COVID-19 in Children
NIH Tribal Advisory Committee

Rohan Hazra, MD
October 26, 2021
Mission Statement

The NICHD leads research and training to understand human development, improve reproductive health, enhance the lives of children and adolescents, and optimize abilities for all.
COVID-19 AND CHILDREN
Fig 6. United States: Number of Child COVID-19 Cases Added in Past Week*

*Note: 5 states changed their definition of child cases: AL as of 8/12/21, HI as of 8/22/21, RI as of 9/10/21, MI as of 10/1/20, WV as of 9/12/21

TX reported age for only a small proportion of total cases each week (eq. 3-20%). TX cumulative cases through 6/25/21

As of 6/30/21, NE COVID-19 dashboard is no longer available. NE cumulative cases through 6/24/21

Due to availability of data and changes made to dashboard, AL cumulative cases through 7/29/21

Due to available data and calculations required to obtain MA child cases, weekly estimates fluctuate

See detail in Appendix. Data from 49 states, NYC, DC, PR and GU

All data reported by state/federal health departments are preliminary and subject to change. Analysis by American Academy of Pediatrics and Children’s Hospital Association
• **6,177,946** total child COVID-19 cases, representing **16.4%** of all cases

• **130,575** new child COVID-19 cases were reported the past week, representing **25.5%** of new weekly cases. Over the past two weeks, there was an **5% increase** in the cumulated number of child COVID-19 cases

• Children ranged from **1.6%-4.2%** of total cumulated hospitalizations, and **0.1%-2.0%** of child COVID-19 cases resulted in hospitalization

• Children were **0.00%-0.25%** of all COVID-19 deaths, and **0.00%-0.03%** of all child COVID-19 cases resulted in death*

Data as of: 10/14/21
NEW HOSPITAL ADMISSIONS: AGE 0-17

65,795
Total Admissions
Aug 01, 2020 - Oct 18, 2021

178
Current 7-Day Average
Oct 12, 2021 - Oct 18, 2021

186
Prior 7-Day Average
Oct 05, 2021 - Oct 11, 2021

371
Peak 7-Day Average
Aug 29, 2021 - Sep 04, 2021

-4.5%
Percent change from prior 7-day avg. of Oct 05, 2021 - Oct 11, 2021

-52.1%
Percent change from peak 7-day avg. of Aug 29, 2021 - Sep 04, 2021


Data as of: 10/18/21
PERCENT RECEIVED COVID-19 VACCINE BY AGE

<table>
<thead>
<tr>
<th>Age Group</th>
<th>At Least One Dose</th>
<th>Fully Vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18 yrs</td>
<td>0.5%</td>
<td>0.3%</td>
</tr>
<tr>
<td>12-15 yrs</td>
<td>56.1%</td>
<td>46.2%</td>
</tr>
<tr>
<td>16-17 yrs</td>
<td>63.4%</td>
<td>53.7%</td>
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<tr>
<th>Age Group</th>
<th>At Least One Dose</th>
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<tbody>
<tr>
<td>18-24 yrs</td>
<td>65.6%</td>
<td>54.3%</td>
</tr>
<tr>
<td>25-39 yrs</td>
<td>68.9%</td>
<td>58.5%</td>
</tr>
<tr>
<td>40-49 yrs</td>
<td>77.1%</td>
<td>67.1%</td>
</tr>
<tr>
<td>50-64 yrs</td>
<td>84.3%</td>
<td>74.6%</td>
</tr>
<tr>
<td>65-74 yrs</td>
<td>98.5%</td>
<td>86.8%</td>
</tr>
<tr>
<td>75+ yrs</td>
<td>92.9%</td>
<td>81.5%</td>
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https://covid.cdc.gov/covid-data-tracker/#vaccination-demographics-trends

Data as of: 10/19/21
“The rate (per 100,000 persons) of COVID-19 admissions in August 2021 in the quartile of states with the lowest vaccination coverage was 3.7 times that in the quartile of states with the highest vaccination coverage.”

Children and SARS-CoV-2 illness

• SARS-CoV-2 exhibits a wide range of clinical outcomes
  • Asymptomatic/mild disease
  • Severe viral pneumonia/RDS
  • GI, musculoskeletal & mucocutaneous disease
  • Serious cardiac, cerebrovascular and vascular complications
  • Acute kidney injury, shock syndrome, coagulopathy
  • MIS-C

• Risk of severe illness/hospitalization
  • Genetic, heart disease, neurologic & metabolic comorbidities
  • Obesity, diabetes, asthma/chronic lung disease, SCD
  • R/E minorities
Effects of the Pandemic

• Family and economic stress
• Loss of caregivers/grief
• Missed routine vaccinations
• Undetected abuse and neglect
• Neurodevelopmental/cognitive/educational impacts
• Mental health
• Substance use
• Decreased physical activity/obesity
Multisystem Inflammatory Syndrome in Children (MIS-C) and other forms of Post-Acute Sequelae of SARS-CoV-2 (PASC)
Multisystem Inflammatory Syndrome in Children (MIS-C)

Children are falling ill with perplexing inflammatory syndrome thought to be linked to covid-19

Number of cases remains small, but officials are on high alert because of severity

Washington Post

Young adults are also affected by Kawasaki-like disease linked to coronavirus, doctors say

Washington Post

Boston Children's Hospital to lead nationwide study on COVID-19 in children

CDC-funded study will seek factors that increase vulnerability to the novel coronavirus

BOSTON CHILDREN'S HOSPITAL
5,217 confirmed cases
46 total deaths

https://www.cdc.gov/mis/cases/index.html

Data as of: 10/04/21
CARING for Children with COVID
(Collaboration to Assess Risk and Identify long-term outcomes for Children with COVID)

- Two approaches
- Leverages resources and networks from 3 NIH ICs to capture data from patients with MIS-C
- Trans-NIH effort through RADx-rad to enhance diagnostic and predictive efforts
- https://caring4kidswithcovid.nih.gov/
CARING for Children with COVID
(Collaboration to Assess Risk and Identify Long-term outcomes for Children with COVID)

• Leverages networks from NICHD, NHLBI, NIAID to study MIS-C
  • Capitalizes on strengths of each network: immune profiling (NIAID); long-term cardiac effects (NHLBI); PK/PD of drugs used to treat COVID-19 but not labeled for children (NICHD)
  • Clinical data will be harmonized across MIS-C cohort studies
  • A searchable data set with common data elements will be created for interoperable sharing across different platforms
  • Aim to follow children for up to five years through longitudinal protocol
  • Currently >1000 children are enrolled across three protocols
  • First data release!
The first batch of data (representing 57 participants) from the CARING for Children with COVID: POP-02 study has been released through the Kids First FHIR API

- View/filter the CARING data alongside Kids First and other interoperable datasets
- Users can develop their own tools/applications
- Next batch of data due soon

- https://portal.kidsfirstdrc.org/explore?id=7op
# NIH Rapid Acceleration of Diagnostics (RADx)℠

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
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<tbody>
<tr>
<td>RADx Tech</td>
<td>Highly competitive, rapid three-phase challenge to identify the best candidates for at-home or point-of-care tests for COVID-19</td>
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<tr>
<td>RADx-Advanced Testing Program (RADx-ATP)</td>
<td>Rapid scale-up of advanced POC technologies to accelerate and enhance and validate throughput – and support of ultra-high throughput machines and facilities</td>
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<tr>
<td>RADx-Radical (RADx-rad)</td>
<td>Develop and advance novel, non-traditional approaches or new applications of existing approaches for testing</td>
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<tr>
<td>RADx-Underserved Populations (RADx-UP)</td>
<td>Interlinked community-engaged projects focused on implementation strategies to enable and enhance testing of COVID-19 in underserved and/or vulnerable populations</td>
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Predicting Viral-Associated Inflammatory disease severity in children with Laboratory diagnostics and artificial Intelligence (PreVAIL klds)

Develop translational tools to understand the spectrum of pediatric SARS-CoV-2 illness, rapidly diagnose and characterize MIS-C associated with SARS-CoV-2, and predict the longitudinal risk of disease severity after exposure to and/or infection by SARS-CoV-2

- Genetics; Omics; Other biomarkers
- Viral Dynamics and Immune Profiling Studies
- Digital Health Platforms Leveraged for Children
- Artificial Intelligence

- Milestone-driven award (R61/R33); up to 4 years
Predicting Viral-Associated Inflammatory disease severity in children with Laboratory diagnostics and artificial Intelligence

- Severity predictors integrating salivary transcriptomics and proteomics with neural network intelligence in SARS-CoV-2 infection in children
  - Lucila Ohno-Machado

- Integrating salivary transcriptomics and proteomics with neural network intelligence in SARS-CoV-2 infection and Kawasaki Disease in children
  - Usha Sethuraman

- Artificial Intelligence COVID-19 Risk Assessment for kids
  - Ananth V. Annapragada

- Diagnosing and predicting risk in children with SARS-CoV-2 related illness
  - Jane Burns

- Data science approach to MIS-C identification and management associated with SARS-CoV-2 infection and Kawasaki Disease in children
  - Cedric Manlihot

- Diagnosis of MIS-C in febrile children
  - Audrey R. Odom John

- Identifying biomarker signatures of prognostic value for MIS-C
  - Juan Salazar

- Discovery and clinical validation of host biomarkers of disease severity and MIS-C in children with COVID-19
  - Charles Chiu

- 8 Teams w/ multi-disciplinary expertise to address Program aims

- Access to diverse patient populations in > 75 sites across 30 US States

- International collaborations in UK, Canada, Asia, & S. America

- Enrolling >16,000 children with substantial racial and ethnic diversity

- Leveraging established biorepositories

- The studies include both prospective and retrospective enrollments
At 12, She’s a Covid ‘Long Hauler’

Although most young people recover quickly, doctors are seeing some children and teens with lingering fatigue and other chronic problems.

‘This Is Really Scary’: Kids Struggle With Long Covid

Lingering physical, mental and neurological symptoms are affecting children as well as adults, including many who had mild reactions to the initial coronavirus infection.
Understanding the Full Spectrum of PASC: A Multi-System Disorder

### PASC: Refining the Case Definition

- **Descriptions include:**
  - “persistent symptoms and/or delayed or long-term complications of SARS-CoV-2 infection beyond 4 weeks from the onset of symptoms.”¹

- **Potential overlap with other disorders** and conditions (e.g., ME/CFS; Post-ICU).

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#### Detection Unlikely

- **Viral load**
  - SARS-CoV-2 exposure
  - Nasopharyngeal

#### PCR positive

- Viral isolation from respiratory tract

#### PCR negative

- Fatigue
- Decline in quality of life
- Muscular weakness
- Joint pain
- Dyspnea
- Cough
- Persistent oxygen requirement
- Anxiety/depression
- Sleep Disturbances
- PTSD
- Cognitive disturbances (brain fog)
- Headaches
- Palpitations
- Chest pain
- Thromboembolism
- Chronic kidney disease
- Hair loss

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<tr>
<th>Detection Unlikely</th>
<th>PCR positive</th>
<th>PCR negative</th>
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<tbody>
<tr>
<td>Before symptom onset</td>
<td>After symptom onset</td>
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<table>
<thead>
<tr>
<th>Acute COVID-19</th>
<th>Post-acute COVID-19</th>
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<tbody>
<tr>
<td>Subacute/ongoing COVID-19</td>
<td>Chronic/post-COVID-19</td>
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¹Nalbandian et al. (2021)
WHO Clinical Case Definition: Post COVID-19 Condition

- Post COVID-19 condition occurs in individuals with a history of probable or confirmed SARS-CoV-2 infection, usually 3 months from the onset of COVID-19 with symptoms that last for at least 2 months and cannot be explained by an alternative diagnosis.
- Common symptoms include fatigue, shortness of breath, cognitive dysfunction but also others which generally have an impact on everyday functioning.
- Symptoms may be new onset, following initial recovery from an acute COVID19 episode, or persist from the initial illness.
- Symptoms may also fluctuate or relapse over time.
- A separate definition may be applicable for children.


recoverCOVID.org
REsearching COVid to Enhance Recovery (RECOVER)

RECOVER Website – www.recovercovid.org

Long-term effects of COVID are real. Join the search for answers.

Have questions about the long-term health effects of the virus? Start by learning about PASC.
Keeping up with NICHD and COVID

• https://www.nichd.nih.gov/research/supported/COVID
Questions?