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

TOTAL CASES

24,876,261

https://www.cdc.gov/covid-data-tracker/index.html#trends
Trends in Number of COVID-19 Deaths in the United States

January 22, 2020, to January 24, 2021

https://www.cdc.gov/covid-data-tracker/index.html#trends
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

- 85+: 7243
- 75-84: 4698
- 65-74: 4528
- 50-64: 6031
- 40-49: 6809
- 30-39: 7012
- 18-29: 8062
- 5-17: 3140
- 0-4: 1800

COVID-19 Incidence per 100,000 Population

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

- 0-4 yrs: 15,333
- 5-17 yrs: 27,218
- 18-49 yrs: 30,602
- 50-64 yrs: 22,966
- >=65 yrs: 16,722

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

<table>
<thead>
<tr>
<th>Characteristic</th>
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C. Hobbs, et al. CDC COVID-19 Response Team, unpublished data

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

* Vanderbilt University Medical Center;
Marshfield Clinic Research Institute

Short-term follow-up:

Periodic/daily follow-up and sample collection

FLUTES-C Study. Grijalva, et al. MMWR 2020;69(44):1631-34
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

![Bar chart showing demographics of enrolled participants]
Younger Children Were Less Likely to Be Symptomatic and Have Fewer Symptoms than Adults

Symptoms reported during follow-up

- None
- Fever
- Cough
- Sore Throat
- Runny nose
- Nasal congestion
- Fatigue
- Shortness of breath
- Loss of taste/smell
- Headache

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

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Contacts</th>
<th>Infected</th>
<th>% (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;12 years</td>
<td>9</td>
<td>2</td>
<td>22 (6, 55)</td>
</tr>
<tr>
<td>12-17 years</td>
<td>19</td>
<td>6</td>
<td>32 (15, 54)</td>
</tr>
<tr>
<td>18-49 years</td>
<td>105</td>
<td>56</td>
<td>53 (44, 63)</td>
</tr>
<tr>
<td>50-64 years</td>
<td>18</td>
<td>7</td>
<td>39 (20, 61)</td>
</tr>
<tr>
<td>65+ years</td>
<td>8</td>
<td>7</td>
<td>88 (53, 98)</td>
</tr>
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Secondary infections (%) (excluding possible co-primary and tertiary cases)

FLUTES-C Study. Preliminary data, subject to change
Children Exposed in the Household Had Similar Risk of SARS-CoV-2 Infection as Adults

FLUTES-C Study. Preliminary data, subject to change
Secondary Infection Rates Similar Among Pediatric and Adult Household Contacts: Utah and Wisconsin, March–May 2020

- Pediatric household contacts (n = 68) 28%
- Adult contacts in all households (n = 120) 30%
- Adult contacts in households with children (n = 65) 28%
- Adult contacts in households without children (n = 55) 33%

N = 188
Children <18 years have the Lowest Cumulative Rate of COVID-19 Associated Hospitalizations


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

March 1 – September 30, 2020

Weighted Percent of Hospitalized Persons Aged < 18

- Obesity
- Asthma
- Immunocompromised
- Chronic lung disease
- Cardiovascular disease
- Sickle cell disease
- Diabetes
- Cerebral palsy
- Down syndrome
- Hypertension
- Renal disease

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


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

<table>
<thead>
<tr>
<th>Age Group (Years)</th>
<th>Death Rate per 100,000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>85+</td>
<td>1,514.8</td>
</tr>
<tr>
<td>75-84</td>
<td>501.2</td>
</tr>
<tr>
<td>65-74</td>
<td>194.6</td>
</tr>
<tr>
<td>50-64</td>
<td>66.9</td>
</tr>
<tr>
<td>40-49</td>
<td>20.4</td>
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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 fever, laboratory evidence of inflammation\(i\), 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

\(i\)Fever ≥38.0°C for ≥24 hours, or report of subjective fever lasting ≥24 hours

\(i\)Including, 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
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

February 19 – December 29, 2020

https://www.cdc.gov/mis-c/cases/index.html; last updated January 8, 2021
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, 2021
## 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

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