

Update: October 2, 2020

COVID-19 DIGEST

From the Cross-Campus Infectious Diseases COVID-19 Task Force

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EPIDEMIOLOGY

LOCAL

[California](#) now reports **822,779 confirmed COVID-19 cases** and **15,993 deaths**. The [positive test rate statewide](#) continues to decrease and was 2.8% over the last week. As of October 2, **11,360 positive cases** and **107 deaths** have been reported in [San Francisco](#). Both new cases and test positivity have been steadily declining since mid-August: over the last 7 days an average of 51 new cases were diagnosed per day and the positive test rate was 1.8%. On Tuesday, San Francisco became the first Bay Area county to enter the [Orange Tier](#) ('Moderate Risk') in the State's re-opening framework and the Mayor's office [announced](#) that indoor dining and places of worship could re-open at 25% capacity and public outdoor playgrounds are slated to open on October 14. California announced a [Health Equity](#) metric, which requires the test positivity rate in the county's lowest quartile census tract meet specified thresholds for each tier of risk under the Blueprint for a Safer Economy Framework and submit a plan for targeted investments in disproportionately impacted communities.

NATIONAL

The [United States](#) currently reports over **7.3 million cases** of COVID-19 diagnosed and more than **208,500 deaths**. Both [testing and daily reported cases](#) have been increasing through the second half of September prompting concern for a '3rd wave' of infections, with the [Midwest](#) seeing the sharpest increase and the highest rate of new infections. New York City, the first U.S. hotspot saw a [slight uptick in test positivity](#) this week, with a positive test rate of 3.25% on Monday, the highest rate since June. The city is responding by partnering with community organizations in zip codes with recent increases in cases and test positivity to increase mask wearing, access to testing, and social distancing. In Florida, one of the most significant summer hot spots, the governor signed an [executive order](#) allowing bars and restaurants to operate at full capacity without restrictions.

GLOBAL

The world passed the grim milestone of **1 million deaths** this week and there are currently over **34.4 million** reported cases of COVID-19 [globally](#). India recorded the most COVID-19 cases in the world in the month of September and is second only to the United States in total number of reported cases. In an analysis of [surveillance and contact tracing data](#) from the states of Tamil Nadu and Andhra Pradesh which included 84,965 confirmed cases and 575,071 of their contacts with COVID-19 testing results available estimated secondary attack rates of ranging from 1.2% in health care settings, 2.6% in the community, and 9% within households. The estimated secondary attack rate was the highest between index-contact pairs of the same age across all age groups, and adults age 20-44 had the highest percentage of contacts who tested positive.

UP TO THE MINUTE DISPATCHES

Has there been confirmed SARS-CoV-2 transmission associated with airplane travel?

The safety of air travel is on the mind of many. Two recent studies examine episodes of SARS-CoV-2 transmission during air travel in predominately unmasked passengers and flight attendants early in the pandemic. The first [report](#), describes

SARS-CoV-2 transmission from two passengers travelling from Boston to Hong Kong (HK) to two flight attendants (FAs) from March 2020. The FAs had attended to the passengers in first class for 15 hours. The passengers both developed symptoms in HK on March 10, 2020, and the FAs developed symptoms 6-8 days later. Genotyping of virus from all infected strongly supported in-flight transmission. The second [report](#) describes transmission on a domestic Australian flight where 11 patients with confirmed SARS-CoV-2 infection likely transmitted virus to another 11 passengers. Among secondary cases, 8 passengers were seated within 2 rows of infectious passengers, 2 possibly flight-associated cases were seated 3 rows away, and 1 flight-associated case was seated 6 rows away. Seven (64%) secondary cases were among persons who had window seats. **Conclusion:** SARS-CoV-2 can be transmitted on planes, even in “first class” conditions when masks are not being worn. Longer flights and those where eating or drinking interrupts mask wearing are all risk factors for SARS-CoV-2 transmission, and anyone choosing air travel will need to weigh these risks. Fortunately, many airlines are supporting strict mitigation measures.

Age-related differences in immune response may impact differences in clinical manifestations

Studies have shown that increasing age is an important risk factor for more severe COVID-19 with children in particular having mild disease. However, the mechanism for these differences is unknown. Two recent studies increase our understanding of varied immunologic responses to SARS-CoV-2 infection that may explain why disease outcomes vary by age. One [study](#) compared cellular and humoral immune responses between adults (n=60) and children/youth (<24 years, n=65) including 21 cases of Multisystem Inflammatory Syndrome in Children (MIS-C). They found that adults had a more robust adaptive immune response (T cell and neutralizing antibody responses) while children had more robust innate immune response (higher levels of IL-17A and IFN γ early in infection). They hypothesized that this difference in response type may contribute to the milder disease course in children. A second [study](#) sought to evaluate different elements of the adaptive immune response in relation to disease severity in a group of 54 adults. A coordinated adaptive immune response with SARS-CoV-2 antigen-specific CD4+ T cell, CD8+ T cell, and antibody responses was associated with a milder disease course, and this coordination was much more often disrupted in individuals > 65 years old. **Conclusion:** These studies shed light on the age-related differences in the immune response to SARS-CoV-2 infection and suggest that a robust innate immune response in children may protect against severe disease while a disrupted adaptive immune response in older adults may lead to more severe disease. These age-related differences may have implications in treatment strategies and potential vaccine efficacy amongst different age groups.

Interfering with interferons may lead to severe COVID-19 disease

Type I interferons are an essential part of the human antiviral defense system. Recent studies have revealed that (1) in-born errors in genes known to regulate type I interferon production and (2) auto-antibodies to type I interferon/interferon receptor were more common in patients with severe COVID-19 disease than in those with mild or asymptomatic disease or in healthy controls. In the first [study](#), among 659 patients with life-threatening COVID-19, 23 (3.5%) patients were found to have loss of function mutations associated with type 1 interferon. None of these patients had reported other severe viral infections. In the second [study](#), among 987 patients with life-threatening COVID-19, 101 (10%) had evidence of auto-antibodies against the interferon pathway. No auto-antibodies were found among 663 patients with mild or asymptomatic infection. **Conclusion:** Together, these studies highlight the crucial role of type I interferons in protective immunity against COVID-19 and may provide an explanation as to why some individuals are predisposed to severe disease. These studies are an entry point into new and exciting laboratory and clinical studies with potential to improve understanding and treatment of SARS-CoV-2 and other viruses.

Death in Patients < 21 years from COVID-19 in the United States

Although COVID-19 is a less severe disease in children when compared to adults, COVID-19-associated death can occur in children. A [recent study](#) analyzed the COVID-19-associated deaths among persons <21 years in the United States. Between February 12–July 31, 2020, 391,814 cases of COVID-19 and Multisystem Inflammatory Syndrome (MIS-C) and 121 deaths were identified among persons aged <21 years using case-based surveillance. Of the 121 deaths, 47% occurred in females and 70% occurred in those 10-20 years (10% were in infants <1 year, 20% were in children 1-9 years); persons 18-20 years accounted for over 40% of the deaths. African Americans and LatinX accounted for nearly 75% of deaths (LatinX 45%, African American 29%). A minority of these deaths were attributed to MIS-C (12%) and

majority of persons (75%) had at least one underlying medical condition and 45% had two or more medical conditions. Most frequently medical conditions were asthma (28%), obesity (27%), neurologic and developmental conditions (22%), cardiovascular conditions (18%), and cancer or immunosuppressive conditions (14%). Overall, 65% of deaths occurred after hospital admission and for those patients with a known illness onset date, the median time from onset of illness to death was 11 days. **Conclusion:** SARS-CoV-2 can be associated with mortality in persons <21 years and is most prevalent among those 10-20 years, with at least one underlying medical condition, and identify as LatinX and/or African American.

FAQ

1. Is lung transplantation a viable treatment for patients with severe COVID?

Lung transplantation has been offered as a life-saving therapy for some patients with acute respiratory distress syndrome (ARDS) due to COVID-19. The first reports came out of China, including a [case series](#) of two patients aged 66 and 70 years and [another report](#) of three men aged 58 to 73 years. All five Chinese patients had ARDS from COVID-19 requiring ECMO, and negative SARS-CoV-2 PCR testing prior to transplant. Among these five cases—three survived, one patient experienced early acute rejection, and one experienced intra-operative cardiac arrest. Since then, an [additional report](#) from Austria has documented successful lung transplant for a patient with COVID-19 ARDS where SARS-CoV-2 culture was negative but PCR remained positive at high cycle threshold values both before and after transplant. In the United States, successful lung transplant for COVID-19 has been performed in [Chicago, IL](#), [Gainesville, FL](#) and [Houston, TX](#). **Conclusion:** Lung transplantation for COVID-19 may be a viable treatment with acceptable outcomes in select cases. However, careful selection of candidates is crucial (e.g. confirm no replicating virus and isolated pulmonary failure) and systematic data collection will be needed to understand long term outcomes.

2. How are birth outcomes impacted by COVID-19 in pregnant women?

[Prior studies](#) have suggested that pregnant women with COVID-19 are more likely to be hospitalized and are at higher risk of ICU admission than non-pregnant women of reproductive age. However, information regarding birth outcomes has been limited. A recently published [MMWR report](#) on pregnancy outcomes (as part of the Vaccine Safety data link surveillance program) found that pre-term delivery occurred in 15%, which is higher than the rate in the general population, and a rate of stillbirths of 3%. A larger [cohort study](#) in the MMWR of pregnancies completed during COVID-19 associated hospitalizations reported a pregnancy loss rate of 2.2% and a preterm delivery rate of 12.6%, with a higher rate of pre-term delivery observed in symptomatic patients (23.1%). One additional [observational study](#) conducted in New York hospitals found that disease severity was associated with higher rates of cesarian section surgery and preterm birth. **Conclusion:** Pregnant women with COVID-19, may be at increased risk of adverse pregnancy outcomes.

3. What is the updated understanding about how COVID-19 impacts the heart in young adults?

Prior studies have reported cardiac injury in patients with severe COVID-19. However, [a recent study](#) reported findings of cardiac MRI (CMR) in 26 college athletes with mild or asymptomatic COVID-19, performed 11-53 days after diagnosis. Four athletes (15%, all male) had CMR findings of myocardial edema and injury, fulfilling criteria for myocarditis per the [Lake Louise Criteria](#). An additional 8 athletes (31%, 7/8 male) had late gadolinium enhancement, a non-specific finding suggestive of prior myocardial injury. Troponin I was not elevated in any subjects. [Similar findings](#) have been described in [adults](#) who received CMR during recovery from COVID-19, with abnormal CMR findings seen in 58-78% of patients. Further, [in a recent study](#) evaluating Multisystem Inflammatory Syndrome in children (MIC-S) and adolescents with COVID-19, 80% had cardiovascular involvement. **Conclusion:** While the exact incidence is unknown, SARS-CoV-2 may cause myocardial injury and associated myocarditis in patients with both severe and more mild disease, including in young adults. The clinical implications of these findings are unknown but long-term effects on myocardial function as well as cardiac arrhythmias are not known and require further study.

Protecting frontline workers from COVID-19

An interview with UCSF Health & ZSFG leaders in Occupational Health



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1. What are the core components of your strategy to protect employees and patients during the COVID-19 epidemic?

The core components of our strategy to protect employees and patients during the epidemic included: (1) daily screening of all on-site employees, students, visitors and patients for symptoms and exposures to COVID-19, (2) a COVID-19 Hotline for employees and patients to get medical advice, rapid turnaround testing and clinical evaluation, (3) testing all symptomatic employees, as well as asymptomatic employees with significant exposures to COVID-19 as part of contact tracing, (4) an automated return to work clearance for employees, (5) pre-procedural testing of all patients, (6) baseline asymptomatic testing of employees and students who are new/returning to campus, and screening of a random sample of employees to detect early outbreaks and guide targeted mass testing, and (7) a robust contact tracing team with rapid identification, quarantine and testing of appropriate persons.

2. Early on, technology was used for employee screening. Can you describe that tool and how it was developed and how it has evolved during the pandemic?

At UCSF Health, we partnered with [Conversa Health](#) and the [UCSF Center for Digital Health Innovation](#) to design a mobile web-app to administer the daily health screening questions each morning and avoid the lines for the manual screener. It has evolved to support daily symptom monitoring reminders, as well as the addition of new questions to target gaps in screening that have been identified over time

At ZSFG we utilized Microsoft Forms to create the online screening form questionnaire, and Power Automate to create some basic backend workflows. We also partnered with the in-person screening team to ensure that employees were being appropriately referred to OHS for evaluation.

3. What has been the biggest success and challenge for occupational health during the pandemic?

At UCSF Health, our biggest successes has been the creation of the (1) COVID Occupational Health Coronavirus Hotline with sufficient staffing to allow short wait times; (2) quick turnaround COVID testing time with a mobile testing unit; (3) a robust contact tracing team; (4) occupational and clinical

health support of employees who test positive; (5) development of a likelihood model for case classifications; (6) data analytics and tracking all resulting in an overall effective reproductive number for UCSF Health transmission of < 0.10. Our biggest challenges have been (1) being able to automate contact tracing data (software) and exposure notification and (2) ensuring staffing to address surge volumes

At ZSFG, our biggest success is that there has not been an outbreak of COVID-19 cases among employees at ZSFG, nor transmission of COVID-19 among ZSFG staff. The biggest challenge has been ongoing staffing shortages and frequency of staff turnover, resulting in some program inefficiencies.

4. How many employees have been diagnosed with COVID-19 and how many were likely acquired through patient care?

Through September 2020, ZSFG and UCSF Health have diagnosed 92 and 232 employees with COVID, respectively. At both sites, about 70-80% have a likely community/household source, and 20-30% are likely occupationally acquired from all sources (patient care, coworker, and work travel early in the pandemic).

5. How do you envision your program evolving in the coming months?

At UCSF Health, our next steps will be to integrate influenza testing, incorporate an exposure notification program, expand random employee testing, and strategies to increase research density

At ZSFG, in the coming months the ZSFG Employee COVID-19 Program is working on further improving our existing workflows, planning for how influenza may impact COVID-19 related evaluations and return to work guidance, and strategizing how COVID-19 vaccination may be implemented once available.

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UCSF Hospital Epidemiology and Infection Prevention COVID-19 webpage:

<https://infectioncontrol.ucsfmedicalcenter.org/ucsf-health-covid-19-resources>

San Francisco DPH link: <https://www.sfcdcp.org/infectious-diseases-a-to-z/coronavirus-2019-novel-coronavirus>

*Previous digests can be found: hivdgm.ucsf.edu/covid-19
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