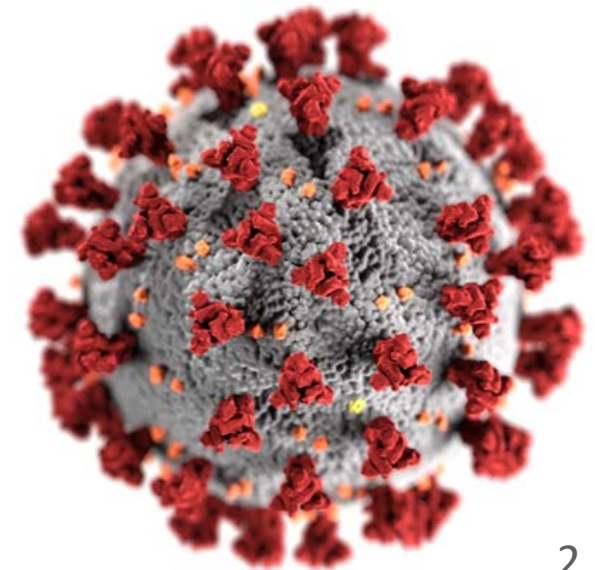
January 27, 2021



For more information: www.cdc.gov/COVID19

Outline

- Overview of U.S. COVID-19 Epidemiology
- Epidemiology of COVID-19 in Children and Teens
- Multisystem Inflammatory Syndrome in Children (MIS-C)

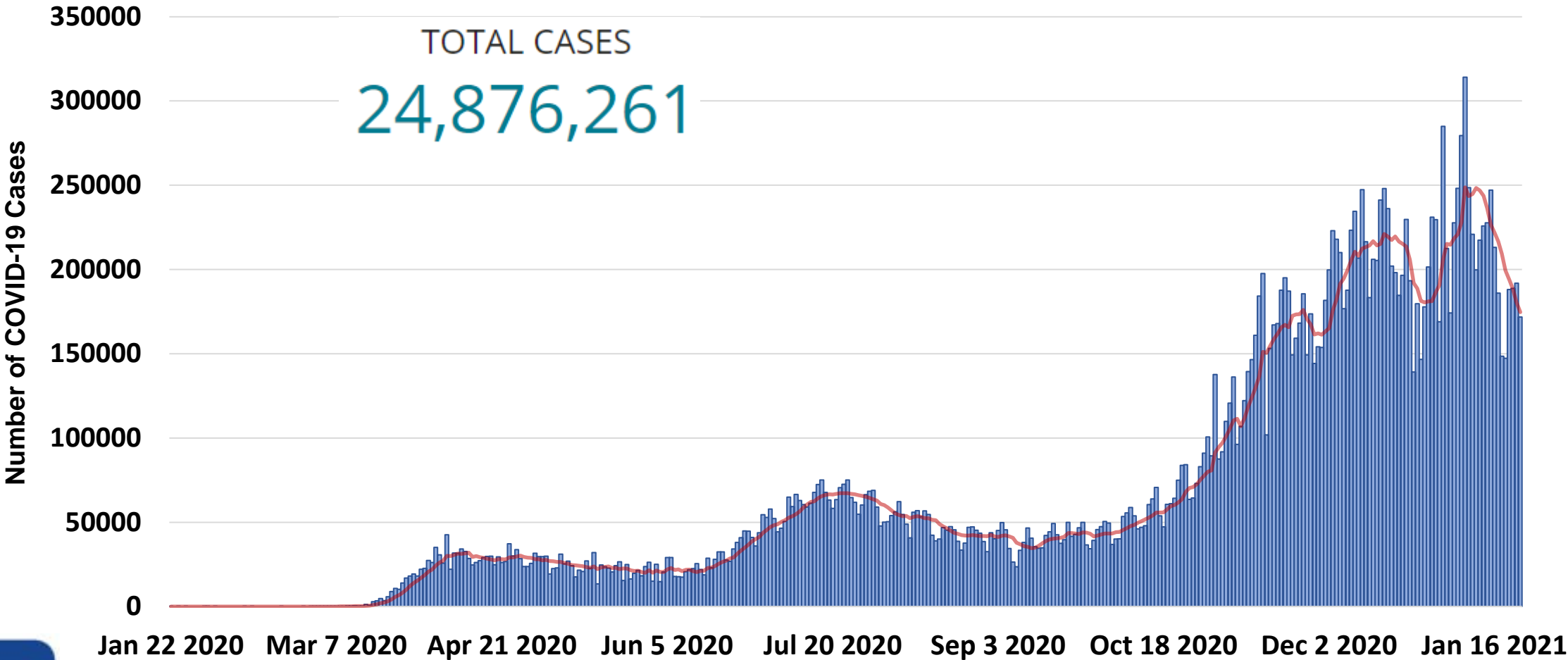


Overview of U.S. COVID-19 Epidemiology



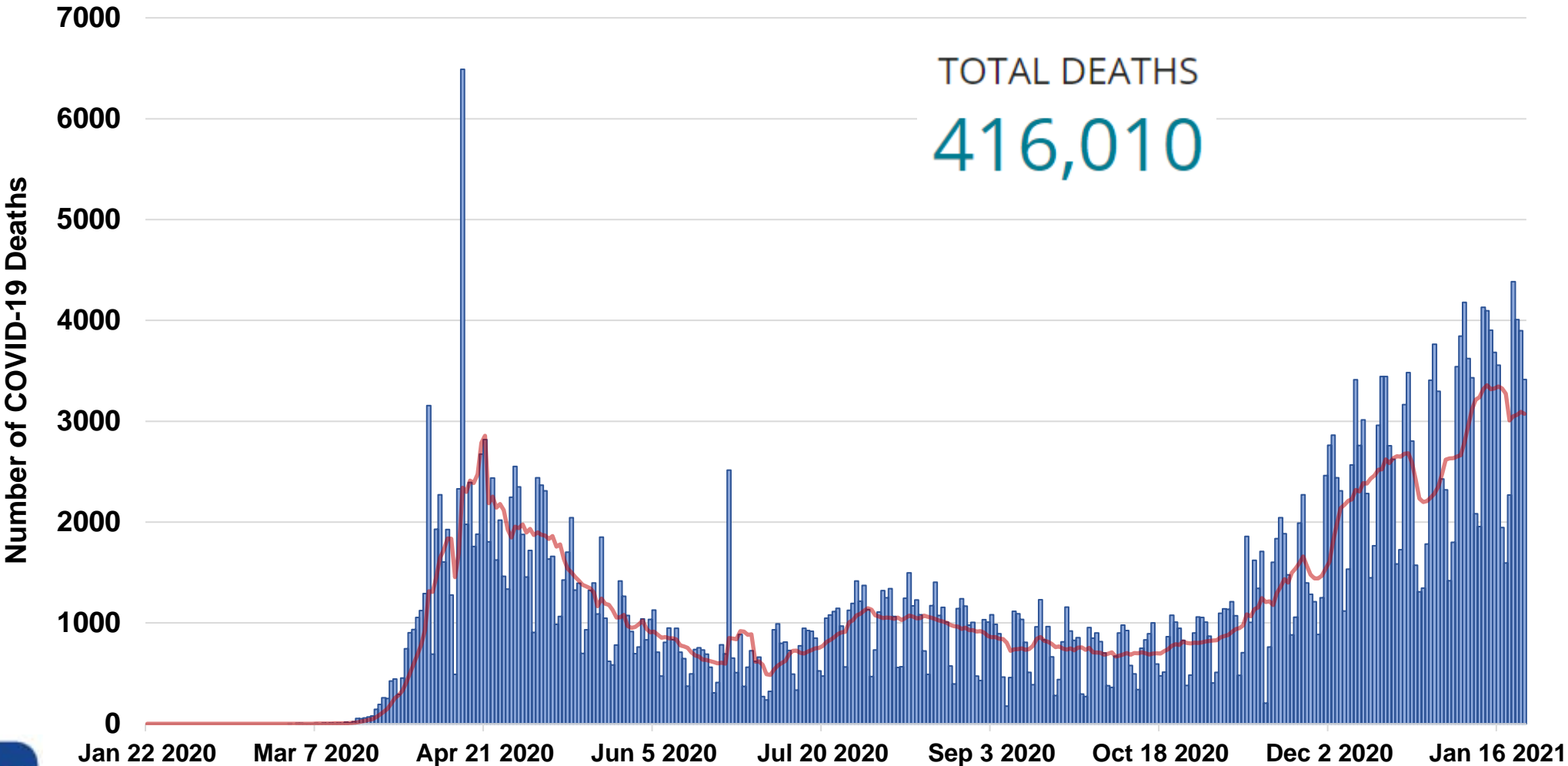
Trends in Number of COVID-19 Cases in the United States

January 22, 2020, to January 24, 2021



Trends in Number of COVID-19 Deaths in the United States

January 22, 2020, to January 24, 2021

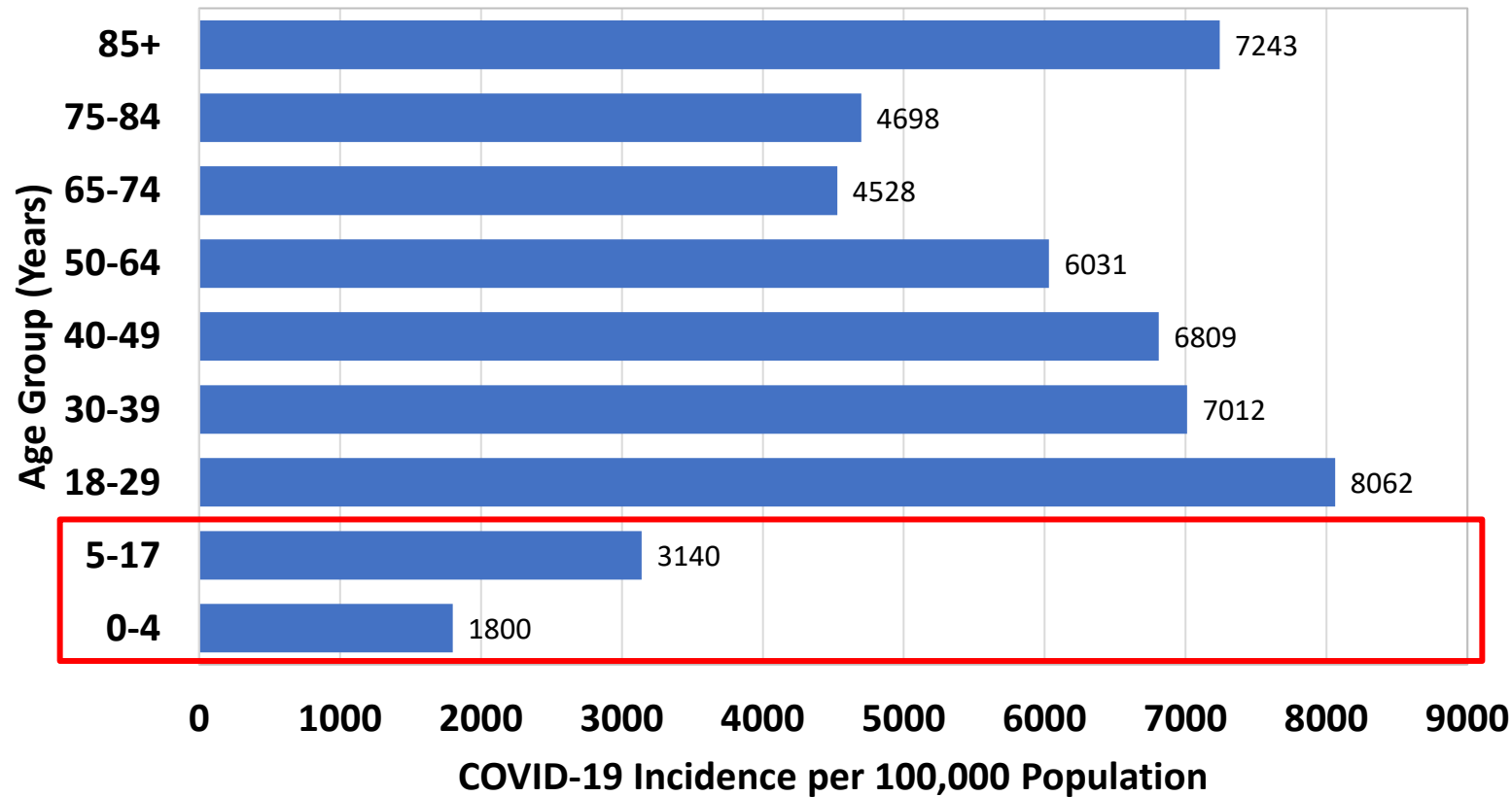


Epidemiology of COVID-19 in Children and Teens



COVID-19 Reported Incidence by Age Group: Lowest in Children <18 Years

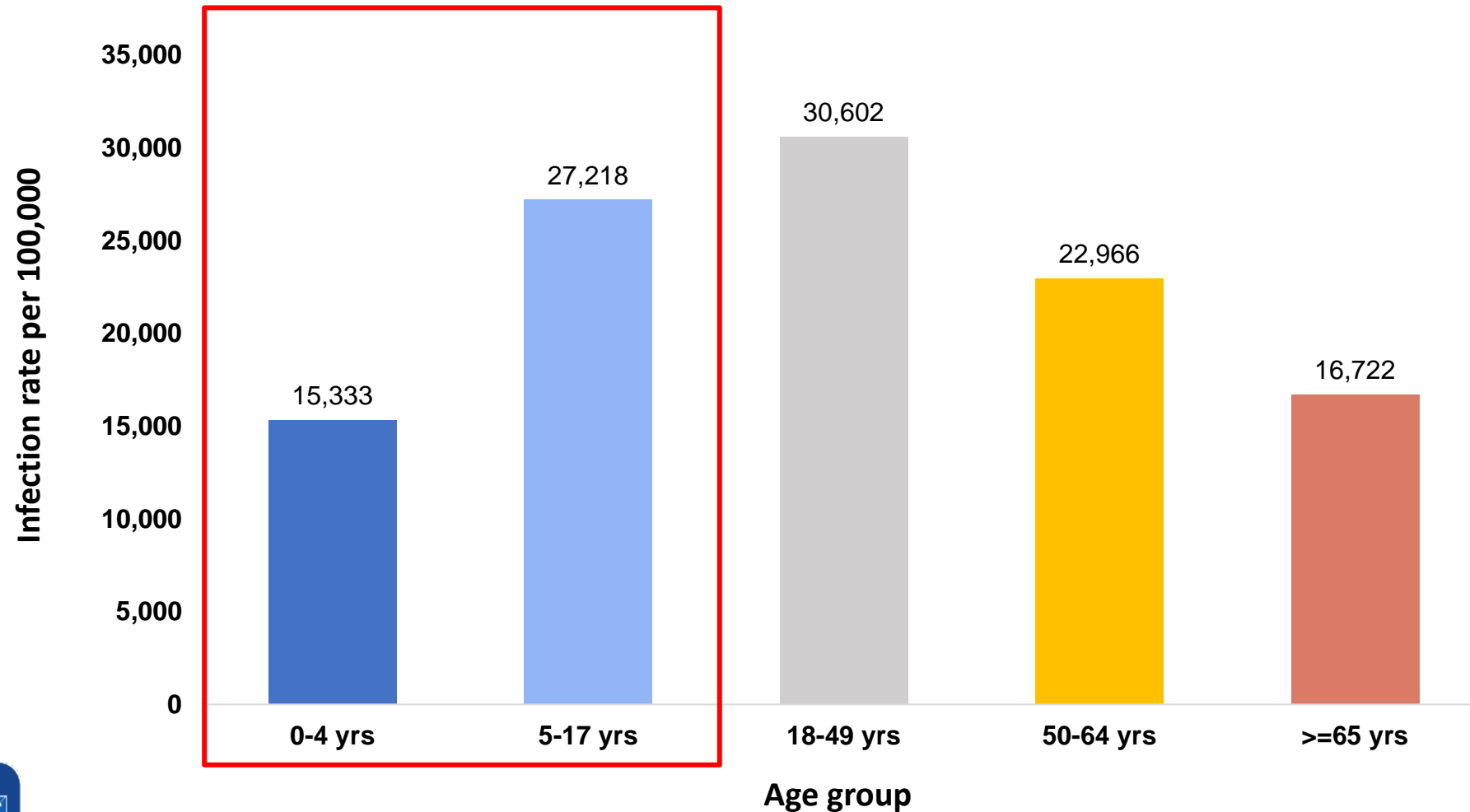
National Estimate of COVID-19 Incidence per 100,000 Population, by Age Group – Data through Jan 24, 2021



Updated as of 1/24/21. Data are based on COVID-19 case-level data reported by state and territorial jurisdictions to CDC. The numbers are confirmed and probable COVID-19 cases as reported by U.S. states, territories, New York City, and the District of Columbia from the previous day.

<https://www.cdc.gov/covid-data-tracker/index.html#demographics>

Estimated SARS-CoV-2 Infection Rates per 100,000 Population Adjusting for Under Detection



Estimated SARS-CoV-2 Seroprevalence in Children <18 Years, Mississippi, May–Sept 2020

- Residual serum samples from routine laboratory testing
- University of Mississippi Medical Center

SARS-CoV-2 Serology Results

Characteristic	No.	Positive	%
Overall	1,603	175	10.9
Race/Ethnicity			
Black, non-Hispanic	901	117	13.0
Hispanic	69	16	23.2
Other, non-Hispanic	44	7	15.9
White, non-Hispanic	565	30	5.3
Dates of specimen collection			
May 17-31, 2020	174	6	3.5
June 1-30, 2020	447	28	6.3
July 1-31, 2020	339	35	10.3
August 1-31, 2020	368	56	15.2
September 1-19, 2020	275	50	18.2



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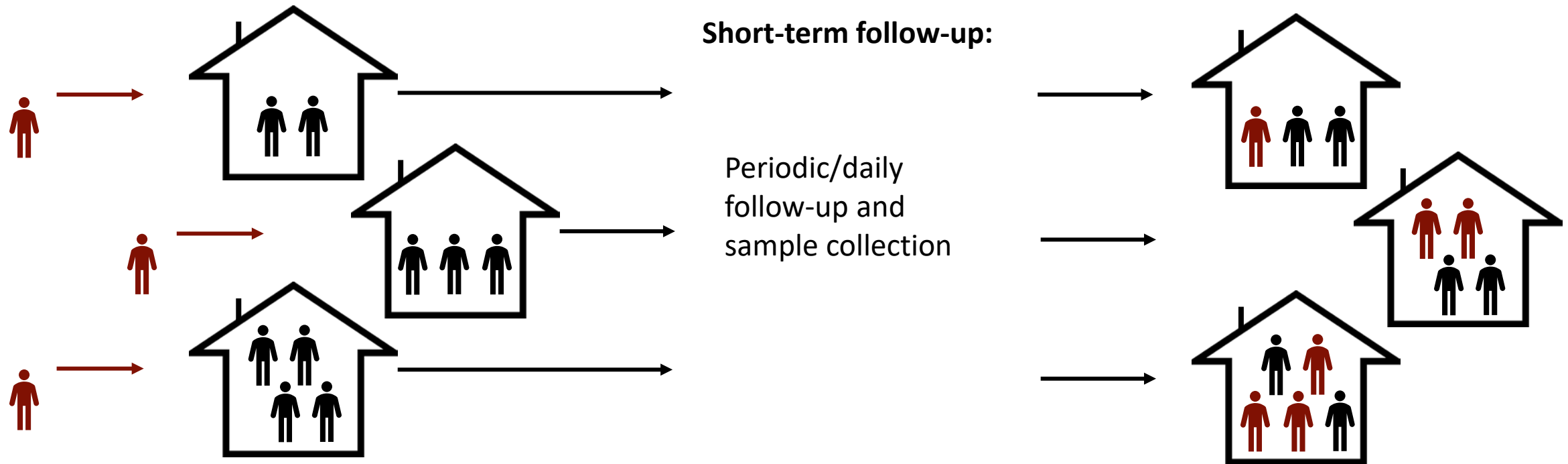
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Case-Ascertained Household Transmission Study, Tennessee and Wisconsin,* April–Nov 2020



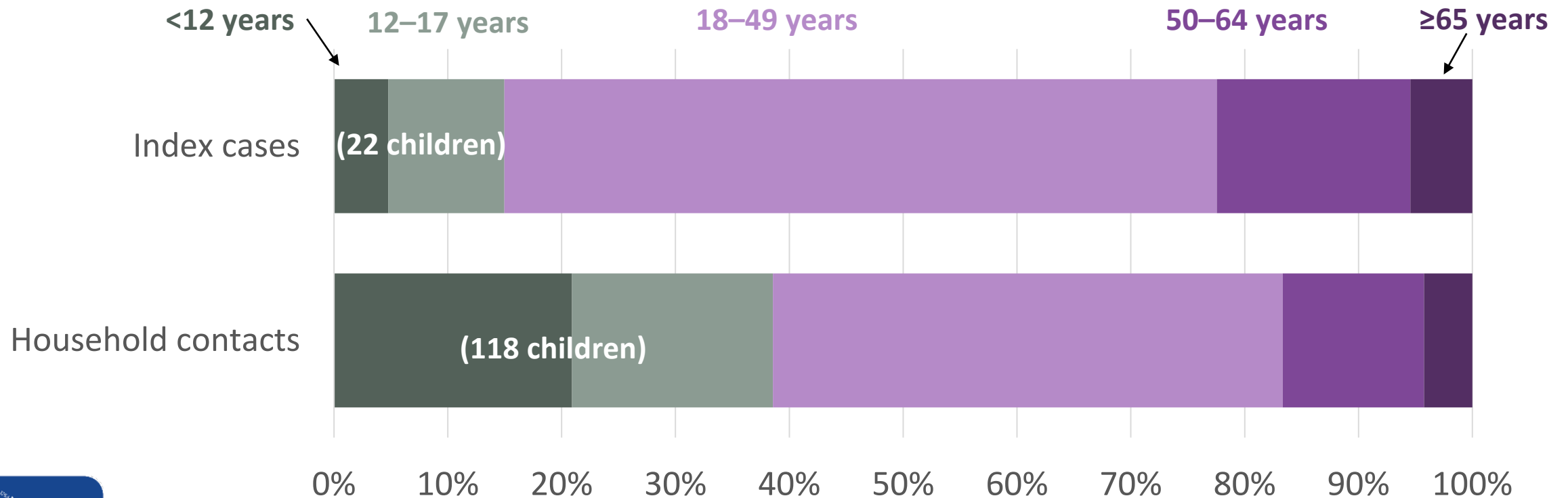
♀ = Non-infected
♂ = Infected

* Vanderbilt University Medical Center;
Marshfield Clinic Research Institute

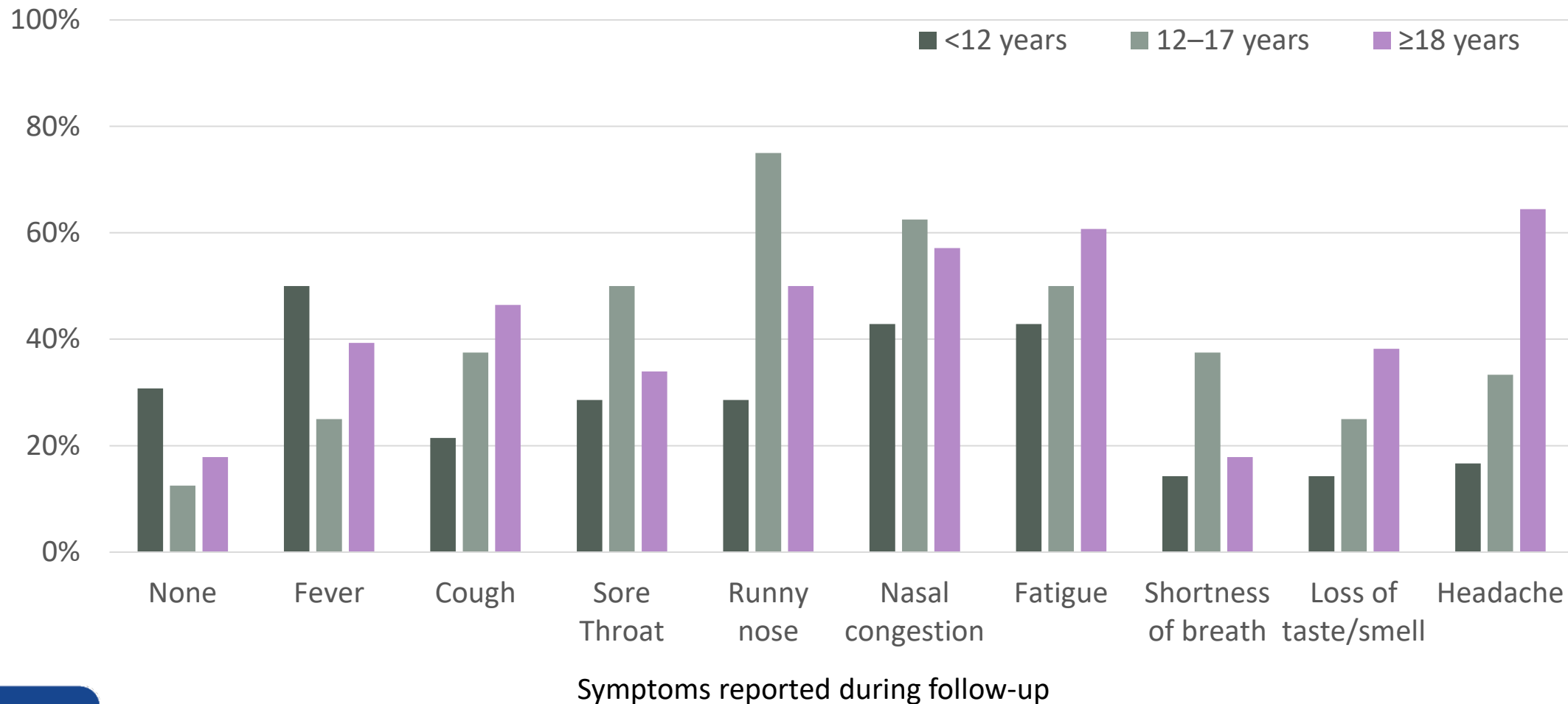


Case-Ascertained Household Transmission Study, Tennessee and Wisconsin: Enrolled Participants

- 147 index cases enrolled, median 3.5 days after onset (IQR: 3–4 days)
- 306 household contacts enrolled



Younger Children Were Less Likely to Be Symptomatic and Have Fewer Symptoms than Adults

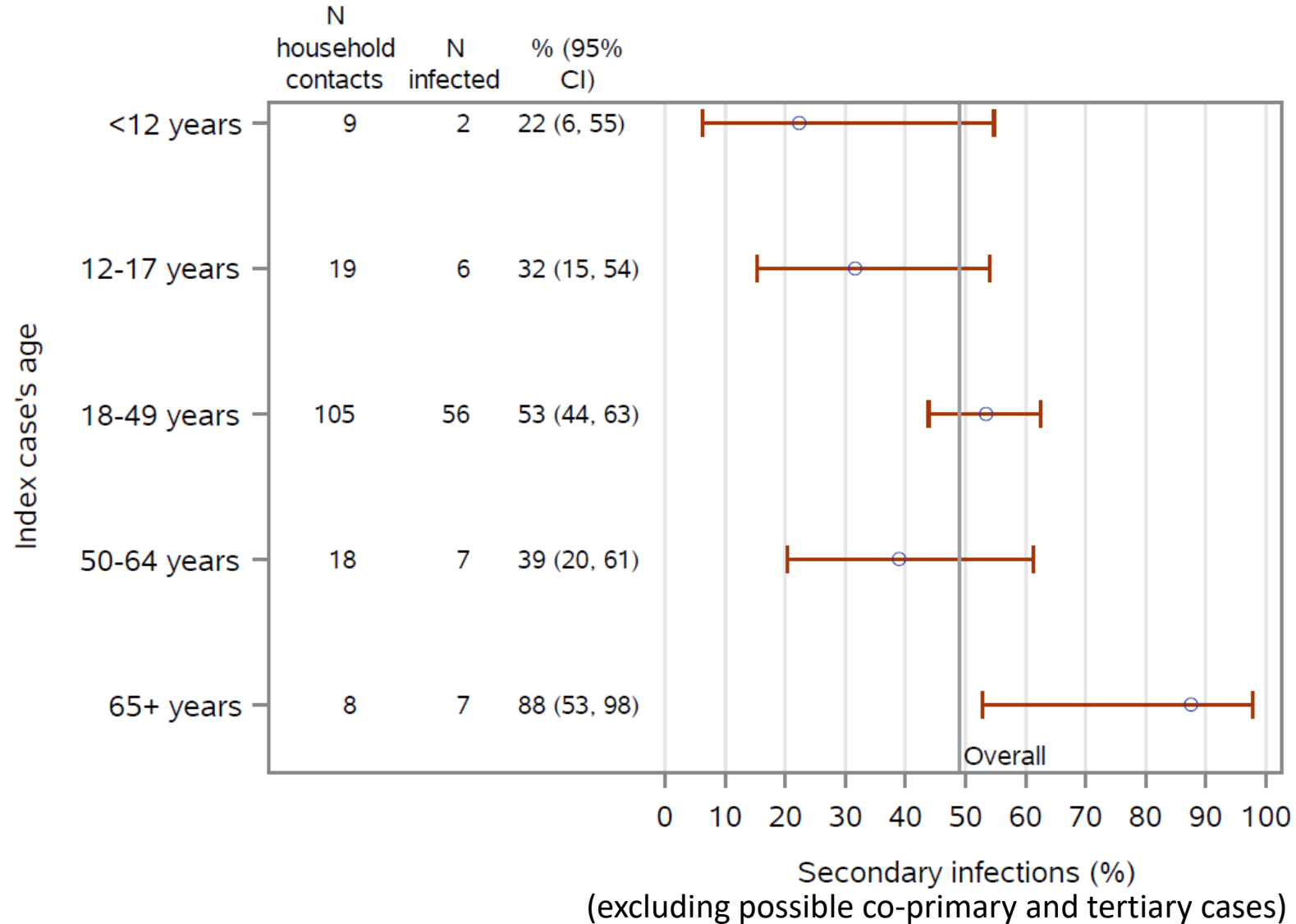


Sample size for each category: <12 years, n=14; 12-17 years, n=8; ≥18 years, n=56

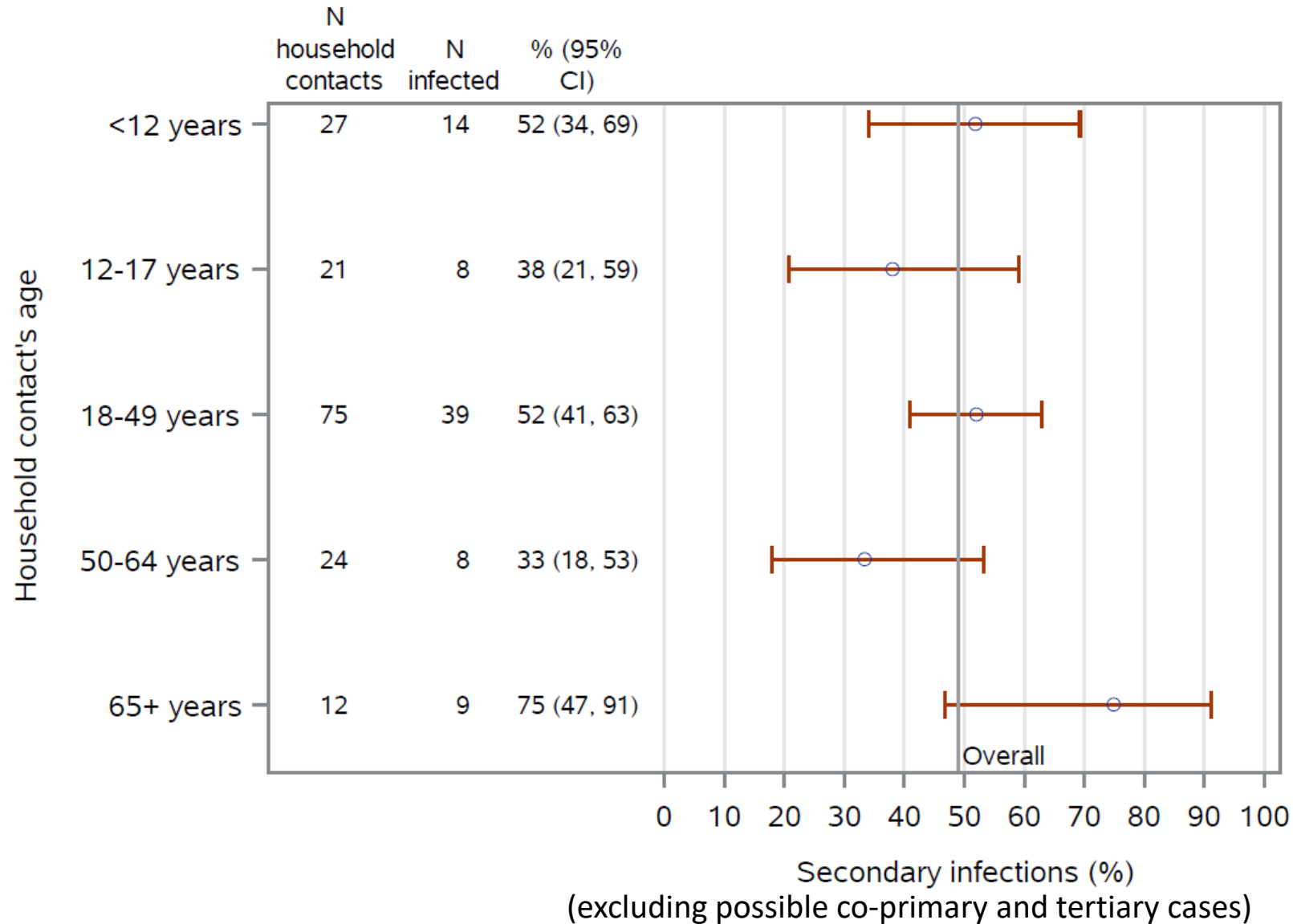
FLUTES-C Study. Preliminary data, subject to change



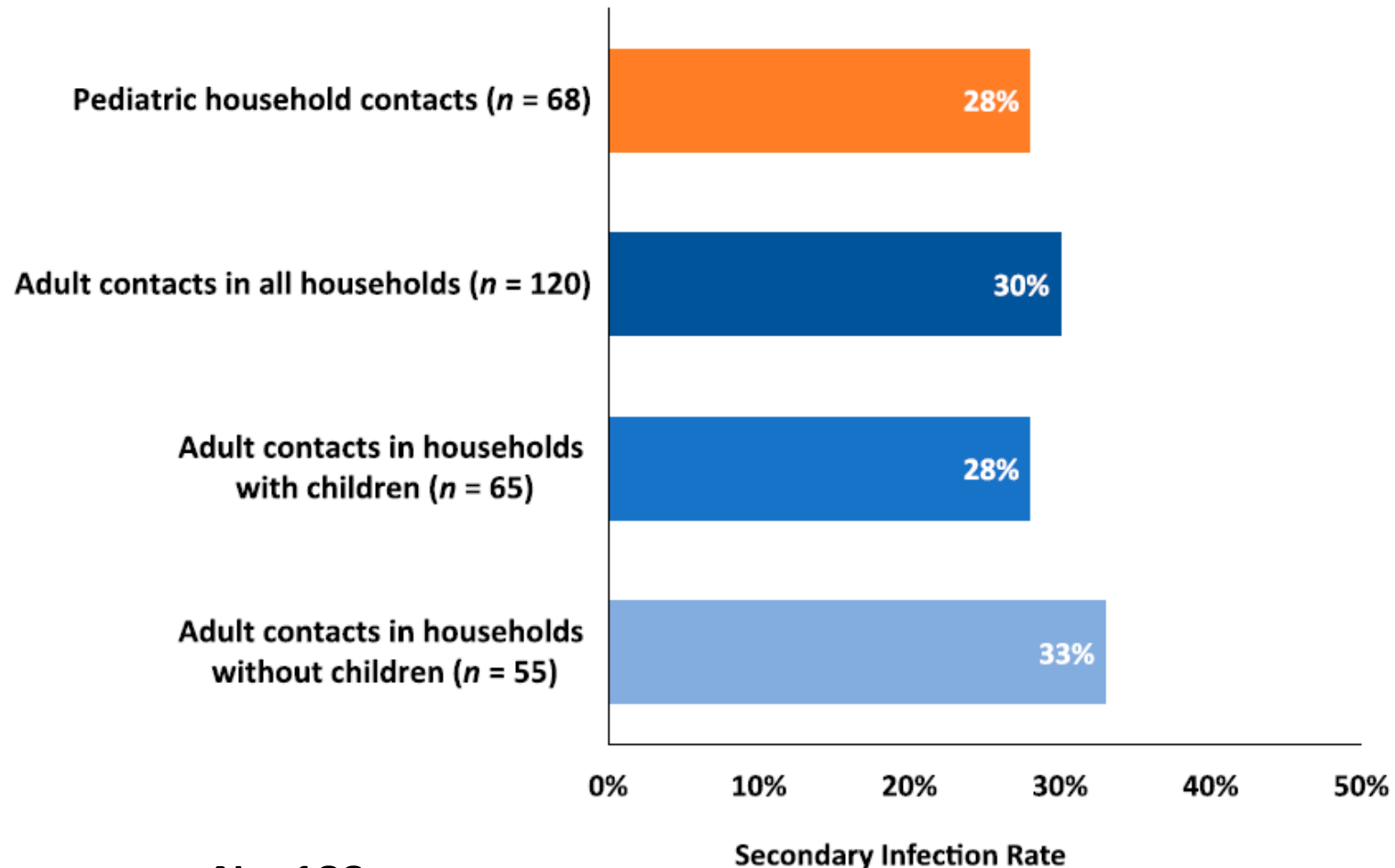
Secondary Infection Rates: Symptomatic Children Seem to Transmit SARS-CoV-2 Less than Adults



Children Exposed in the Household Had Similar Risk of SARS-CoV-2 Infection as Adults



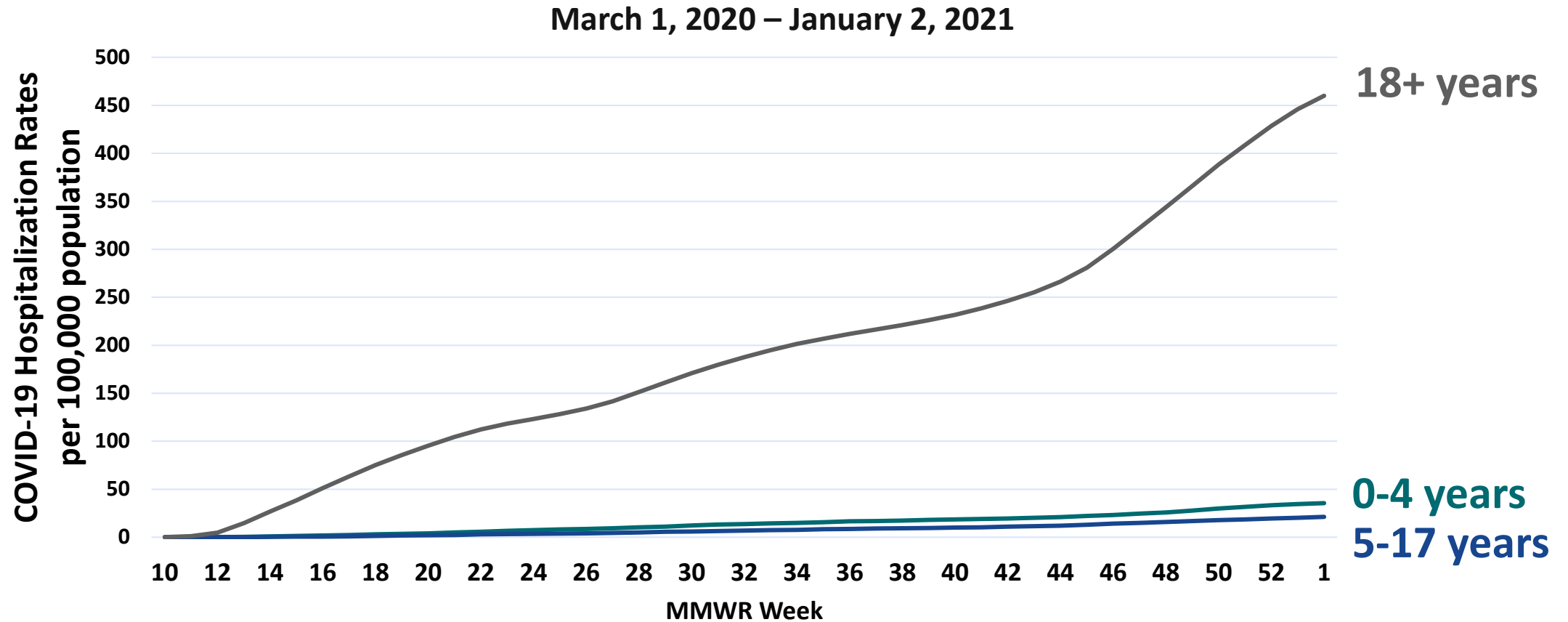
Secondary Infection Rates Similar Among Pediatric and Adult Household Contacts: Utah and Wisconsin, March–May 2020



N = 188



Children <18 years have the Lowest Cumulative Rate of COVID-19 Associated Hospitalizations



COVID-19 associated hospitalizations reported to Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization Surveillance Network (COVID-NET) surveillance system between March 1 and January 2, 2021. COVID-NET is a population-based surveillance system that collects data on laboratory-confirmed COVID-19-associated hospitalizations among children and adults through a network of over 250 acute-care hospitals in 14 states.

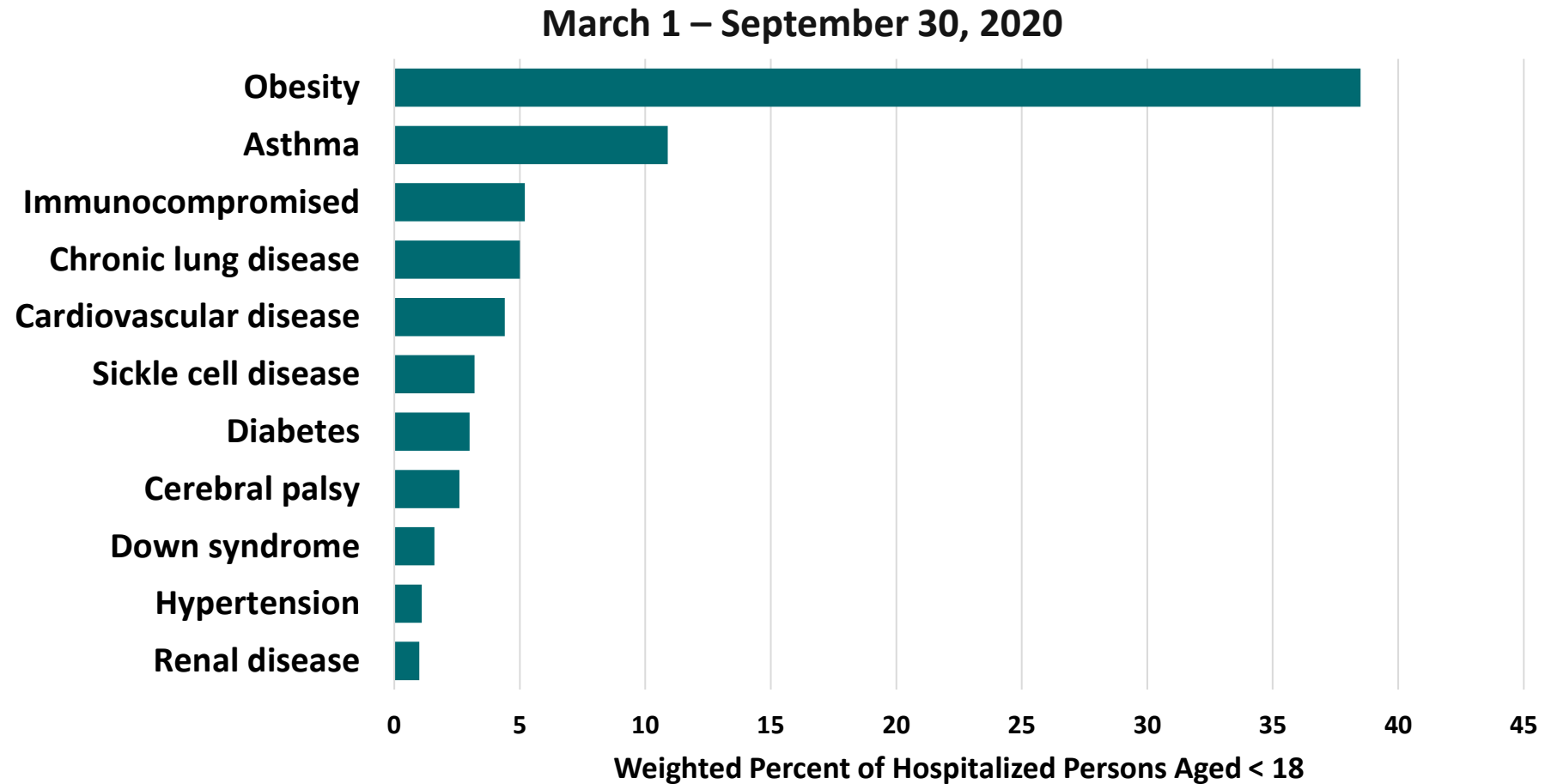
https://gis.cdc.gov/grasp/COVIDNet/COVID19_3.html

Children with Certain Underlying Conditions May Be More Likely to Have Severe Illness from COVID-19

- Asthma or chronic lung disease
- Diabetes
- Genetic, neurologic, or metabolic conditions
- Sickle cell disease
- Heart disease since birth
- Immunosuppression
- Medical complexity
- Obesity



52% of Children <18 Years Hospitalized with COVID-19 Had an Underlying Condition

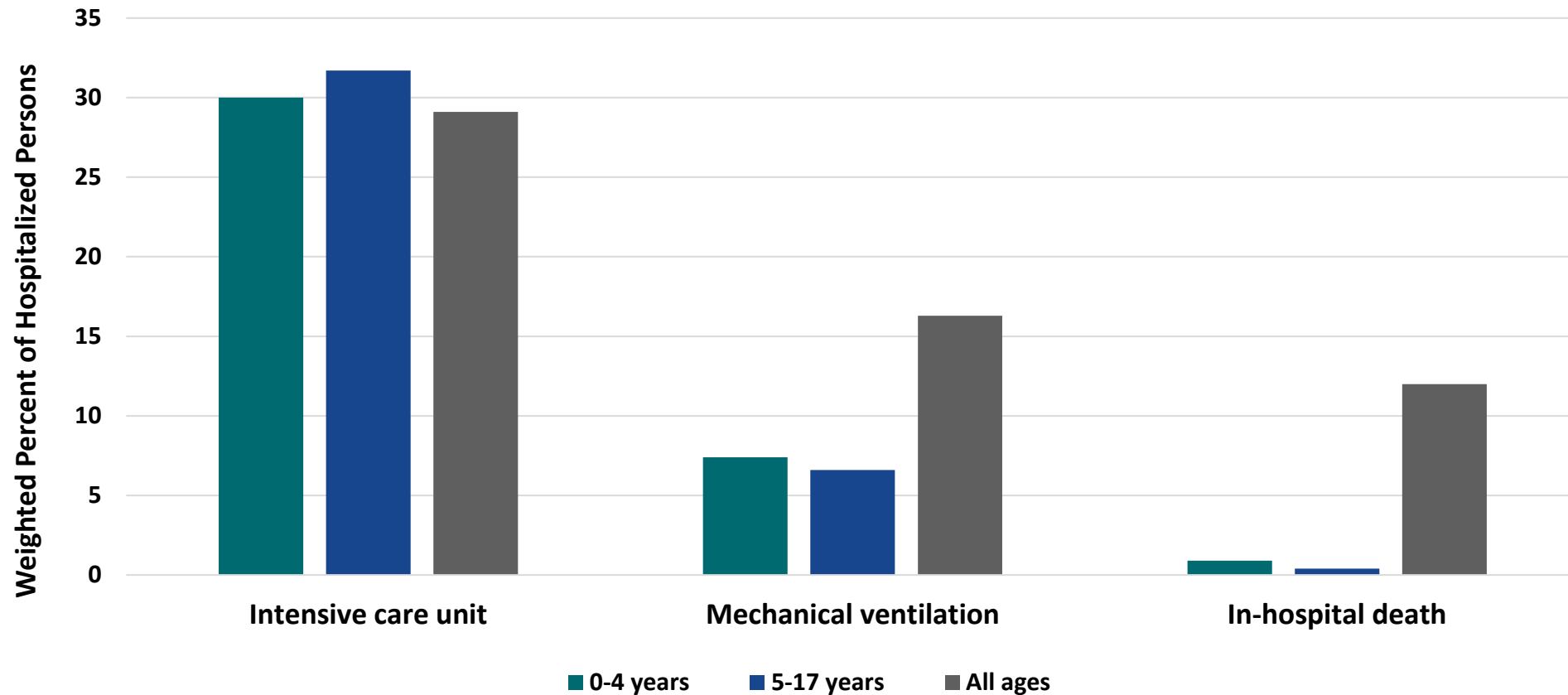


N=823, COVID-19-associated hospitalizations reported to Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization Surveillance Network (COVID-NET) surveillance system between March 1 and September 30, 2020. COVID-NET is a population-based surveillance system that collects data on laboratory-confirmed COVID-19-associated hospitalizations among children and adults through a network of over 250 acute-care hospitals in 14 states.

https://gis.cdc.gov/grasp/COVIDNet/COVID19_5.html

Children <18 Years Hospitalized with COVID-19 Are Less Likely Than Adults to Experience Mechanical Ventilation or In-Hospital Death

March 1 – September 30, 2020



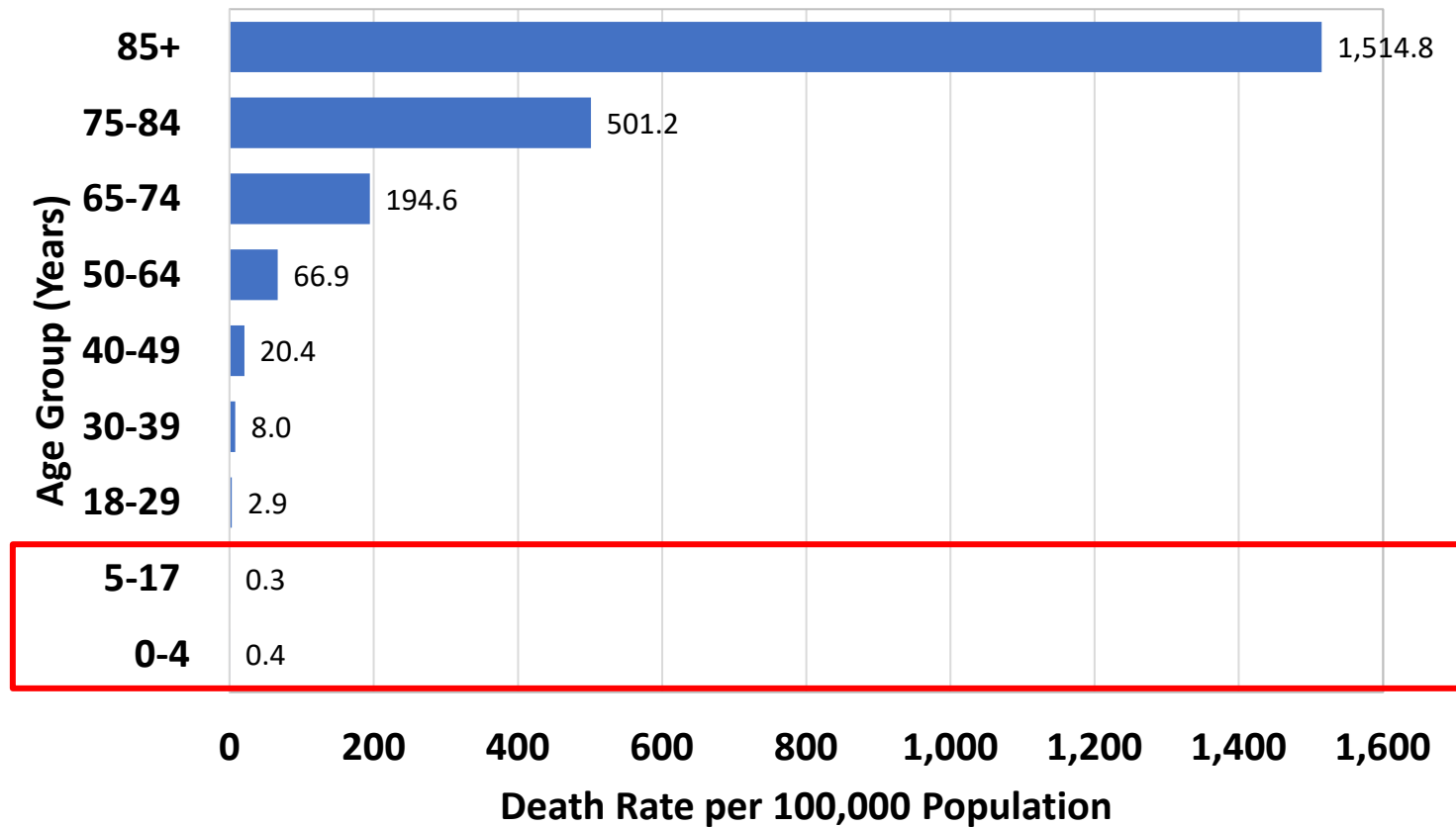
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COVID-19 Mortality Rates Are Lowest Among Children <18 Years

National Estimate of COVID-19 Deaths per 100,000 Population, by Age Group – Data through Jan 24, 2021



Updated as of 1/24/21. Data are based on COVID-19 case-level data reported by state and territorial jurisdictions to CDC. The numbers are confirmed and probable COVID-19 cases as reported by U.S. states, territories, New York City, and the District of Columbia from the previous day.

<https://www.cdc.gov/covid-data-tracker/index.html#demographics>



Multisystem Inflammatory Syndrome in Children (MIS-C)



Multisystem Inflammatory Syndrome in Children

- April 2020 – Severe inflammatory syndrome recognized in the UK, occurring in children with current or recent infection with SARS-CoV-2
- May 2020 – Cases reported in New York City and New York State
- May 14 – Healthcare providers requested to report patients <21 years old meeting MIS-C criteria to local, state, or territorial health departments

Multisystem Inflammatory Syndrome in Children
(MIS-C) Associated with Coronavirus Disease 2019
(COVID-19)



Distributed via the CDC Health Alert Network
May 14, 2020, 4:45 PM ET
CDCHAN-00432



Case Definition for Multisystem Inflammatory Syndrome in Children (MIS-C)

- An individual aged <21 years presenting with feverⁱ, laboratory evidence of inflammationⁱⁱ, and evidence of clinically severe illness requiring hospitalization, with multisystem (≥ 2) organ involvement (cardiac, renal, respiratory, hematologic, gastrointestinal, dermatologic or neurological); **AND**
- No alternative plausible diagnoses; **AND**
- Positive for current or recent SARS-CoV-2 infection by RT-PCR, serology, or antigen test; or COVID-19 exposure within the 4 weeks prior to the onset of symptoms

ⁱFever $\geq 38.0^{\circ}\text{C}$ for ≥ 24 hours, or report of subjective fever lasting ≥ 24 hours

ⁱⁱIncluding, but not limited to, one or more of the following: an elevated C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), fibrinogen, procalcitonin, d-dimer, ferritin, lactic acid dehydrogenase (LDH), or interleukin 6 (IL-6), elevated neutrophils, reduced lymphocytes and low albumin

Additional comments

- Some individuals may fulfill full or partial criteria for Kawasaki disease but should be reported if they meet the case definition for MIS-C
- Consider MIS-C in any pediatric death with evidence of SARS-CoV-2 infection



COVID-19–Associated Multisystem Inflammatory Syndrome in Children — United States, March–July 2020

Shana Godfred-Cato, DO¹; Bobbi Bryant, MPH^{1,2}; Jessica Leung, MPH¹; Matthew E. Oster, MD¹; Laura Conklin, MD¹; Joseph Abrams, PhD¹; Katherine Roguski, MPH¹; Bailey Wallace, MPH^{1,2}; Emily Prezzato, MPH¹; Emilia H. Koumans, MD¹; Ellen H. Lee, MD³; Anita Geevarughese, MD³; Maura K. Lash, MPH³; Kathleen H. Reilly, PhD³; Wendy P. Pulver, MS⁴; Deepam Thomas, MPH⁵; Kenneth A. Feder, PhD⁶; Katherine K. Hsu, MD⁷; Nottasorn Plipat, MD, PhD⁸; Gillian Richardson, MPH⁹; Heather Reid¹⁰; Sarah Lim, MBBCh¹¹; Ann Schmitz, DVM^{12,13}; Timmy Pierce, MPH^{1,2}; Susan Hrapcak, MD¹; Deblina Datta, MD¹; Sapna Bamrah Morris, MD¹; Kevin Clarke, MD¹; Ermias Belay, MD¹; California MIS-C Response Team

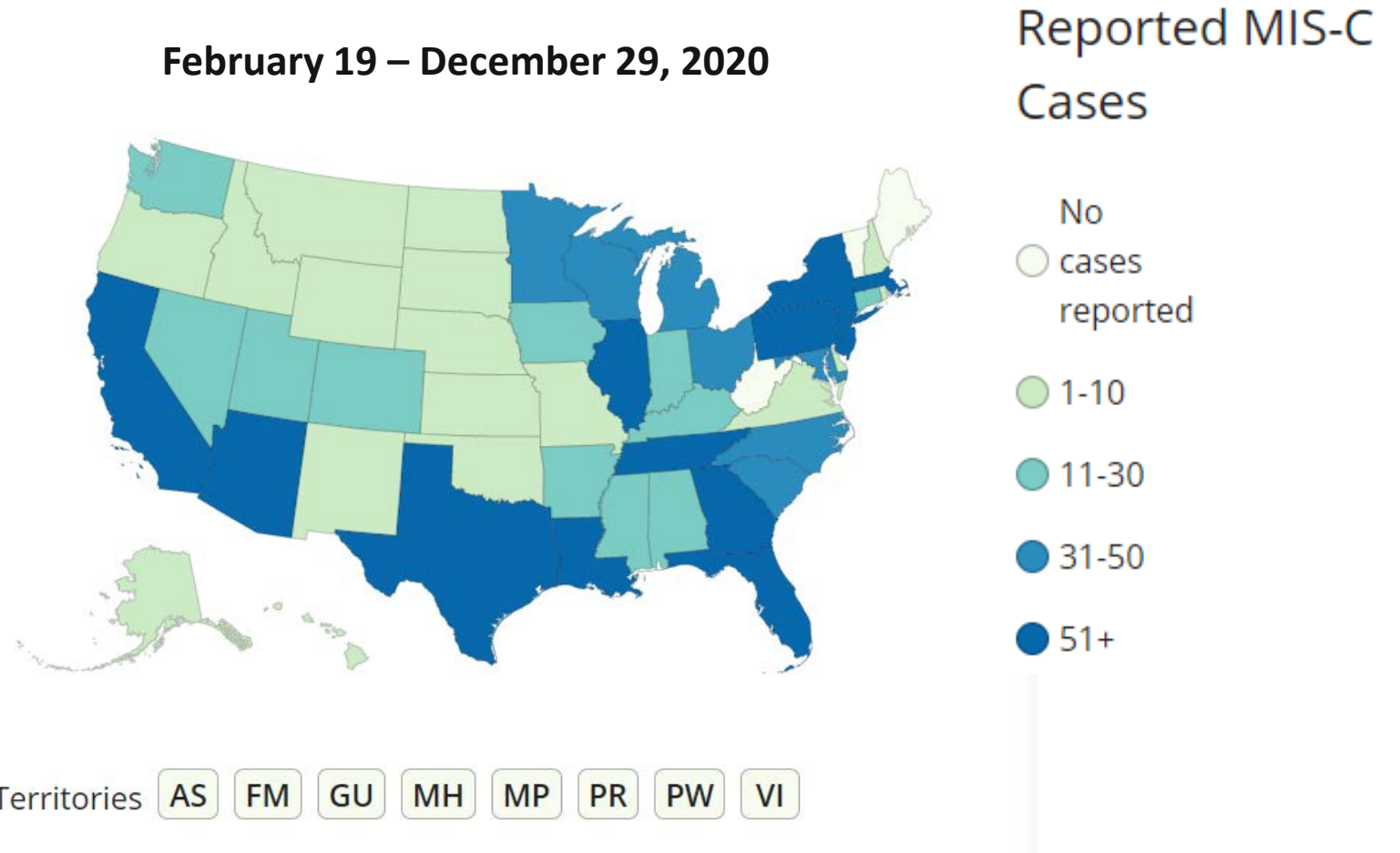
Three classes of patients:

- **Class 1 (n=203), “typical” MIS-C**
 - 98% serology positive
 - 100% cardiovascular and 98% GI manifestations
 - Markedly elevated laboratory markers of inflammation
 - 84% ICU admission
- **Class 2 (n=169), acute COVID-19/MIS-C combo**
 - 100% RT-PCR positive, 16% serology positive
 - More respiratory involvement
 - 62% ICU admission
- **Class 3 (n=198), milder illness**
 - Younger, median age 6 years
 - Higher frequency of rash, mucocutaneous lesions
 - 97% serology positive, 36% RT-PCR; 44% ICU admission

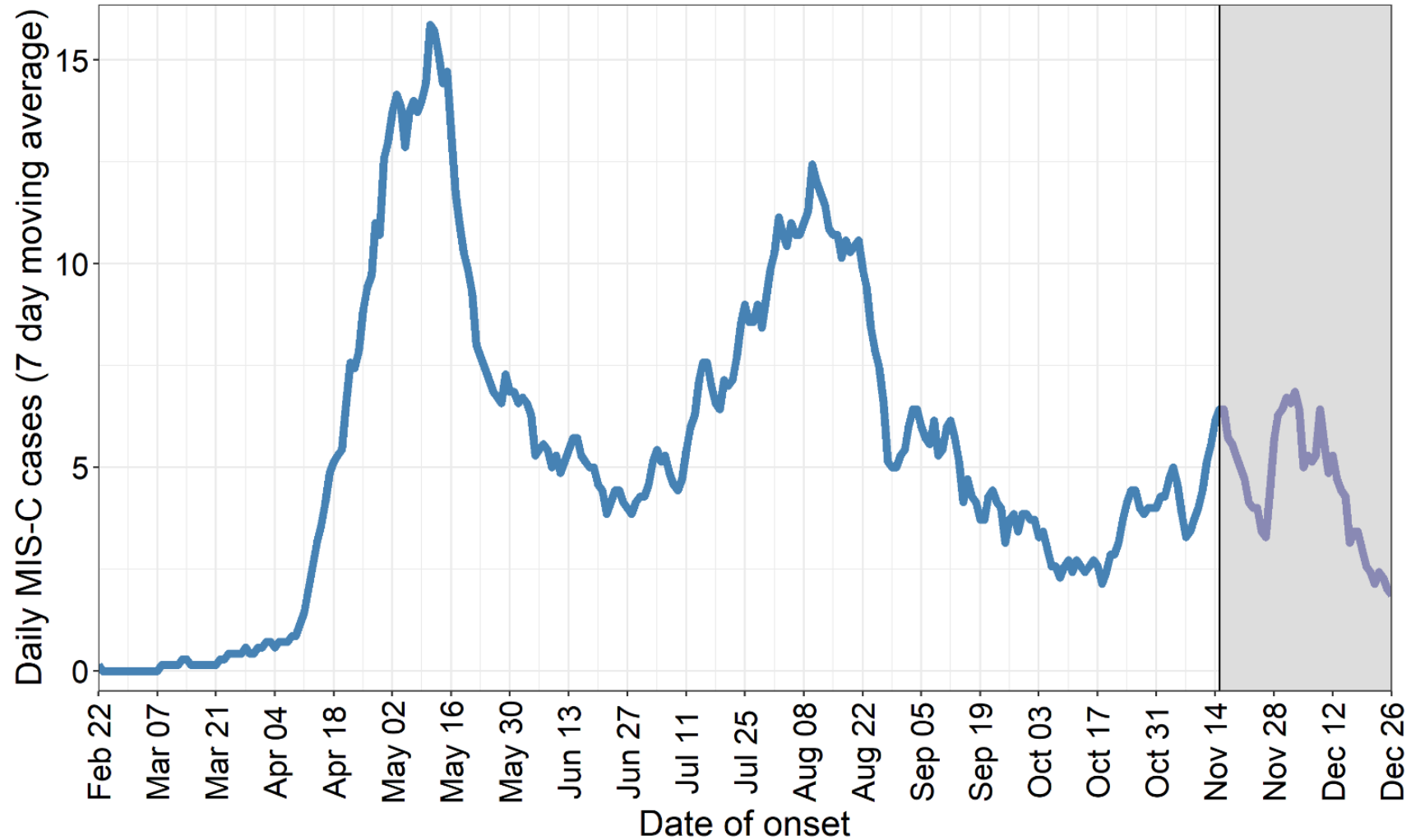


Health Department-Reported Cases of Multisystem Inflammatory Syndrome in Children (MIS-C)

- 1,659 cases
- 26 deaths
- 47 states, New York City, and Washington, DC, have reported ≥ 1 case
- Average age 8 years
- 57% male
- 33% Hispanic/Latino; 30% Black, non-Hispanic



Daily MIS-C Cases, March–December 2020



N=1659; Gray area on right represents most recent 6 weeks of data, for which case reports are likely incomplete.

<https://www.cdc.gov/mis-c/cases/index.html>; last updated January 8, 2021²⁹



Estimated Incidence of MIS-C Cases, 7 Jurisdictions, April–June 2020

- Population-based incidence estimates (denominator was population of persons <21 years):
 - 1 to 8.5 MIS-C cases per million person-months
- Using denominator of estimated SARS-CoV-2 infections, incidence was higher among Black/African American and Hispanic/Latino children compared with White children

Race and Ethnicity	Adjusted Incidence per Million SARS-CoV-2 Infections in Children (95% CI)	Adjusted Incidence Rate Ratio (95% CI)
White	110 (77–156)	reference
Black/African American	616 (481–790)	6 (4–9)
Hispanic/Latino	467 (371–588)	4 (3–6)
Asian/Pacific Islander	315 (169–589)	3 (1–6)



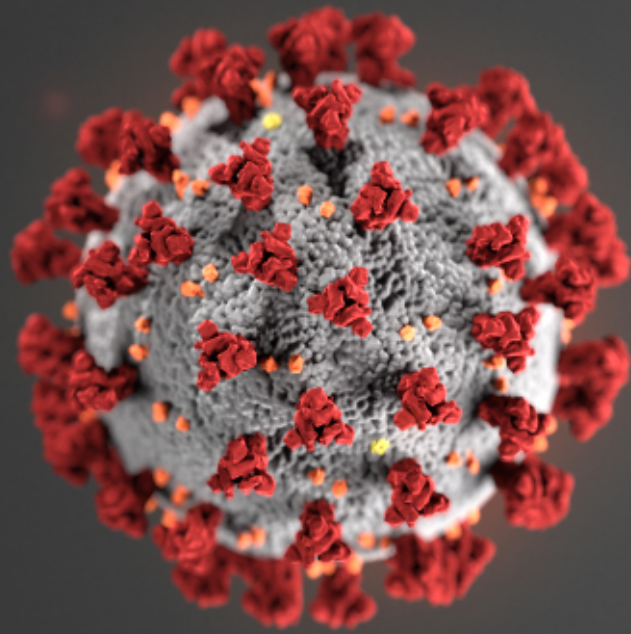
Summary



Summary

- As of January 24, >24 million cases of COVID-19 and >410,000 COVID-19-associated deaths were reported in the United States.
- Children <18 years have lower rates of COVID-19 incidence, hospitalization, and mortality than adults.
- Children are susceptible to SARS-CoV-2, though younger children tended to have fewer respiratory symptoms than adults.
- MIS-C is a complication of COVID-19 and has varied clinical presentations.
- MIS-C is highest, and disproportionately so, among Black/African American children and Hispanic/Latino children.
- Further studies are needed to fully understand the role of children and teens in SARS-CoV-2 transmission and risk factors for severe illness and complications of COVID-19.





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.

