

The Impact of SARS CoV2 on Children and Adolescents



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HEALING. HEALTHY. HAPPY.

A Seventh-day Adventist Organization

CHILDREN'S
HEALTH

Disclosures

» I have no financial disclosures to make.

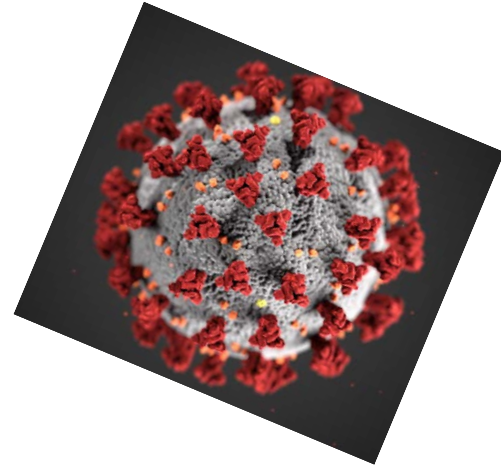
Objectives

- » Understand the burden of SARS CoV2 infection in our childhood population
- » Understand Risk Factors for severe disease
- » Understand MIS-C presentation and treatment
- » Return to Play guidelines for children who have had Covid or MIS-C
- » Understand the psychological impact of children during the pandemic

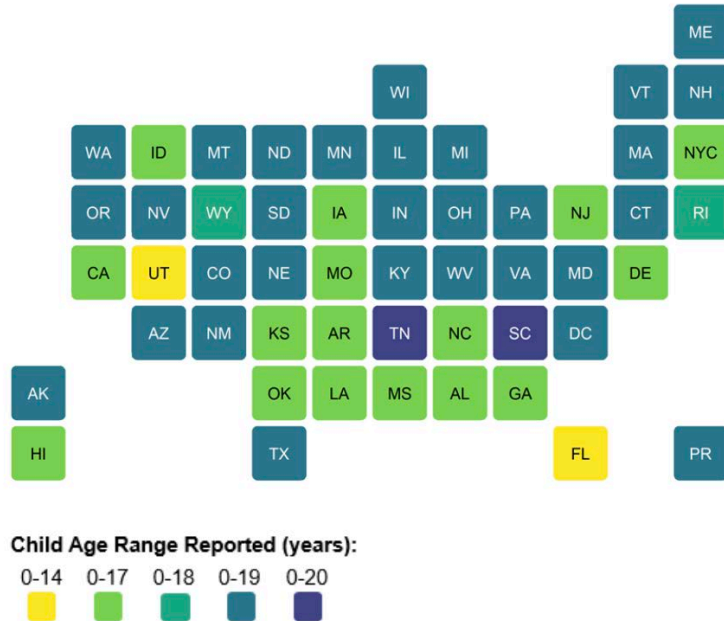


SARS CoV 2 in children/adolescents

- » The burden is broad reaching across physical, emotional, and mental
 - ~ Less severe initial disease
 - ~ MIS-C
 - ~ School performance
 - ~ Athletics/activity
 - ~ Psychological impact
- » Fortunately the physical burden of disease has been lower in children/adolescents than our population >65
- » Long term ramifications of the psychological and school burden are yet to be known



State Reporting Varies

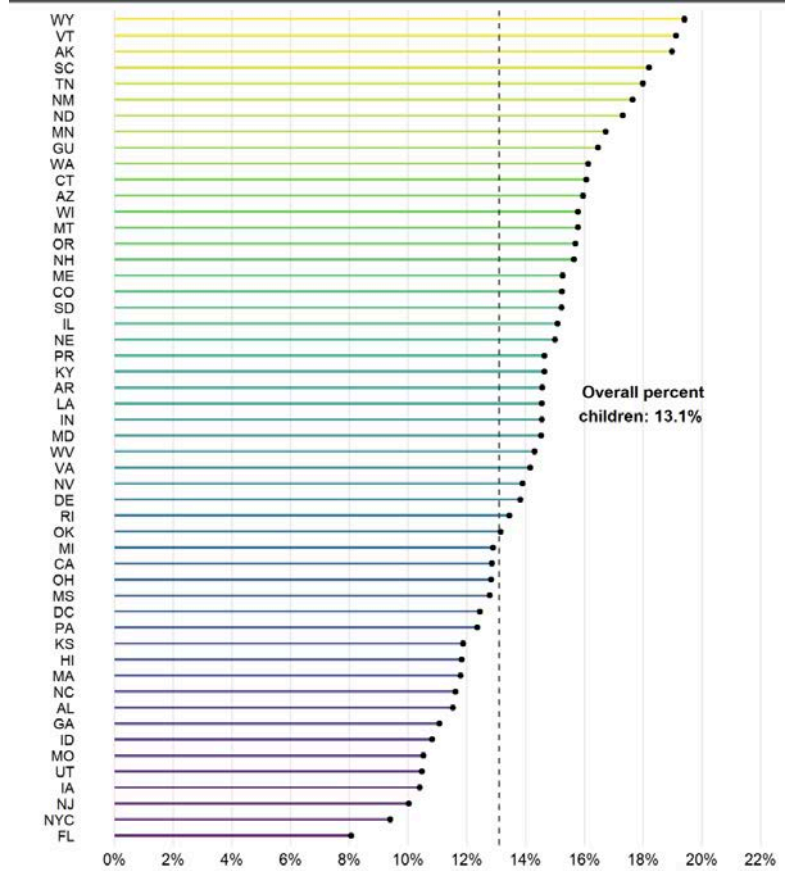


- Format/content/metrics differ by state
- Definition of child differs
- Some states changed definitions partway through pandemic
- Unknown # of children infected and not tested / counted

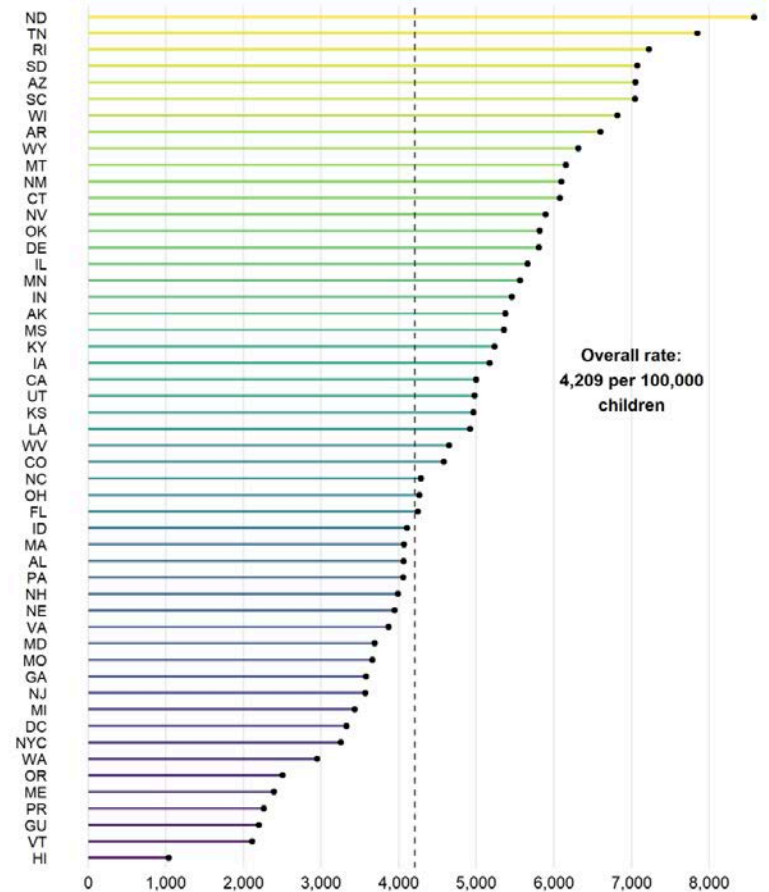
Overall Burden of Disease – 2/25/21

- » 3,168,274 total child COVID-19 cases reported with children representing 13.1% of all cases
 - ~ Poor early testing availability, suboptimal currently in some areas
 - ~ Poor testing ability <2 yr if not hospitalized
- » Overall rate: 4,209 cases per 100,000 children in the population
- » Children were 1.3%-3.0% of total reported hospitalizations, and between 0.1%-2.2% of all child COVID-19 cases resulted in hospitalization
- » Children were < 0.2% of all COVID-19 deaths, and 10 states reported zero child death

% + tests that are children



Cases/100,000 children in State



North American PICU data

3092

COVID-19 Positive

90

Confirmed Deaths

34K

Tested*

942

MIS-C Diagnosed

17K

PICU Days

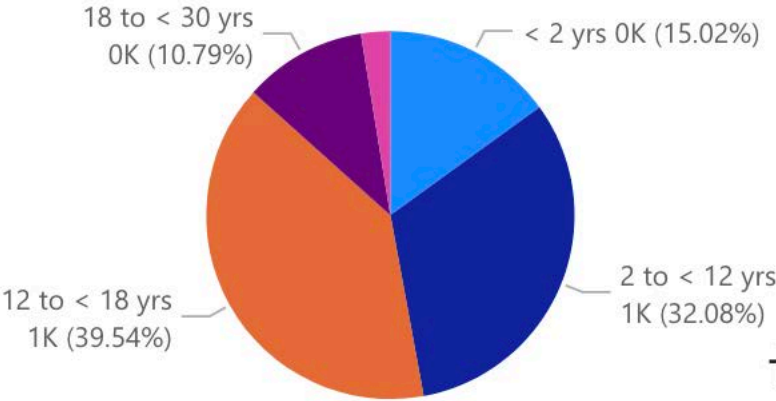
185

Sites Submitted Data*

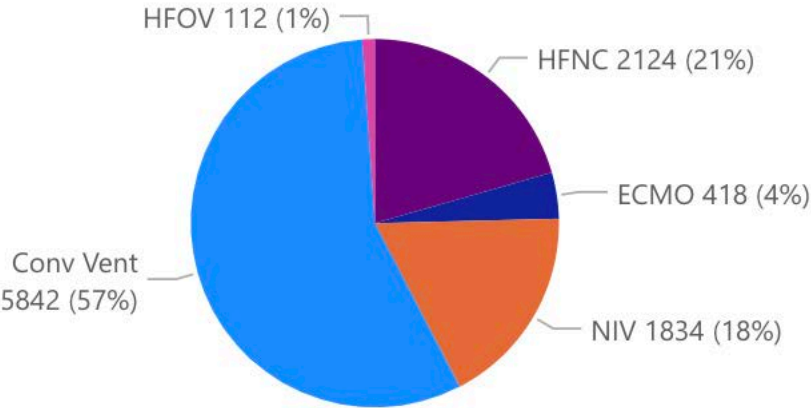


3/14/20 – 2/25/21

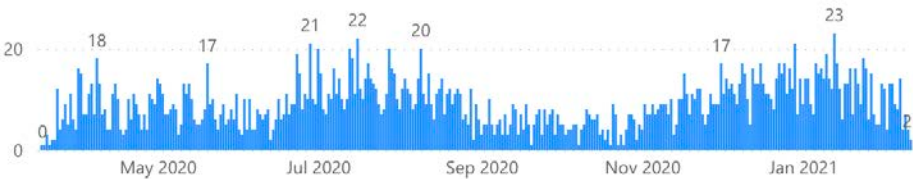
Age Distribution



Therapies Used (as Cumulative PICU Days) *



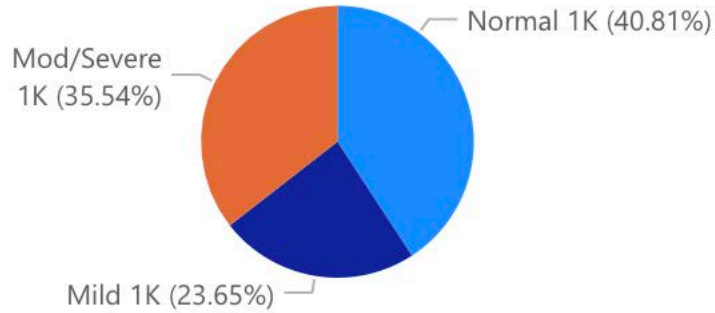
COVID-19 Positive PICU Admissions Per Day



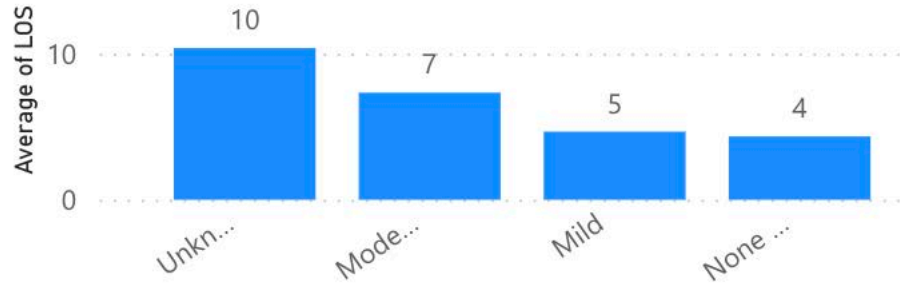
Risk for severe disease

- » Obesity is independently a risk
 - ~ Study in the Journal of Pediatrics showed odds ratio of 3.39
- » Amount of hypoxia on arrival
 - ~ Odds ratio of 4.01
- » Age >12 yrs
- » Underlying co-morbid conditions
 - ~ Chronic Lung disease
 - ~ Diabetes
 - ~ Congenital Cardiac Disease
 - ~ Immunosuppression
 - ~ Genetic/Metabolic disease

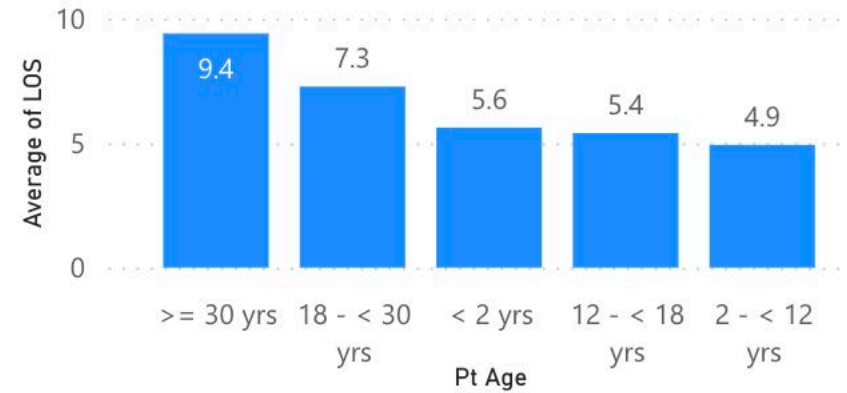
Comorbidity of Patients



Average of LOS (in days) by Prior Comorbidities

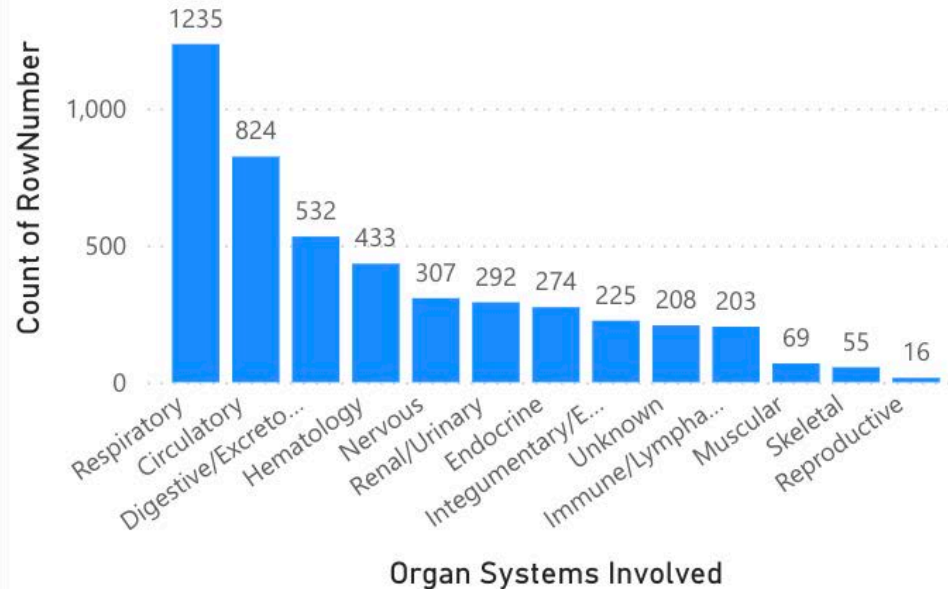


Average of LOS (in days) by Age Group



Presenting Symptoms in Children

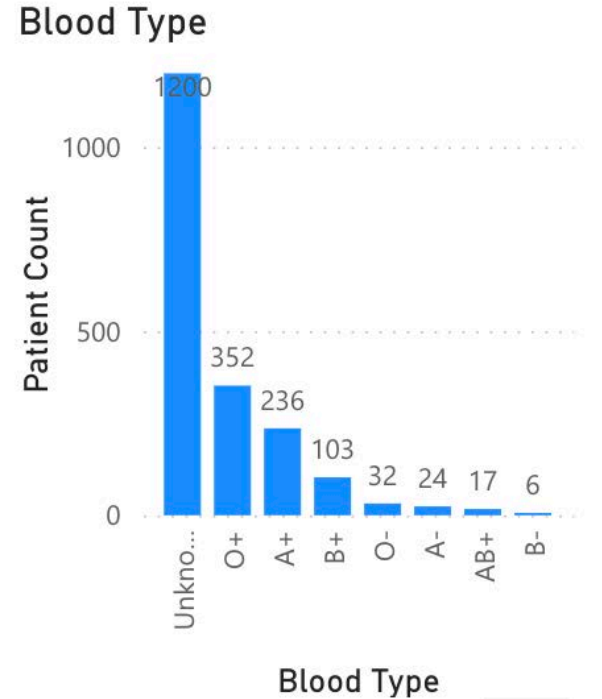
Organ Systems Involved By COVID-19 *



- » Broad and many organ systems
- » ICU level care needed - increased respiratory and cardiac disease
- » Ward level care symptoms are variable
- » Asymptomatic children presented for many other hospital needs

Is there a blood type correlation?

- » Some international data was published in adults to say that O+ was protective. Harvard study did not replicate this but showed that maybe people with O had less severe disease.
- » PICU data in North America does not show that but there were a large number of patients with unknown blood type.



ED treatment - Bamlanivimab



» Criteria:

- ~ a. Patient will be discharged from the ED
- ~ b. Does not require supplemental oxygen or an increase in baseline oxygen use
- ~ c. Symptom onset is less than 10 days, and

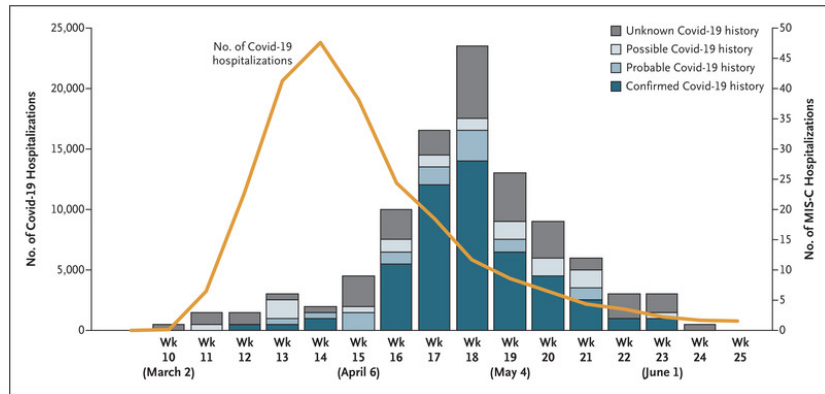
» PEDIATRIC PATIENTS - d. high risk with one of the following:

- ~ i. Is 12-17 years of age and weighs at least 40kg, AND
- ~ ii. BMI > 85th percentile for age and gender (CDC growth chart), or
- ~ iii. Sickle cell disease
- ~ iv. Congenital or acquired heart disease, or
- ~ v. Neurodevelopmental disorders (e.g. cerebral palsy)
- ~ vi. Medical-related technological dependence, (e.g. trach, gastrostomy tube, etc.,) or
- ~ viii. Asthma, reactive airway disease or other chronic respiratory disease requiring daily medication for control.

COVID treatment - Hospital

- » Infection prevention and control measures with supportive care
- » Indications for experimental treatment
 - ~ Symptomatic with LRTI + SARS CoV2 PCR +
 - ~ Mod to Severe disease
- » Remdesivir - binds to viral RNA dependent RNA polymerase
 - ~ loading dose and then up to 10 days
 - ~ FDA approved >12 kg and >40 kg
 - ~ EUA: 3.5 kg to 40 kg or <12 years and at least 3.5 kg
 - ~ Need normal GFR, trend liver function, PT/PTT
- » Corticosteroids – mod to severe disease - up to 10 days
- » Treat secondary infections, cardiac support, pulmonary support

MIS-C



» Multisystem Inflammatory Syndrome – Children

» < 21 yrs with clinical criteria

~ Fever

~ Illness requiring hospitalization

~ multisystem organ involvement

~ lab evidence of inflammation

~ lab or epi evidence of SARS CoV2 infection

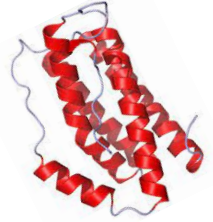
» No alternative plausible diagnosis

» Ave age: 8 years

» General onset: 2-4 weeks after initial SARS CoV2 infection

~ Usually Ab positive, can be PCR + or –

MIS-C



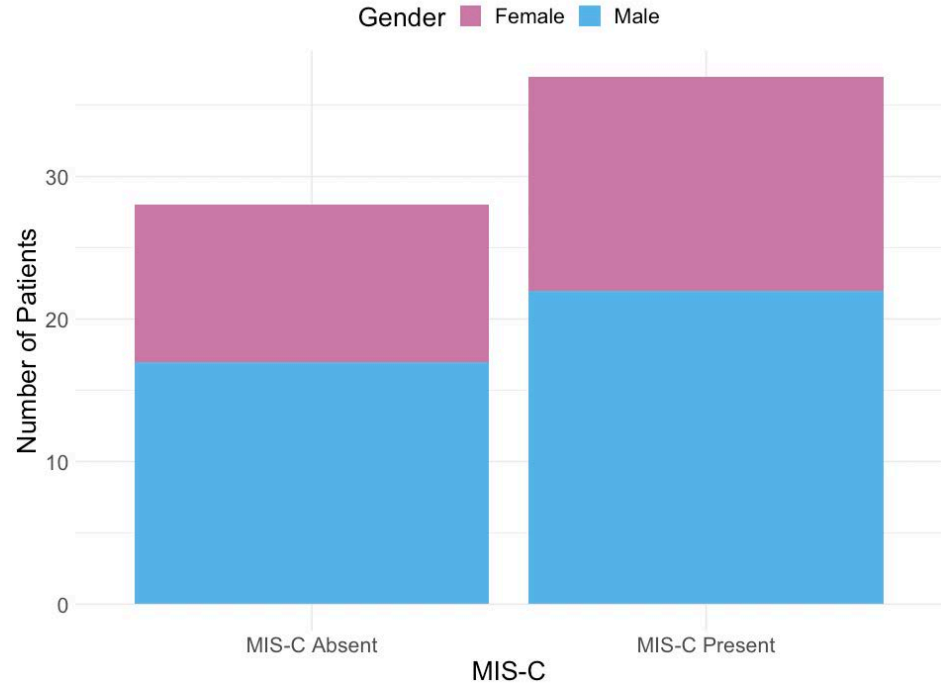
- » Cytokine release is felt to be mechanism of severe disease
- » Elevated levels of IL-6, IL-1, and TNF may be involved but currently no evidence that inhibiting these improves outcomes
 - ~ Several clinical trials underway
- » First line therapy
 - ~ IVIG 2gm/kg
 - ~ + Methylprednisolone 2mg/kg/d x 5 d then oral taper x 2-3 wks
 - ~ + low dose asa 3-5 mg/kg/dose daily (max 81mg) x 4-6 weeks
- » Refractory therapy
 - ~ Methylprednisolone for secondary hemophagocytic lymphohistiocytosis
 - ~ Anakinra – 8mg/kg/dose SQ daily x 5 days



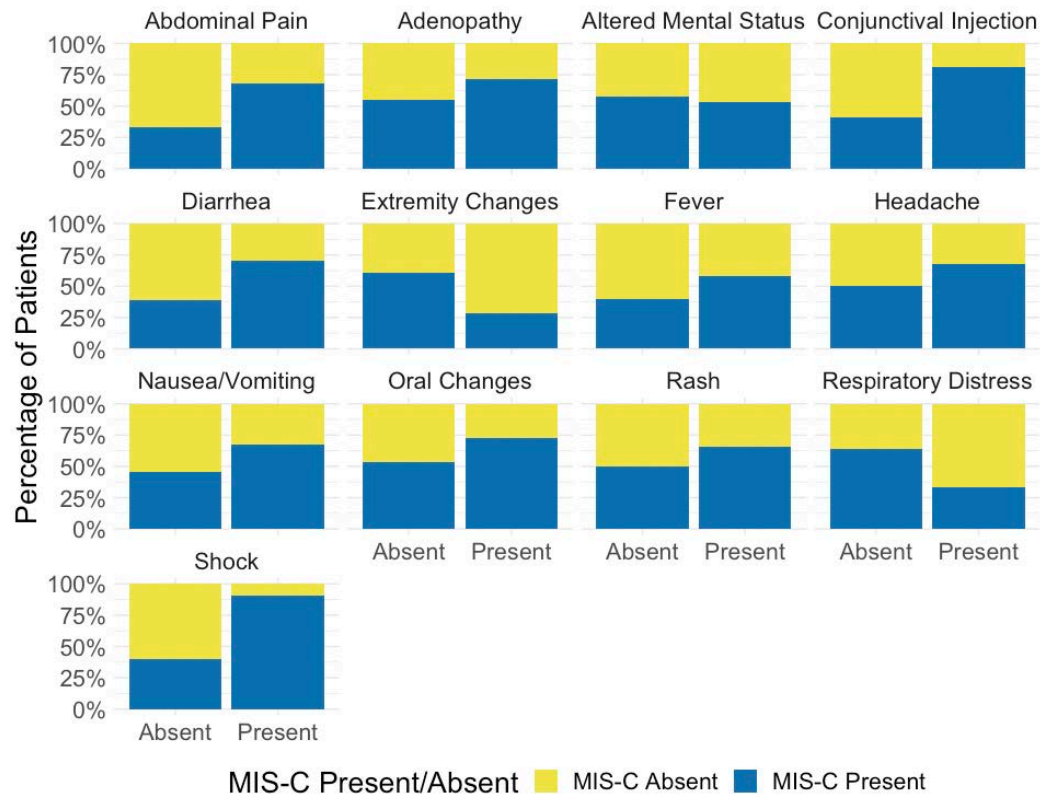
LLUCH MIS-C experience

- » MIS-C Absent – patients ID was consulted on for symptoms in the MIS-C categories ultimately decided not to be MIS-C
- » MIS-C present – those diagnosed as MIS-C

Gender distribution of patients with and without MIS-C

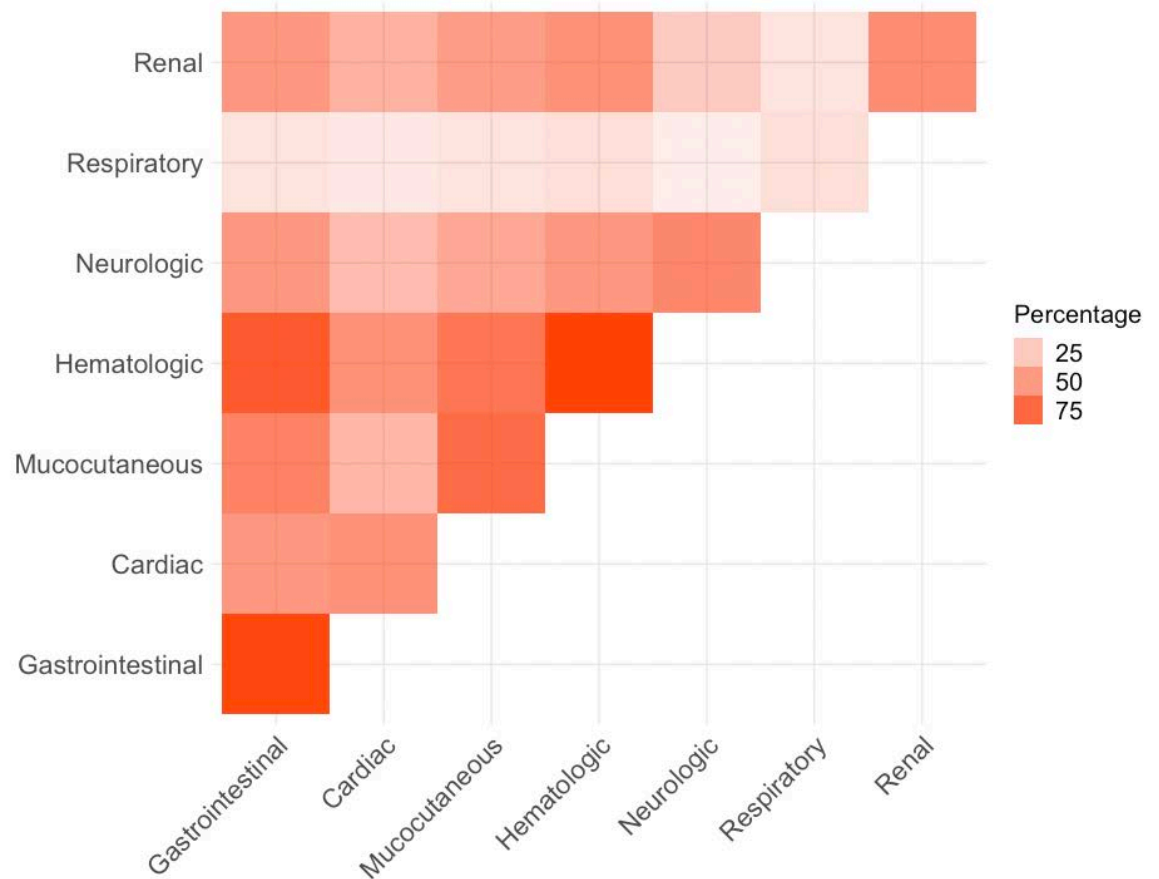


LL MIS-C experience – PE findings

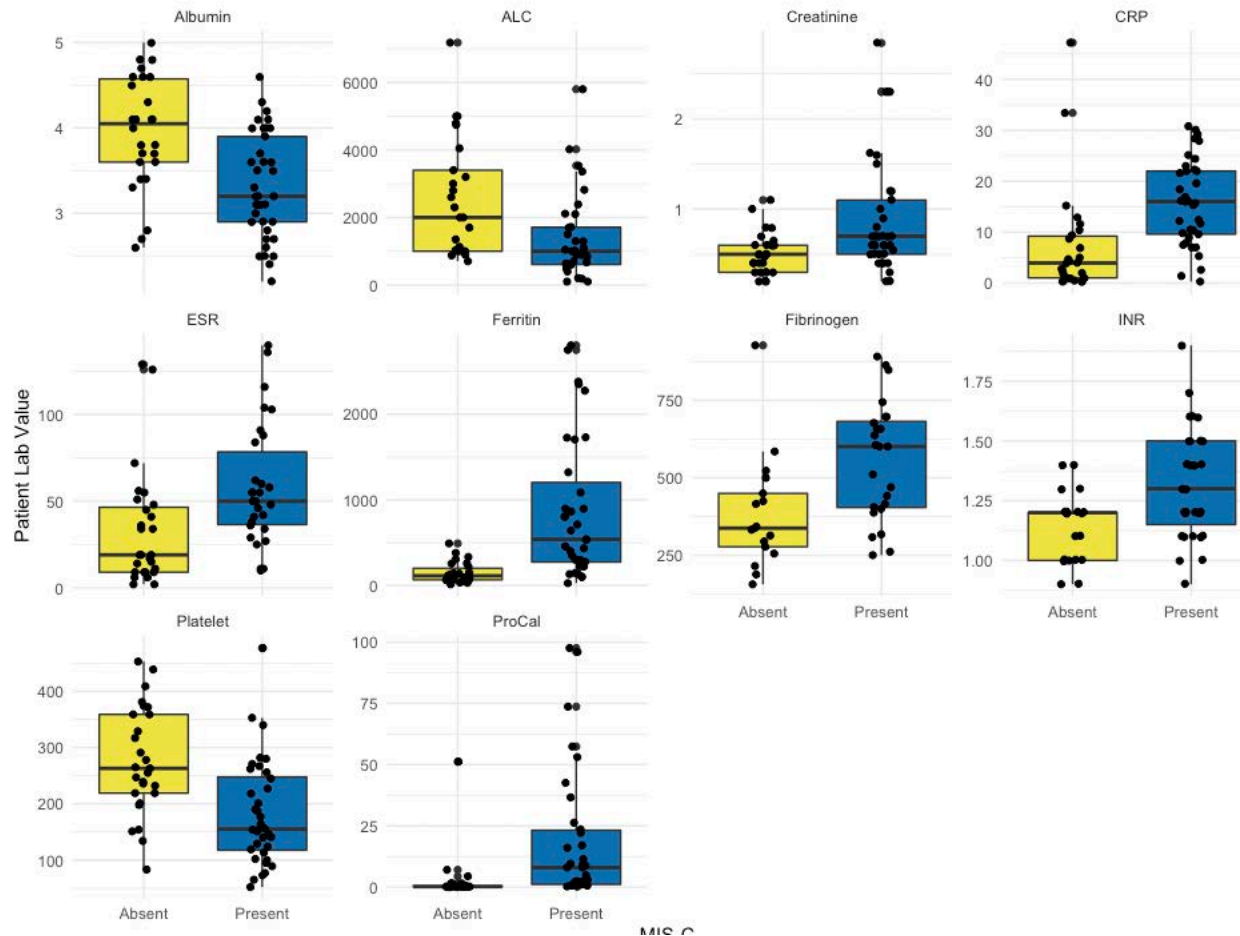


MIS-C

Systems by % at presentation



Labs in Patients With & Without MIS-C



- » Scatter pattern is broad
- » Patients all presented with s/s concerning for MIS-C
- » No healthy controls in this data set

Return to Play



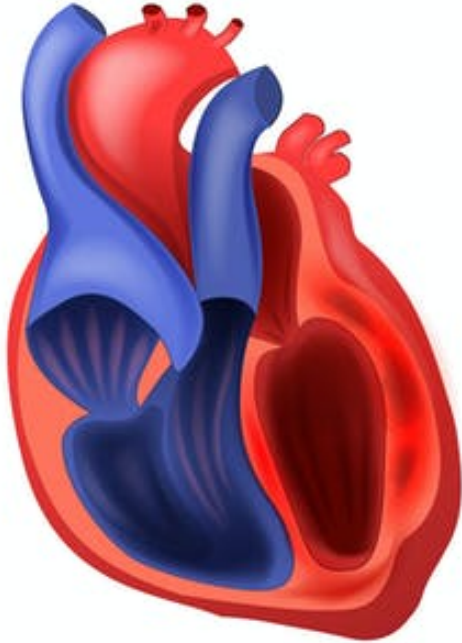
- » ~ 35-45 mil youth from 6-18 participate in athletics
- » Recognition that return to play has physical and psychological benefits
- » Transition Mitigation Strategies
 - ~ Adolescents may spread as easily as adults
 - ~ Youth under 10 may spread less
- » Prolonged close contact is the #1 driver for spread
- » Risk/benefit ratio includes type of sport, local incidence, individual risk
- » Masking to/from field/court, during warm up, breaks, all coaches
- » Consider pods of athletes, own water bottles, not shared locker rooms, etc

When to return after COVID-19?

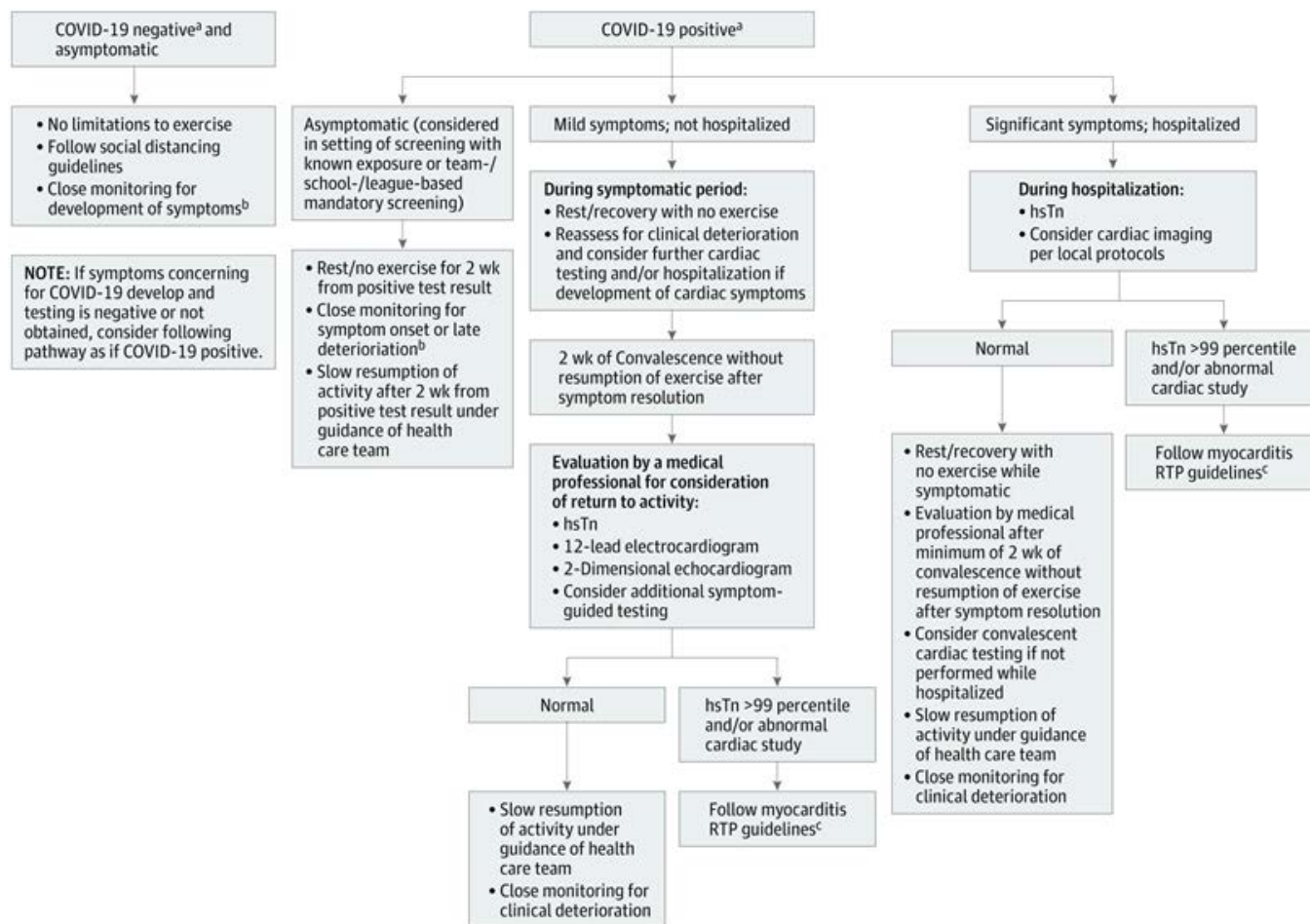
- » AAP recommends that a PCP clears any youth who had Covid-19 or MIS-C before resuming training.
- » Screen for cardiac symptoms
 - ~ Chest Pain, SOB, Fatigue, Palpitations, Syncope
- » Severe illness – hypotension, arrhythmias, intubation, EMCO, cardiac or renal involvement, MIS-C
 - ~ Restrict for 3-6 months
 - ~ Gradual return to play with monitoring
- » Mild illness/asymptomatic
 - ~ Rest 14 days after positive test
 - ~ Gradual return to play with obs of symptoms



Myocarditis



- » American College of Cardiology's Sports and Exercise Cardiology Council published in *JAMA Cardiology*, May 2020
- » 15% had evidence of myocarditis on CMR imaging
- » Acute cardiac injury occur in up to 22% of hospitalized patients with COVID-19, compared with the approximately 1% prevalence in non-COVID-19 acute viral infections.
- » Increases the risk of arrhythmias and sudden death



Gradual return to play?

- » Onus will fall on strength and conditioning coaches, ATs, monitoring devices to assist.
- » Youth <15 or in non-club sports have less access to such resources
- » Adolescents are more likely to underreport new symptoms in their desire to play
- » Need to discuss risk with families and players

School Return



- » <10% of US Covid cases are 5-17 yrs old
- » Data to date – in person school has not been associated with substantial community spread
- » Critical to control disease spread in community for safe school opening
- » Study at University of Mississippi – Pub Jan 2021
 - ~ Children/Adolescents were more likely to have known positive contact that was family or close friend
 - ~ Were more likely to state that they were not consistent with masking/social distancing in the 14 days prior
- » School safety plan
 - ~ Should include ventilation and filtration

School Outbreaks

- » Can occur if mitigation strategies are not adhered to
- » Studies show that they are lower than or equal to community outbreaks if mitigation strategies are adhered to
- » North Carolina – 11 districts – adhered to mitigation practices – open fall 2020 with minimal school related transmission
- » Chicago, Germany, Norway, Italy – all with data to support that opening with mitigation policies can be done
- » Israel – 2 asymptomatic students lead to outbreak
 - ~ They lifted the mask requirement due to heat

School - UK experience

- » Closed on March 20, 2020, other than for vulnerable pupils and children of key workers, and national exams were cancelled
- » Recognized that vulnerable are less likely to learn well remotely
- » Partial opening: 57,600 schools attended by a median of 928,000 students per day. June 1 – July 17
 - ~ 113 total cases – most staff, 47% from staff-staff transmission
- » Restart March 8
- » Students will be tested three times in the first two weeks and then two rapid tests to use each week at home
- » Includes family members in the home



Psychological Impact

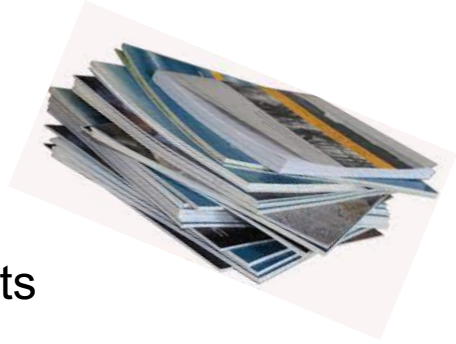
- » Worry about sick parent/grandparent
- » Worry about getting sick yourself
- » Food or housing insecurity
- » Witnessing the anxiety/stress of adult caregivers
- » Dealing with the loss of a family member
- » Separation from peers
- » School challenges – distance learning, loss of monumental milestones (Prom, graduation, senior sports seasons)
- » Social Media Bullying
- » Home tensions – not all homes are safe places



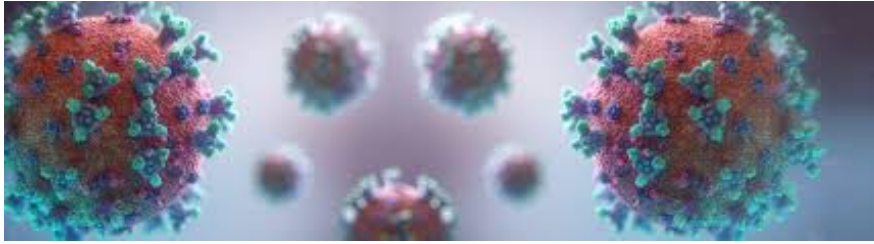
ACE – Adverse Childhood Event

- » Toxic stress – dysregulation of child
- » Increased cortisol and proinflammatory cytokines
- » Negative health outcomes later in adult life
- » The more ACEs experienced -> the greater chance of poor adult outcomes
- » Can see physiologic changes in children with delay in cognitive development, somatic complaints, obesity, asthma, diabetes, recurrent infections, sleep disturbance
- » Adults who experienced ACEs have increased risk for chronic health problems, substance abuse, mental illness, and earlier death

Studies in the Literature



- » Predictability is a stabilizing force for children and adolescents
- » Youth are in a critical period of neurodevelopment
- » Online questionnaire - 359 children and 3254 adolescents aged 7 to 18 years
 - ~ 22.3% of youth had scores indicative of clinical depressive symptoms, (baseline is 13.2% estimated prevalence of youth depression)
 - ~ Problem-focused coping style was associated with lower levels of clinical depressive symptoms vs emotion-focused coping style
- » PHQ-9 and GAD-7 in >8,000 Jr and Sr High School students
 - ~ 43% with depressive symptoms, 37% with anxiety
 - ~ Knowledge of prevention measures was greater in those without symptoms



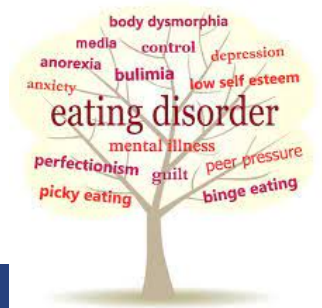
- » Bangladesh, Italy, Spain studies all with increased levels of anxiety
 - ~ 85.7% of parents reported changes in their children's emotions and behaviors during the quarantine
- » Review of 63 studies: Duration of loneliness compared to intensity of loneliness has been strongly associated with mental health symptoms
- » Review of 51 studies: children in all developmental phases have been impacted.
 - ~ Age, gender, knowledge, rural/urban, screen time, school closures, family/community connections, pre-existing conditions, covid illness, vulnerable socioeconomic status all have impact in + or - way

Anxiety/Depression/Suicide Risk

- » Number of studies have shown increase in mental health stressors
- » Rising levels of anxiety and depression
- » Concern for rising levels of SI/Suicide attempts – 2nd leading cause of death in adolescents and young adults
 - ~ Was on the rise pre-pandemic from 2017 to 2019 – 10th to 2nd cause
- » Conflicting reports
 - ~ Some reporting an increase in suicide attempts
 - ~ Journal of Pediatrics report – scattered elevations but not consistent
- » More detailed analysis and continued tracking is key, along with mental health resources

Eating disorders

- » Complex relationship with food
- » Pre-pandemic was already increasing and skewing younger
- » Often stem from attempt to achieve control
- » Pandemic has caused food insecurity and panic buying
- » Learning from past outbreaks - MERS, Ebola, Influenza
 - ~ Sense of foreboding, anxiety, panic, PTSD symptoms
 - ~ Relationship between the neuropsychiatric symptoms experienced and the outbreak concerned



Eating Disorders – LL experience



- » Difficult to assign causation at this time
- » LL Experience is 1.7x the admissions from March 2020 – Now compared to the same time frame the year prior
- » 65% of these children have co-existing anxiety or depression
- » No major difference in demographics for mean age, gender, race, admission BMI, or comorbidities
- » PHP and other services for youth are impacted by pandemic and resources for outpatient therapy is challenging
- » Health disparities are seen in programs and types of insurance taken

What can we do

- » Talk to our children and adolescents about how they are feeling
- » Normalize those feelings without encouraging unhealthy focus on anxiety, sadness, loss of control
- » Seek support for yourself or them if symptoms are present
- » Encourage PCP visits!
- » Advocate at the local, state, national level for safe return to school and activities
- » Encourage appropriate families to consider enrolling in clinical vaccine trials



Mental Health Hope

- » Coalition of 14 mental health organizations have been meeting regularly since the start of the pandemic
- » Created a strategic plan with a road map of 7 policy areas
 - ~ Including speeding up the National 988 Suicide Prevention Lifeline
 - ~ One of them being integrated “whole person” well-being!
- » SAMHSA received \$425 mil covid relief and distributed to states
- » Barriers – not enough total workforce or diversity in the mental health workforce



Vaccine Hope



- » Pfizer – currently 16 and above
 - ~ ~2,300 children 12-15 enrolled in trial
 - ~ Enroll 5-11 later this year
 - ~ 4,000 pregnant women
 - ~ Possible new dose, possible new schedule for kids
- » Moderna – currently 18 and above
 - ~ ~3,000 children 12-17 now
- » Johnson & Johnson – currently 18 and above
 - ~ Have not started enrollment for children in US
 - ~ Planned for 12 - <18, infant trial, pregnant trial

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