CHOC Children's Business Development
Virtual Pediatric Lecture Series

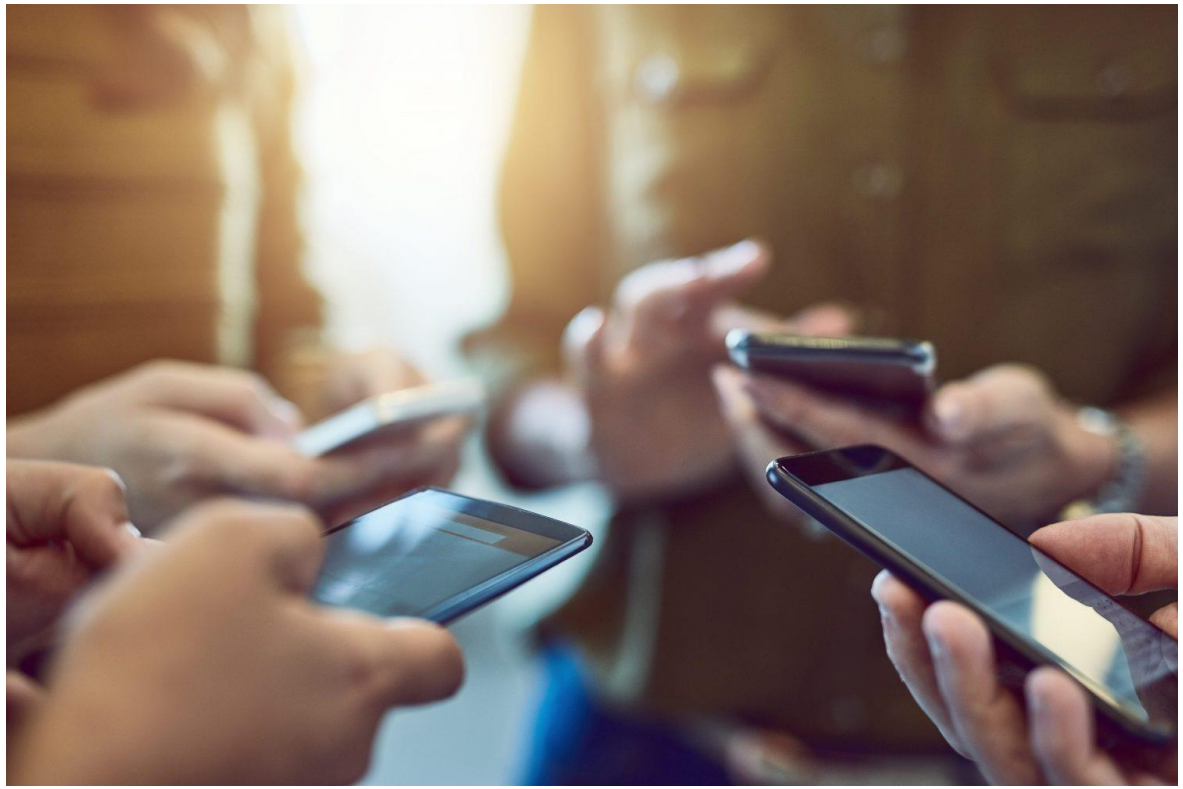
COVID-19 in Children

Thursday, October 15, 2020 from 12:30 – 1:30 PM (PST)

WELCOME

CHOC Children's
LONG LIVE CHILDHOOD

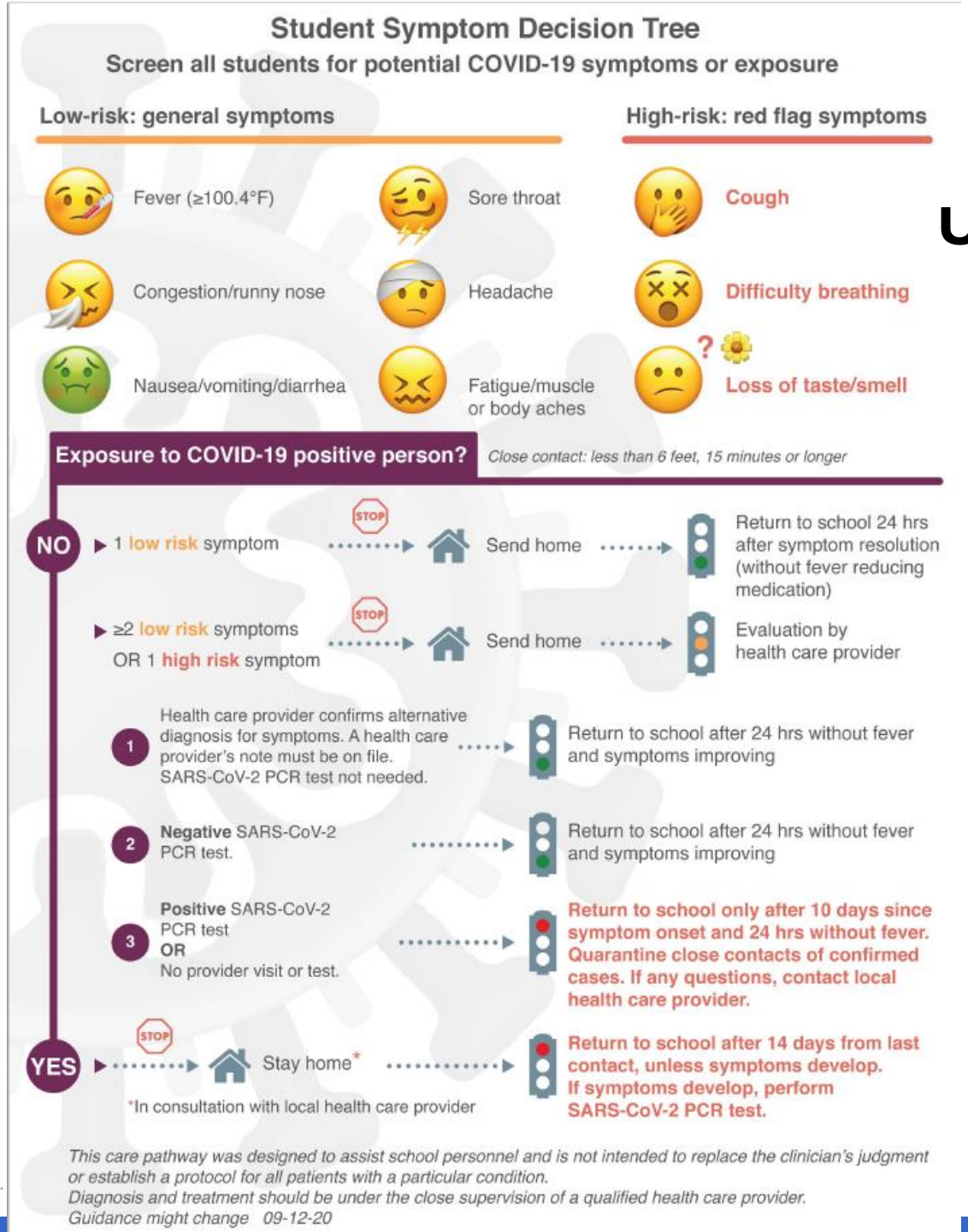
1-844-GET-CHOC



- Open to all families regardless of insurance
- 24/7/365 Nurse Triage for COVID issues
  - Validated, evidence-based COVID-19 triage protocols
- 24/7/365 ability to transfer to a physician or NP for a telehealth visit
- Visit documentation
  - Data collection
  - Follow-up
- Also serves as gateway for schools

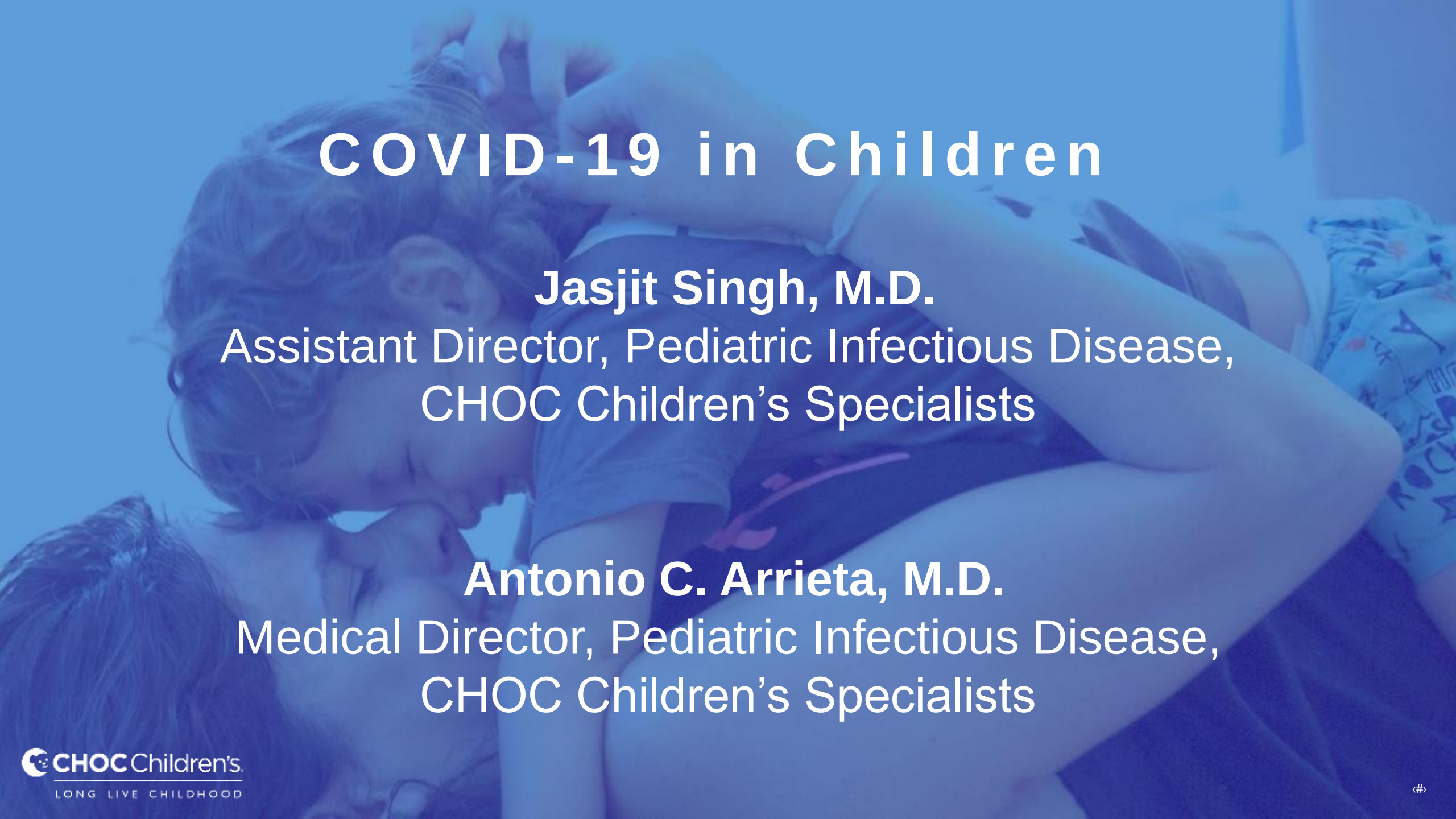
CHOC-UCI-OCHCA Collaboration

- Open to school staff only
- M-F 8 am-6 pm provider availability
- Answer questions/provide guidance
- Education for staff/administrators
- School nurse resource
- Review re-opening plans
- Use of evidence-based recommendations
- NOT providing patient care
- NOT doing contact tracing
- NOT making opening decisions
- Staying out of politics



UCI-OCHCA-CHOC Collaboration

- Designed for real-time use by nurses or health aids
- Based on CDC, CDPH, and AAP guidelines
- "exposure" is >/= 15 minutes, cumulative exposure, in a 24 hr period with, or without a mask



COVID-19 in Children

Jasjit Singh, M.D.
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CHOC Children's Specialists

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Medical Director, Pediatric Infectious Disease,
CHOC Children's Specialists

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Learning Objective

- Attendees will be able to counsel patients about the importance of influenza and other routine vaccines for this fall.

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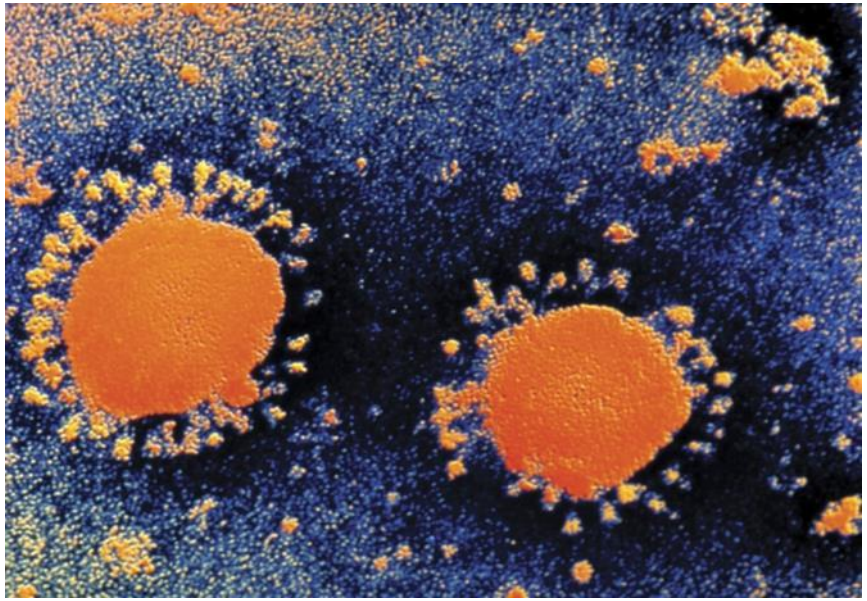
COVID-19 Overview

2019 Novel Coronavirus Update

- **Virus name = SARS-CoV-2**
- **Disease name = COVID-19**



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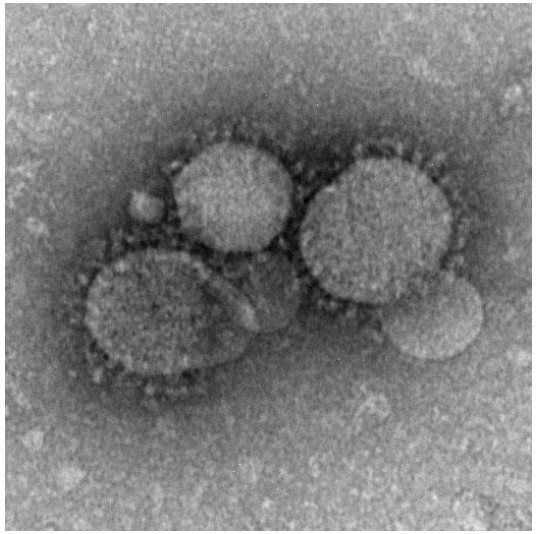
Coronaviruses



- Enveloped RNA viruses (largest RNA virus)
- Significant pathogen in humans and animals
- 7 known human CoVs – zoonotic in origin
  - 229E (alpha CoV)
  - OC43 (beta CoV)
  - HKU1 (beta CoV)
  - NL63 (alpha CoV)
  - SARS-CoV (beta CoV, emerged in 2002)
  - MERS-CoV (beta CoV, emerged in 2012)
  - SARS-CoV-2 (beta CoV, emerged in 2019)

Endemic (circulate yearly)
Cause mainly URTIs
Detected on CHOC RP-PCR

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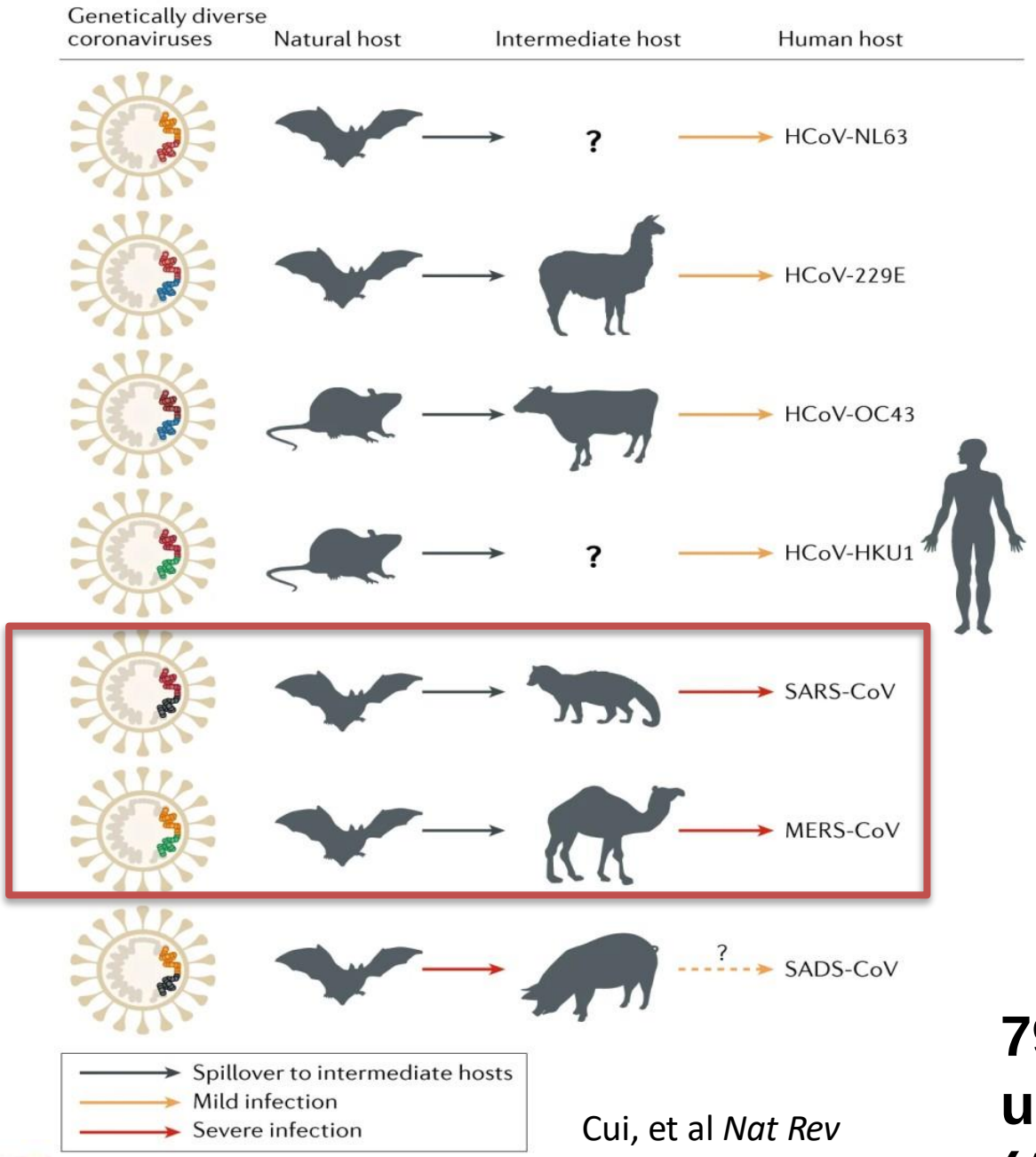

Cui, et al *Nat Rev* 2019

SARS-CoV-2

bats

??

pangolins

79% genetic similarity to SARS-CoV uses same receptor as SARS-CoV (ACE-2)

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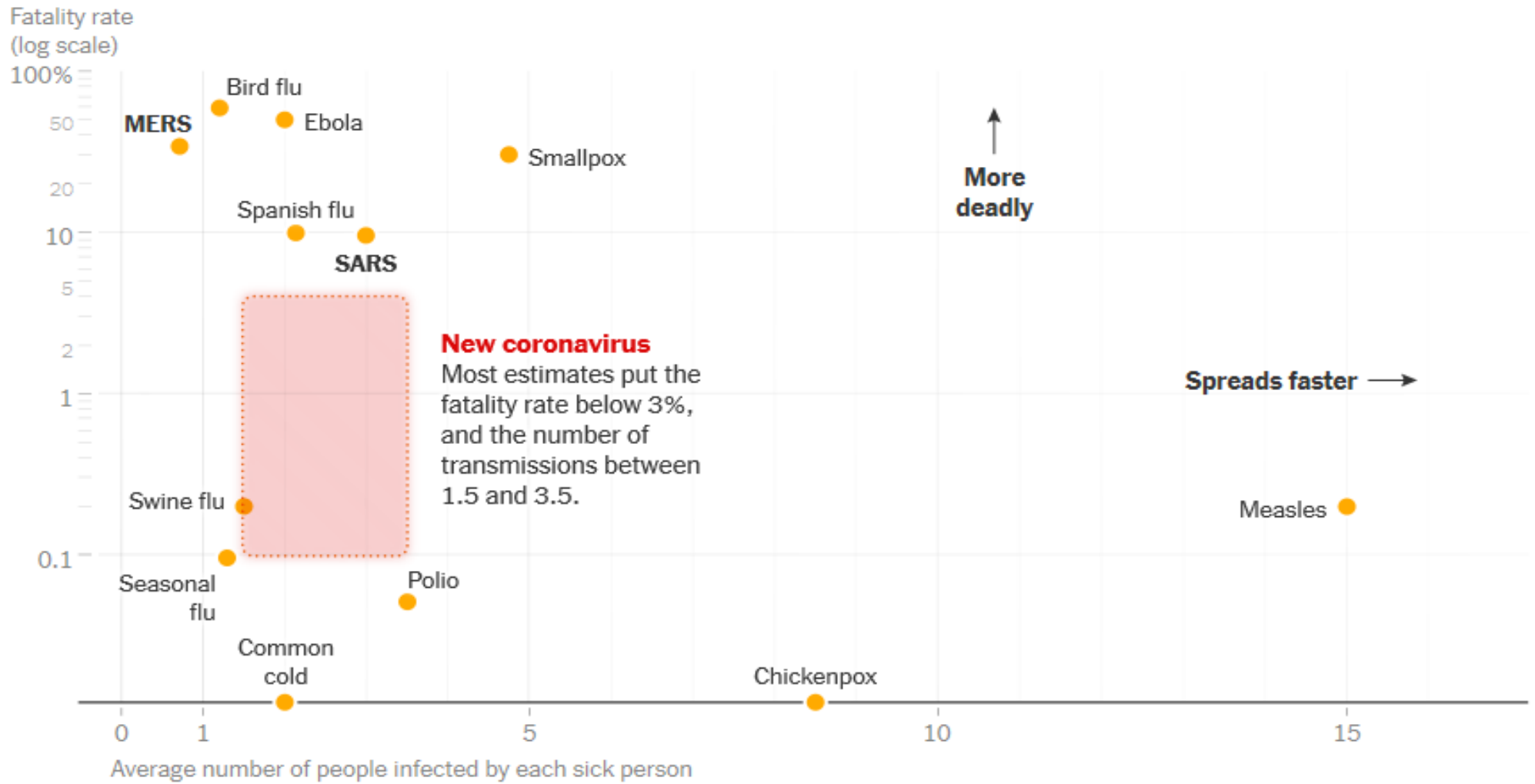
How deadly is COVID-19?



Note: Average case-fatality rates and transmission numbers are shown. Estimates of case-fatality rates can vary, and numbers for the new coronavirus are preliminary estimates.

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Source: NY Times

ochealth CARE AGENCY

October 13, 2020

Cumulative Cases to Date (includes deaths)	Daily COVID Positive Cases Received	Cumulative Deaths to Date	Deaths Reported Today
56,070	178	1,341	0
2,337 SNF residents, 569 OC jail inmates, and 165 Persons Experiencing Homelessness		*Includes 486 SNF residents, 104 ALF residents, 0 OC jail inmates, and 4 Persons Experiencing Homelessness*	*0 skilled nursing facility residents, 0 skilled nursing staff, 0 assisted living facility residents, 0 residents (not living in a facility)*

Cumulative Tests To Date	Tests Reported Today	Cases Currently Hospitalized	Cases Currently in ICU
957,839	9,168	160	57
		*Includes ICU cases	*ICU - Intensive Care Units*

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ORANGE COUNTY COVID-19 DASHBOARD

Cumulative Cases
56,070
(Includes Deaths, PCR Positive only)

Cumulative Antigen Positive Cases***
1,703

Daily PCR+ Cases Received
178

Cumulative Deaths
1,341

Daily (New) Deaths Received
0

Cumulative PCR Tests
957,839

Daily PCR Tests Received
9,168

Recovered Cases
50,130
(Estimated)
Updated: 10/13/2020

CURRENT TIER: SUBSTANTIAL (TIER 2)

Daily COVID-19 Positive Cases per 100,000
4.6
(7-Day Average with 7-Day Lag)

Testing Positivity Percent
3.5%
(7-Day Average with 7-Day Lag)

Tier Framework Metrics

County Risk Level*	Daily New Cases (per 100k)** (7-day average w/ 7-day lag)	Positive Tests (7-day average w/ 7-day lag)
WIDESPREAD Tier 1	>7 new daily cases (per 100k)	>8%
SUBSTANTIAL Tier 2	4 - 7 new daily cases (per 100k)	5 - 8%
MODERATE Tier 3	1 - 3.9 new daily cases (per 100k)	2 - 4.9%
MINIMAL Tier 4	<1 new daily cases (per 100k)	<2%

*Counties are assigned a tier based on two metrics: test positivity and case rate. The case rate is adjusted based on testing volume per 100,000 population as described below. Due to variability in data, this adjustment does not apply to small counties (defined as those with a population less than ~100,000 residents)

- For counties with testing volume above the state median, the factor is less than 1, decreasing in a linear manner from 1.0 to 0.6 as testing volume increases from the state median to 2x the state median. The factor remains at 0.6 if the testing volume is greater than 2x the state median.
- For counties with testing volume below the state median, the factor is greater than 1, increasing in a linear manner from 1.0 to 1.4 as testing volume decreases from the state median to zero. However, this adjustment for low testing volume will not be applied to counties with a test positivity < 3.5%.

**Case rate will be determined using cases confirmed by PCR

***HCA is tracking and conducting contact tracing on antigen+ cases.

Figures shown in this tab are reported by California Department of Public Health and will be updated every Tuesday.

Moving through the Tiers

Rules of the framework:

1. CDPH will assess indicators weekly. The first weekly assessment will be released on September 8, 2020.
2. A county will remain in a tier for a minimum of three weeks before being able to advance to a later tier.
3. A county can only move forward one tier at a time, even if metrics qualify for a more advanced tier.
4. If a county's case rate and test positivity measure fall into two different tiers, the county will be assigned to the more restrictive tier.
5. City local health jurisdiction (LHJ) data will be included in overall metrics, and city LHJs will be assigned the same tier as the surrounding county.

Initial step applied on August 28, 2020:

1. Each county is assigned to a tier based on an adjusted case rate and test positivity from the prior two reporting periods. If a county's case rate and test positivity measure fall into two different tiers, the county will be assigned the more restrictive tier.
2. This tier status will be effective on Monday, August 31, 2020.
3. If a county is initially assigned to Purple Tier 1 and has met the criteria for a less restrictive tier the prior week, the county only needs to meet the criteria for a less restrictive tier for one more week to move to the Red Tier 2. (For the September 8, 2020 assignment, a county does not need to remain in the Purple Tier 1 for three weeks. For all subsequent assessments, a county must remain in a tier for three weeks and meet the criteria to advance as described below.)

To advance:

1. A county must have been in the current tier for a minimum of three weeks, except as described in the "Initial step applied on August 28, 2020" section above.
2. A county must meet criteria for the next tier for both measures for the prior two consecutive weeks in order to progress to the next tier.
3. In addition, the state will establish health equity measures on activities such as data collection, testing access, contact tracing, supportive isolation, and outreach that demonstrate a county's ability to address the most impacted communities within a county. Additional measures addressing health outcomes such as case rates, hospitalizations and deaths, will also be developed and tracked for improvement.

To move back:

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CA Tiered Framework

County risk level	New cases	Positive tests
WIDESPREAD Many non-essential indoor business operations are closed	More than 7 daily new cases (per 100k)	More than 8% Positive tests
SUBSTANTIAL Some non-essential indoor business operations are closed	4 - 7 daily new cases (per 100k)	5 - 8% Positive tests
MODERATE Some indoor business operations are open with modifications	1 - 3.9 daily new cases (per 100k)	2 - 4.9% Positive tests
MINIMAL Most indoor business operations are open with modifications	Less than 1 daily new cases (per 100k)	Less than 2% Positive tests

Source: Blueprint for a Safer Economy

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OC health CARE AGENCY

October 13, 2020

Current Hospital Patients

160

(Includes ICU)

Current ICU Patients

57

ICU - Intensive Care Unit

LIMITED HOSPITAL CAPACITY

Percent ICU Beds Currently Available

36%

Percent Ventilators Currently Available

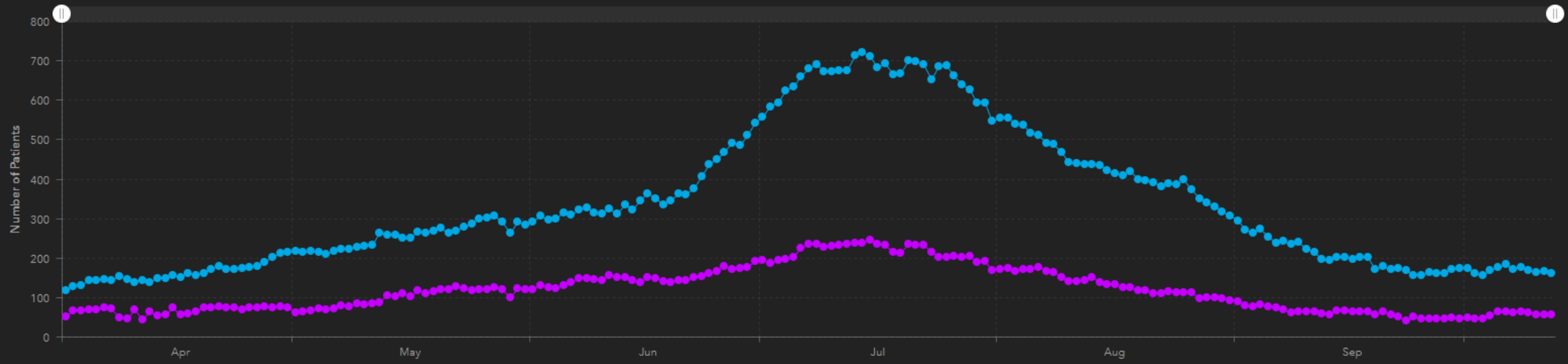
66%

INCREASING HOSPITALIZATION

Change in 3-day Average Hospitalized Patients

-5%

Daily Hospital/ICU Patient Census



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Outpatient Care Strategies

Where Do We See Patients?

- Clinic/Office
- Telehealth
- OEC
- Emergency Department

Clinic/Office

Well Visits

- Essential – making up deficits
- All offices

Sick Visits/Specialty Care

- Telehealth offered 1st
- If office needed can be seen
- Different strategies at different offices

Keeping the Clinic/Office Staff/Patients Safe

- **Mask** - All staff, providers and patients are required to use a mask
- **Outdoor** - Upon arrival to the office/clinic, patients check in from their car and wait there until the exam room is available and they are called in
- **Limit** - Family members are limited to 1 caregiver per patient unless there are extenuating circumstances
- **Disinfect** – wipe down all surfaces after each encounter
- **PPE** – Face shield, gown, gloves, N95 when appropriate

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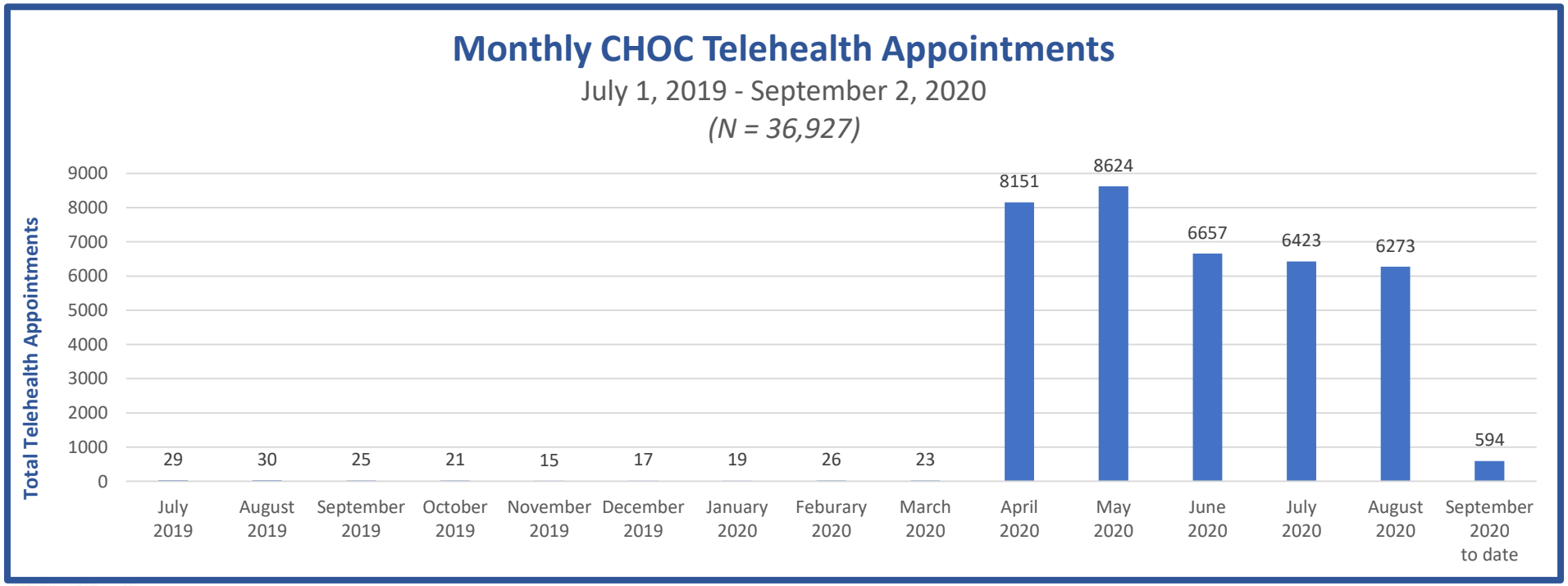
Telehealth: Re-Thinking HOW and WHERE we provide care

Implemented enterprise-wide in March

- Access and convenience
- Expands the reach of current resources
- 600 Telehealth visits per day



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New way of delivering care

Outdoor Evaluation Center (OEC)

- Medical Screening (tests sent to Quest/LabCorp)
- Pre-procedural screening (tests sent to CHOC lab)
- Testing for all scheduled admissions (tests sent to CHOC lab)
- Healthy Smiles partnership times
- UCI partnership for second OEC location

OEC at CHOC Orange Campus

OEC in the Long-Term

- Necessary for at least one more year for pre-procedural testing
- Expecting COVID-19 waves
- Partial Well-Child Visits, influenza vaccines
- Community medical testing resource
  - CHOC Ambulatory will have access to antigen tests
- Timely access to testing will be essential

OEC at UCI Campus

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CHOC Nurse Available 24/7

- Answers COVID-related questions for pediatric patients
- Can refer for a Telehealth appointment
- Coordinates OEC testing for suspect patients
- Manages an average of 46 calls daily as of 9/2/2020

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Diagnosis and Management

COVID-19 and Kids
US experience - Infection

- Children are less likely to suffer from severe illness due to SARS-CoV-2 infection than adults. However, a small percentage will suffer complications and death.
- As of 9/10/20, >500,000 cases have been dx'd in US children
  - Represents 10% of cases (vs. 22% of population)
  - Updates by AAP and CHA
- Asymptomatic infection in children estimated at 16-45% per CDC

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COVID-19 and Kids
US experience - Hospitalization

- Based on a 14 state hospitalization network, almost 600 children <18y were hospitalized between 3/1-7/25/20
- This represents a hospitalization rate of ~8/100,000 pop, vs. 164.5/ 100,000 adults
- Highest risk:
  - Children <2y (24.8/100,00)
  - Hispanic children (16.4/100,000)
  - Black children (10.5/100,000)

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COVID-19 and Kids
US experience - Hospitalization

- 1/3 in ICU (= adults)
- 6% required mechanical ventilation (vs. 19% adults)
- 40% with underlying medical conditions (obesity, CLD)
- In children <2y, prematurity a risk factor

Source: MMWR Aug 14, 2020

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Presentation of COVID-19 in Children and Teens

What we've been seeing at CHOC

- Most symptomatic patients presented with one or more of the following
  - Fever (N=478)
  - Cough (N=330)
  - Headache (N=224)
  - Sore Throat (N=220)
- 71% had a known household positive/sick contact
- **17%** were asymptomatic

Notable Inpatient Comorbidities

- Obesity
- Underlying pulmonary/cardiac conditions
- Oncology patients

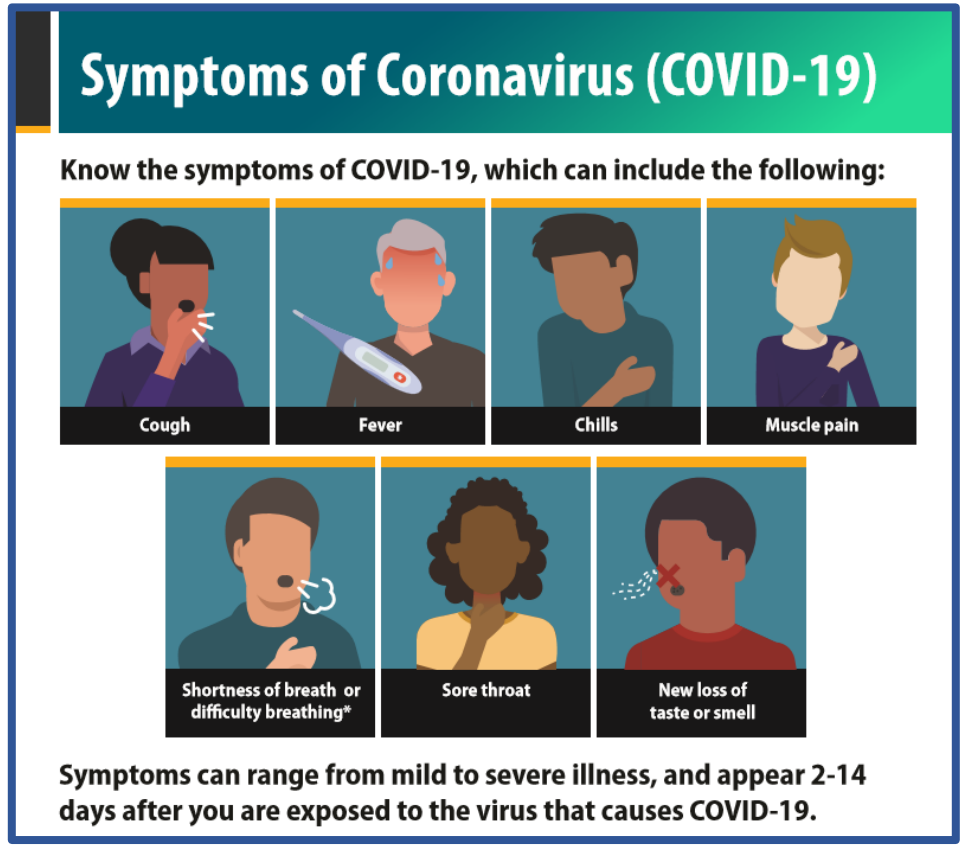

Image Source: CDC

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Positive COVID-19 Patients by Location Tested

*as of **October 13, 2020***

CHOC Orange

Age	Clinic	ED	OECs	Inpatient – ICU	Inpatient – NON ICU	Total
< 12 months	11	61	25	2	21	120
1 – 3 years	18	78	53	2	14	165
4 – 5 years	5	46	33	0	3	87
6 – 10 years	30	77	95	9	9	220
11 – 15 years	49	95	82	14	26	266
16 – 17 years	16	40	43	5	14	118
≥ 18 years	12	76	39	6	8	141
TOTAL	**141**	**473**	**370**	**38**	**95**	**1,117**

CHOC Children's Mission Hospital* = 7 Inpatients

**CHOC network ambulatory/ED patients captured in CHOC Orange data. CCMH ED are not captured.*

CHOC tested a total of **14,605 patients**.

Positivity Rate: 7.6%

Orange County Health Care Agency

as of October 13, 2020

Age	Total Cases Reported
0 – 17 years	4,037
18 – 24 years	8,426
TOTAL	**12,463**

CHOC Children's MIS-C Patients = 19

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COVID-19 Testing is KEY

Patients cannot wait

- Procedures - Nothing is *elective* in pediatric healthcare
- Return to school
- Quarantine restrictions

Testing at CHOC

- Several test modalities available
  - RT-PCR
  - Rapid
  - Antigen
  - Antibody
- Outpatient
  - RTPCR – sent to commercial labs, long TAT
  - Rapid Antigen – POC, 15 min TAT, less sensitive
- Inpatient
  - Currently testing all admissions and pre-procedures
  - PCR only
  - Ensures Associate and Physician safety
  - PPE Stewardship

Photo Credit: WebMD

Photo Credit: USC News

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Mild/Moderate Disease

- Supportive care
- Manage Co-morbidities
  - Asthma
  - Chronic Lung Disease
  - Heart disease
  - GI disease
- Quarantine

Management of COVID Patient in the Hospital / PICU

Available Treatments

- Remdesivir
- Convalescent Sera
- Non-invasive ventilation, positioning, and mechanical ventilation
- Multidisciplinary Team Approach

Treatment Challenges

- Increased risk for blood clots
- Staff needed to maneuver larger patients
- Recovery from being on a ventilator
- Extracorporeal Life Support (ECLS)

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Multisystem Inflammatory Syndrome in Children (MIS-C)

- Previously healthy children positive with COVID-19 presenting with severe inflammatory syndrome with Kawasaki disease-like features
  - Persistent fever
  - Hypotension
  - Multiorgan involvement
  - Elevated inflammatory markers
- Limited information currently available about risk factors, pathogenesis, clinical course, and treatment

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Complications – MIS-C

- From March – July, 2020, there were 570 patients <21y reported to the CDC with MIS-C
- 86% with ≥ 4 organ systems affected:
  - 91% GI
  - 86% Cardiovascular
  - 71% Dermatologic or mucocutaneous
- Common severe complications included:
  - Cardiac dysfunction (40.6%)
  - Shock (35.4%)
  - Myocarditis (22.8%)
  - Coronary artery dilatation or aneurysm (18.6%)
  - AKI (18.4%)
- Disproportionately affected Hispanics (40.5%) and Blacks (33.1%), obese
- 10 died

Source: MMWR Aug 14, 2020

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Complications – MIS-C

- Class 1 (35.6%) – highest # of involved organ systems
  - Almost ½ had ≥ 6 organ systems affected
  - 100% with CV and 97.5% with GI involvement
- Class 2 (29.6%) – resp involvement (76.3%) with symptoms of acute COVID as well
  - Highest case fatality rate
- Class 3 (34.7%) – highest occurrence of rash (62.6%) and mucocutaneous lesions (44.9%)
  - Younger age, aligned more with KD
  - Fewer underlying conditions, systems involved, complications, markers of inflammation, and less cardiac damage

Source: MMWR Aug 14, 2020

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MMWR Sept 15, 2020
"SARS-CoV-2 Associated Deaths Among Persons <21y – US, Feb 12-July31, 2020"

- During this time period, there were a total of 391, 814 cases of COVID-19 and MIS-C, representing 8% of cases (vs. 21% of the population).
- 121 deaths reported:
  - 10% were infants
  - 70% were 10-20y (esp 18-20y)
  - 78% were Hispanic, Black, and Native Americans (vs. 41% of US pop)
  - 75% had an underlying medical condition
  - 33% deaths occurred outside of a hospital

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CHOC Experience – MIS-C

- Diagnosis is challenging, with overlap with many other clinical entities
- Management is challenging
- 19 cases reported to OCHCA

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Future Considerations

Update topics:

- Flu vaccine
- Routine Vaccines
- COVID-19 vaccine updates

Winter 2020

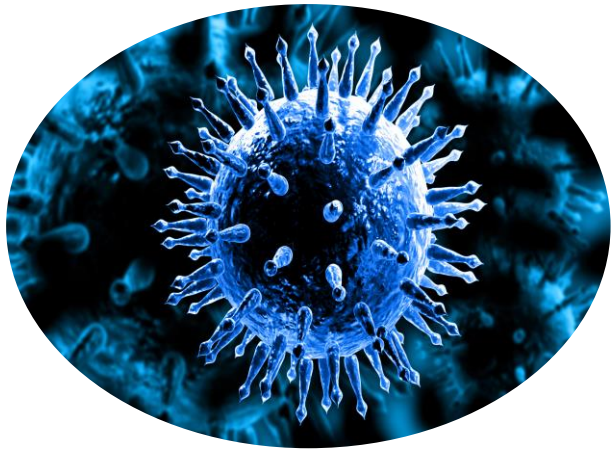
We don’t know if COVID-19 is seasonal

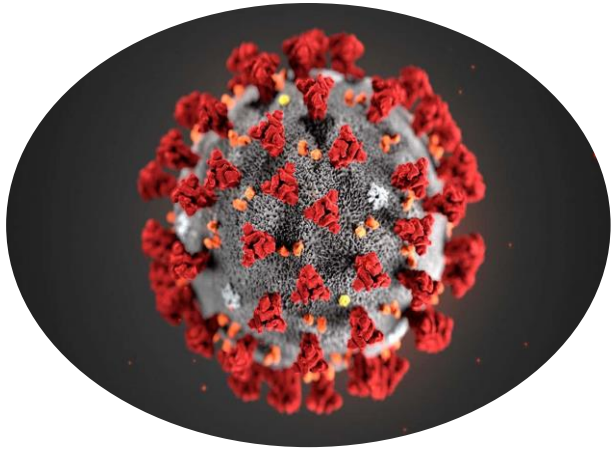
Seroprevalence studies suggest most of the U.S. population is still susceptible

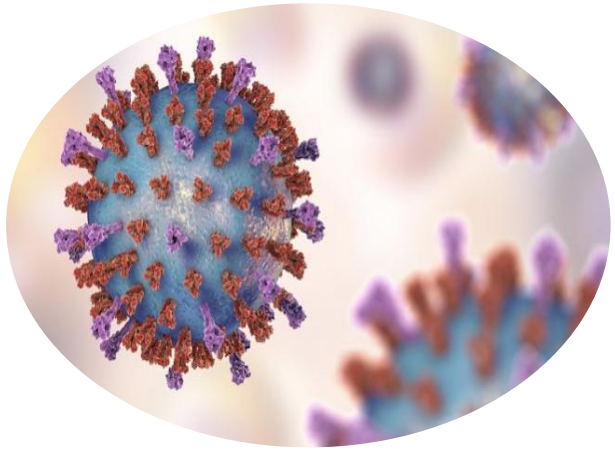
- Anticipating subsequent waves of COVID-19

Winter viruses (Influenza and RSV in pediatrics) could coincide with COVID-19

- Will use many of the same resources including ED beds, ICU beds, ventilators
- Symptoms overlap so more testing will be needed
- **High flu immunization rate will be crucial!**
  - **Vaccines will be available @ CHOC starting 9/8**







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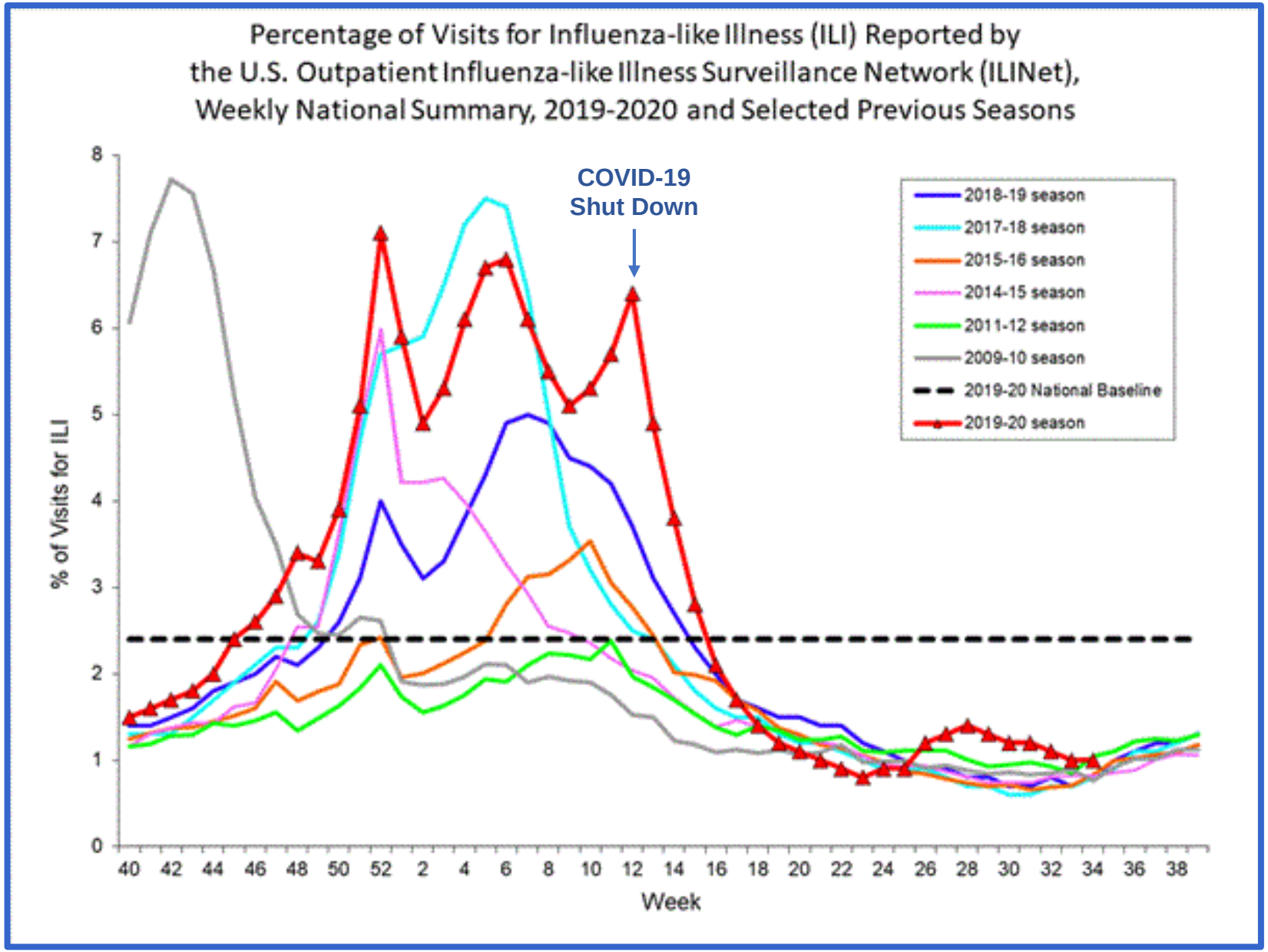

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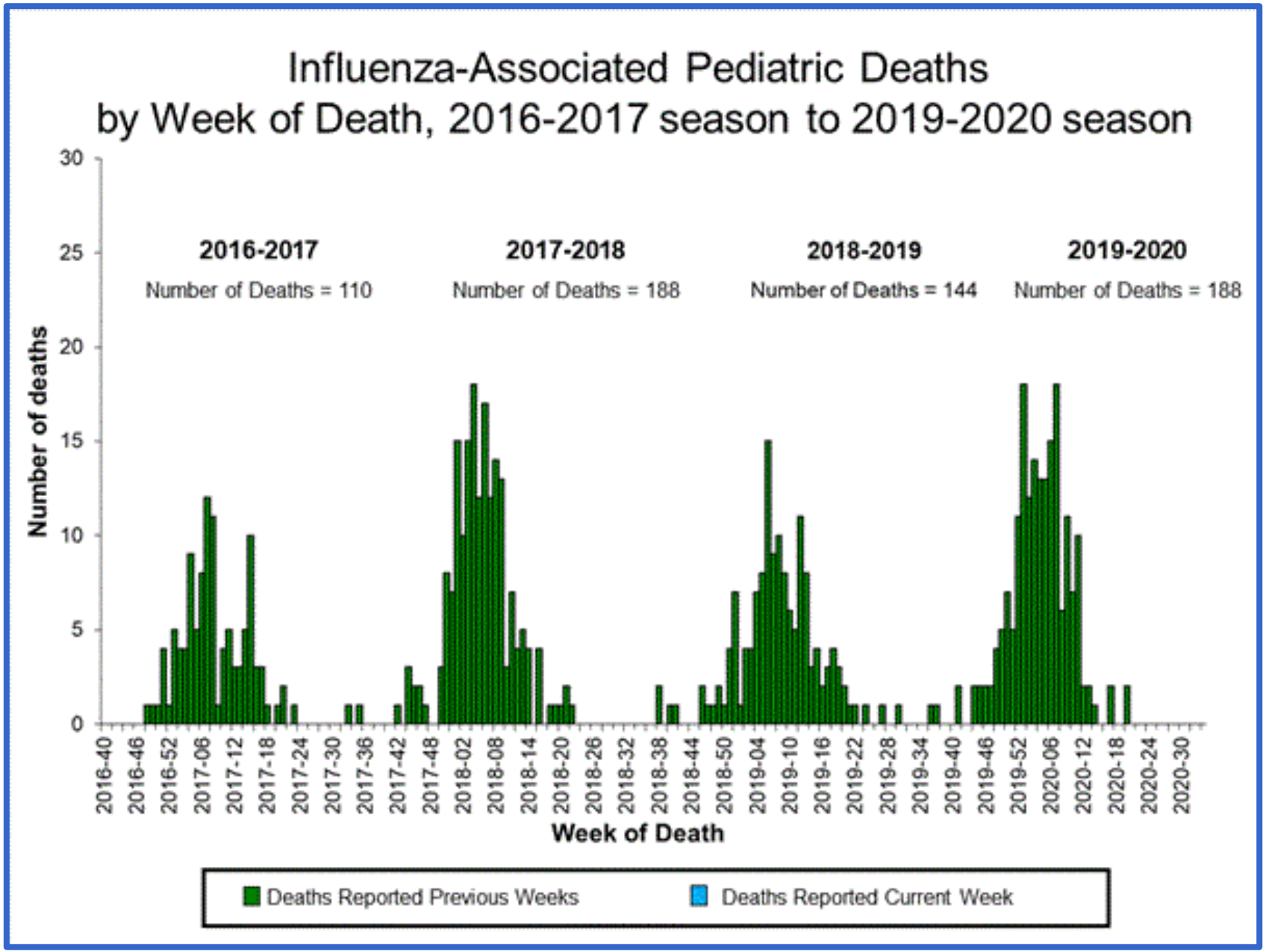
Source: CDC FluView



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Source: CDC FluView

Flu Vaccine

- OC Health Officer's Orders – Sept 8, 2020
- #7 – "Seasonal Flu Vaccination for Certain County Residents and Visitors. All county residents and visitors who are providers for congregate settings, health care providers, or emergency responders in Orange County shall obtain the seasonal flu vaccination unless a medical or religious exemption applies."
- CHOC deadline is Nov 1. Flu shots available throughout the hospital as well as at the Irvine OEC for associates and staff.
- Vaccine also available for all patients and family for inpatients < 6mo and for Specialty Clinic patients through a grant

Must Fill the Vaccination Gap in California

Source: California Immunization Coalition

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Vaccine Development

- Preclinical trials – Usually in animals, looking for an immune response.
- Phase 1 Safety Trials
  - Small # of human volunteers to test safety and dosage, confirm immunogenicity
- Phase 2 Expanded Trials
  - Hundreds of people, usually split into groups (children, elderly, etc.) to ascertain if there are differences in response. Further tests of safety and immunogenicity

Vaccine Development

- Phase 3 Efficacy Trials
  - 1000s-10,000s of individuals who receive vaccine vs. placebo to see what % of each group becomes infected.
  - FDA has said that a vaccine would have to be at least 50% effective.
  - These trials are large enough to detect less common side effects.
  - Regulators in each country review results and consider approval.
  - During a pandemic, there is the possibility of EUA without formal approval.
  - Post marketing surveillance for more rare side effects.

Vaccines in Development
Genetic Vaccines

- DNA
  - Zydus Cadila in India in phase 2
  - Takara in Japan in phase 1
  - Inovio in US in phase 1
- RNA
  - Moderna – mRNA vaccine in phase 3 (30,000)
  - Pfizer – mRNA vaccine in phase 3 (expanded to 43,000). Hope to manufacture 1.3 billion doses worldwide

Vaccines in Development
Viral Vector Vaccines

- Adenovirus vectors
  - CanSino in China completed phase 2 of Ad5 and approved prior to phase 3.
  - Gameleya Research Institute in Russia Ad5 and Ad26
  - AstraZeneca and U of Oxford – based on a chimpanzee adenovirus ChAdOx1. Phase 3 halted 9/6 due to pt with TM, restarted 9/12 in UK.
  - J&J starting phase 3 with Ad26

Vaccines in Development
Protein based Vaccines

- Many have adjuvants
- Some are nanoparticle delivery systems
- Some are genetically engineered proteins

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Vaccines in Development
Inactivated or Attenuated Vaccines

- Inactivated vaccines
- Attenuated vaccines
- Repurposed vaccines – e.g., BCG

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Complex Landscape for COVID vaccine

- Overcoming Vaccine hesitancy
- Communication and education
- Need for socially distant vaccination venues
- # of doses (1 or 2)
- Products not interchangeable
- Varying cold chain requirements
- Vaccine efficacy and adverse event profile in different pops
- Use in children and pregnant women

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The New York Times

The Morning

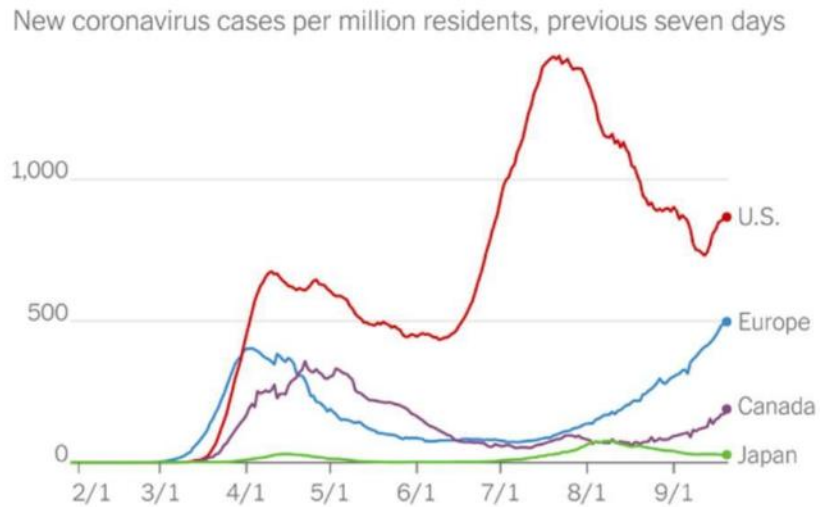
September 22, 2020

By David Leonhardt

Good morning. Republicans say they will fill Ginsburg's seat soon. A Mueller aide has regrets. And coronavirus cases are rising again in the U.S.

The fall surge is here

A coronavirus testing site in Bismark, N.D., this month. Tom Stromme/The Bismarck Tribune, via Associated Press



Europe includes all countries that do not stretch into another continent, regardless of E.U. status.

By The New York Times | Sources: Johns Hopkins University, World Bank

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Non-Pharmaceutical Interventions Make a Difference

Source: University of Washington via covid19.healthdata.org

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PRACTICE INFORMATION

CHOC Children's – Infectious Disease

Specialty Care Clinic

1201 W. La Veta Ave.

Orange, CA 92868

Phone: 888-770-2462

Fax: 855-246-2329

Physicians available via telehealth


THANK YOU