

# References | Rethinking Schools

Marin County Public Health Guided Return to Site-Based Classroom Instruction

Research about SARS-CoV-2 and COVID-19 is emerging and evolving rapidly. Marin County Public Health recommends residents gather and review information from trusted research sources.

*Updated: February 2, 2021*

Newly added references highlighted

## Trusted Resources

Centers for Disease Control and Prevention (CDC).

<https://www.coronavirus.gov/>

<https://www.cdc.gov/coronavirus/2019-ncov/more/science-and-research.html>

CDC Morbidity and Mortality Weekly Report.

[https://www.cdc.gov/mmwr/Novel\\_Coronavirus\\_Reports.html](https://www.cdc.gov/mmwr/Novel_Coronavirus_Reports.html)

California Department of Public Health - COVID-19 Literature Review Digest Team

<https://www.notion.so/Collaborative-COVID-19-Literature-Review-Synopses-CoCOLRS-Database-63a4bf37bc8b4b9ca206fa7b3905628d>

CDPH. Evidence Summary: TK-6 Schools and COVID-19 Transmission

<https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/COVID-19/Safe-Schools-for-All-Plan-Science.aspx>

Johns Hopkins Center for Health Security <https://www.centerforhealthsecurity.org/>

LitCovid: Comprehensive curated literature collection regarding the 2019 novel Coronavirus

<https://www.ncbi.nlm.nih.gov/research/coronavirus/>

National Institutes of Health <https://www.nih.gov/coronavirus>

PubMed <https://pubmed.ncbi.nlm.nih.gov/?term=covid-19>

PubMed Central (PMC) <https://www.ncbi.nlm.nih.gov/pmc/about/covid-19>

World Health Organization. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>

Evidence from the opinion of authorities and/or reports of expert committees.

[UCSF health professionals call for February 1st school reopening – 1/11/2021](#)

## Topics

### Asymptomatic Carriers

Wellinghausen N, et al. J Clin Virol. 2020 Sep; Access at <https://pubmed.ncbi.nlm.nih.gov/32707511/>

Gao M, et al. A study on infectivity of asymptomatic SARS-CoV-2 carriers. Respir Med. 2020 Aug; Access at <https://pubmed.ncbi.nlm.nih.gov/32513410/>

### Children, Youth, and Schools

*In epidemiological studies globally and nationally, the evidence suggests that children seem to get COVID-19 less frequently than adults. Given the limited evidence of school closure effectiveness in containing the pandemic and the consequences for young people, reopening schools with appropriate measures is essential.*

#### [COVID-19 Cases and Transmission in 17 K–12 Schools — Wood County, Wisconsin, August 31–November 29, 2020](#) — 1/29/21

The case rate in schools was lower than at the county-level with only 3,453 cases per 100,000 compared to 5,466 cases per 100,000. Case investigators identified that 7 of the student-identified cases (3.7%) and none of the cases among staff were likely to be linked to in-school transmission.

#### [COVID-19 Trends Among Persons Aged 0–24 Years — United States, March 1–December 12, 2020](#) — 1/22/21

In general, trends in incidence and percentage of positive test results among preschool-aged children (0–4 years) and school-aged children and adolescents (5–17 years) paralleled those among adults throughout the summer and fall, including during the months that some schools were reopening or open for in-person education. The data suggest that K-12 school re-openings are not associated with increased transmission.

#### [Factors Associated with Positive SARS-CoV-2 Test Results in Outpatient Health Facilities and Emergency Departments Among Children and Adolescents Aged <18 Years — Mississippi, September–November 2020](#) — 12/18/20

Among 357 children and adolescents under 18 years old living in Mississippi, close contact with persons with COVID-19, gatherings with persons outside the household, and lack of consistent mask use in school were associated with SARS-CoV-2 infection, whereas attending school or childcare was not associated with positive SARS-CoV-2 test results.

#### [Reopening Schools and the Dynamics of SARS-CoV-2 Infections in Israel: A Nationwide Study](#) — 1/18/21

Positivity rates 21-27 days following school reopening was three times higher among adults 20 years or older. This trend was not consistent with children less than 20 years old. An increase in hospitalizations or deaths was not observed following reopening schools. The authors suggest that easing social gathering restrictions, rather than school reopening, was the major contributor to transmission.

#### [Incidence and Secondary Transmission of SARS-CoV-2 Infections in Schools](#) — 1/6/21

In the first 9 weeks of in-person instruction in North Carolina schools, there was extremely limited within-school secondary transmission of SARS-CoV-2, determined by contact tracing.

#### [The Effects of School Reopenings on COVID-19 Hospitalizations](#) - 1/4/21

The authors found that school reopening reduced SARS-CoV2 transmission. The authors explain that the drop is possible because schools instituted strict protocols that quarantine students who tested positive.

This threat, combined with strong messages sent to encourage safe behaviors, may have led students to be more careful in social distancing outside of school, leading to the net drop in transmissions. Also, we have to consider the counterfactual of what students would have been doing in the absence of going to school in-person. In-person schooling, under supervision of safety-trained educators, might replace unsupervised, unsafe group activities outside of school.

#### [Systematic review of reviews of symptoms and signs of COVID-19 in children and adolescents](#) – 12/17/20

Fever and cough are the predominant symptoms of COVID-19 in CYP, supporting their use in case definitions of potential COVID-19 in this age group. Rhinorrhea and sore throat are infrequent in COVID-19 in CYP, which, given the frequency of URI and associated symptoms in young children, suggests that their presence is much more likely to indicate infection with viruses other than SARS-CoV-2.

#### [Prevalence, clinical characteristics, and outcomes of pediatric COVID-19: A systematic review and meta-analysis](#) – 12/8/20

COVID-19 is prevalent across all pediatric age-groups and presents with varying degree of symptomatology. However, children have a milder course of the disease with extremely favorable prognosis.

#### [SARS-CoV-2 infection and transmission in educational settings: a prospective, cross-sectional analysis of infection clusters and outbreaks in England](#) – 12/8/20

SARS-CoV-2 infections and outbreaks were uncommon in educational settings during the summer half-term in England. The strong association with regional COVID-19 incidence emphasizes the importance of controlling community transmission to protect educational settings. Interventions should focus on reducing transmission in and among staff.

#### [Epidemiology of COVID-19 infection in young children under five years: A systematic review and meta-analysis](#) – 12/5/2021

This systematic review shows that young children aged less than five years generally develop mild COVID-19 disease and these infections are often acquired through community sources.

#### [Transmission of SARS-CoV-2 in Australian educational settings: a prospective cohort study](#) – 12/4/20

SARS-CoV-2 transmission rates were low in NSW educational settings during the first COVID-19 epidemic wave, consistent with mild infrequent disease in the 1.8 million child population. With effective case-contact testing and epidemic management strategies and associated small numbers of attendances while infected, children and teachers did not contribute significantly to COVID-19 transmission via attendance in educational settings.

#### [A meta-analysis on the role of children in SARS-CoV-2 in household transmission 2 clusters](#) – 12/4/20

In household transmission clusters of SARS-CoV-2 children are unlikely 33 to be the index case. Children are also less likely than adults to be infected with SARS-CoV-2 34 from a family member.

#### [Reopening Schools during the COVID-19 Pandemic: Overview and Rapid Systematic Review of Guidelines and Recommendations on Preventive Measures and the Management of Cases](#) – 11/25/20

This study describes and compares the main measures of the prevention and management of symptomatic or positive persons planned and implemented for the new academic year within the WHO European. It provides a rapid systematic review of guidelines and recommendations.

[On the Effect of Age on the Transmission of SARS-CoV-2 in Households, Schools, and the Community](#) — 10/29/20

The authors concluded that opening secondary/high schools is likely to contribute to the spread of SARS-CoV-2. The authors conclude that school reopening requires both lower levels of community transmission and greater safeguards to reduce transmission.

CDC. [Adolescent with COVID-19 as the Source of an Outbreak at a 3-Week Family Gathering — Four States, June–July 2020](#) — 10/9/20

CDC. [COVID-19 Trends Among School-Aged Children — United States, March 1–September 19, 2020](#) — 10/2/20

Viner RM, et al. Susceptibility to SARS-CoV-2 Infection Among Children and Adolescents Compared With Adults: A Systematic Review and Meta-analysis. *JAMA Pediatr.* 2020 Sep 25. Access at <https://jamanetwork.com/journals/jamapediatrics/fullarticle/2771181>

CDC. [Transmission Dynamics of COVID-19 Outbreaks Associated with Child Care Facilities — Salt Lake City, Utah, April–July 2020](#) — 9/18/20

[Limited Secondary Transmission of SARS-CoV-2 in Child Care Programs — Rhode Island, June 1–July 31, 2020](#) — 8/28/20

CDC. [Hospitalization Rates and Characteristics of Children Aged <18 Years Hospitalized with Laboratory-Confirmed COVID-19 — COVID-NET, 14 States, March 1–July 25, 2020](#) — 8/14/20

CDC. [COVID-19–Associated Multisystem Inflammatory Syndrome in Children — United States, March–July 2020](#) — 8/14/20

Li X, et al. The role of children in transmission of SARS-CoV-2: A rapid review. *J Glob Health.* 2020 Jun;10(1):011101. Access at <http://jogh.org/documents/issue202001/jogh-10-011101.pdf>

Viner RM, et al. School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review. *Lancet Child Adolesc Health.* 2020 May;4(5):397-404. Access at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7270629/>

## Face Covering

*As universal masking becomes more widespread, it is important to inform the public about which types of face coverings are most effective for use as source control.*

[Face masks to prevent transmission of COVID-19: A systematic review and meta-analysis](#) — 12/19/20

This systematic review and meta-analysis evaluated the effectiveness of the use of masks to prevent SARS-CoV-2 transmission. This study demonstrated the protective effects of masks against COVID-19 infection on HCWs and other populations.

[Low-cost measurement of face mask efficacy for filtering expelled droplets during speech](#) — 9/2/20

This highly publicized “proof of principle” study used an optical measurement method to evaluate droplet emission through commonly worn face coverings. N95 respirators were most effective in

preventing droplet emission, followed by surgical masks. Bandanas and fleece “gaiters” were least effective.

#### [Visualizing droplet dispersal for face shields and masks with exhalation valves](#) — 9/1/20

This study used qualitative visualization to examine the performance of a face shield and an N95 respirator with an exhalation valve in preventing the spread of a simulated cough/sneeze. They found that a large number of aerosols moved around the visor of the face shield and passed through the exhaust valve of the respirator. They conclude that plain face coverings may be more effective than face shields or masks/respirators with exhalation valves when the wearer is coughing or sneezing.

#### [Effectiveness of Cloth Masks for Protection Against Severe Acute Respiratory Syndrome Coronavirus 2](#) — 7/22/20

This online report summarizes the history and current use of cloth masks to decrease the transmission of infectious diseases, with a focus on COVID-19. The authors conclude that the filtration efficiency of cloth masks is inferior to N95s and surgical masks, but recognize that cloth masks can be made more effective by decreasing gaps, increasing layers, and choosing optimal fabric combinations.

#### [Aerosol Filtration Efficiency of Common Fabrics Used in Respiratory Cloth Masks](#) — 4/24/20

The authors measured the filtration efficiencies of various fabric types and combinations for aerosols ranging in size from ~10 nm to ~6 µm. Key findings were that combining fabric types to form hybrid masks provided broad filtration coverage across all aerosol sizes, and gaps between the mask and face can degrade filtration efficiency by 60% or more.

### Fomites

*Despite consistent evidence as to SARS-CoV-2 contamination of surfaces and the survival of the virus on certain surfaces, there are no specific reports which have directly demonstrated fomite transmission. People who come into contact with potentially infectious surfaces often also have close contact with the infectious person, making it difficult to distinguish respiratory droplet from fomite transmission.*

#### [Low risk of SARS-CoV-2 transmission by fomites in real-life conditions](#) — 9/9/20

Findings suggest that environmental contamination leading to SARS-CoV-2 transmission is unlikely to occur in real-life conditions, provided that standard cleaning procedures and precautions are enforced.

#### [Exaggerated risk of transmission of COVID-19 by fomites](#) — 7/3/20

The chance of transmission through inanimate surfaces is very small, and only in instances where an infected person coughs or sneezes on the surface, and someone else touches that surface soon after the cough or sneeze (within 1–2 h).

### Household Transmission

*Household transmission of SARS-CoV-2 is common and occurs early after illness onset. Persons should self-isolate immediately at the onset of COVID-like symptoms, at the time of testing as a result of a high-risk exposure, or at time of a positive test result, whichever comes first.*

#### [Household Transmission of SARS-CoV-2: A Systematic Review and Meta-analysis](#) — 12/14/20

In this meta-analysis of 54 studies with 77 758 participants, the estimated overall household secondary attack rate was 16.6%. secondary attack rates were higher in households from symptomatic index cases

than asymptomatic index cases, to adult contacts than to child contacts, to spouses than to other family contacts.

### Gatherings and Superspreading Events

*Large events and gatherings (incl. small playdates), particularly those taking place indoors, have been linked to multi-transmission events that have accelerated the pandemic spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).*

### [Factors Associated with Positive SARS-CoV-2 Test Results in Outpatient Health Facilities and Emergency Departments Among Children and Adolescents Aged <18 Years — Mississippi, September–November 2020](#) – 12/18/20

Among children and adolescents aged <18 years in Mississippi, close contact with persons with COVID-19 and gatherings with persons outside the household and lack of consistent mask use in school were associated with SARS-CoV-2 infection, whereas attending school or child care was not associated with receiving positive SARS-CoV-2 test results.

### [Real-time, interactive website for US-county-level COVID-19 event risk assessment](#) – 11/9/20

Large events and gatherings have been linked to multi-transmission events that have accelerated the pandemic spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This interactive online dashboard estimates the risk that at least one individual with SARS-CoV-2 is present in gatherings of different sizes in the United States. It is intended to inform individuals on the need to take preventative steps to reduce new transmission, for example, by avoiding large gatherings and wearing masks when in close contact with others.

### [High COVID-19 Attack Rate Among Attendees at Events at a Church — Arkansas, March 2020](#) — 5/22/20

After two people from an Arkansas church test positive for SARS-CoV-2, 35 cases were identified associated with the same church. 35 cases among 92 church attendees tested positive, among whom 7 were hospitalized, and 3 died.

### Immunity and Re-Infection

#### [Humoral Immune Response to SARS-CoV-2 in Iceland](#) — 9/1/20

The majority of individuals with a positive qPCR test produced detectable antibodies that remained stable for at least 3 months after diagnosis.

#### [COVID-19 re-infection by a phylogenetically distinct SARS-coronavirus-2 strain confirmed by whole genome sequencing](#) — 8/25/20

A 33-year-old man is diagnosed with a phylogenetically different strain of SARS-CoV-2 approximately four months after his initial episode of COVID-19.

#### [New IgM seroconversion and positive RT-PCR test after exposure to the virus in recovered COVID-19 patient](#) [Letter to the Editor] — 6/11/20

After an initial episode of COVID-19, a 69-year-old woman tests positive for SARS-CoV-2 by RT-PCR a second time following six consecutive negative results.

#### [Pre-existing and de novo humoral immunity to SARS-CoV-2 in humans](#) — 5/15/20

This study examines pre-existing antibody responses to normal circulating coronaviruses and the cross-reactivity response to SARS-CoV-2.

[Functional SARS-CoV-2-specific immune memory persists after mild COVID-19](#) — 8/15/20

Results demonstrate that mildly symptomatic COVID-19 induces the development of SARS-CoV-2-specific IgG antibodies and neutralizing plasma, as well as virus-specific memory B and T cells which persist at least 3 months post-symptom onset.

## Physical Distance

[Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis](#) — 6/1/20

The findings of this systematic review and meta-analysis support physical distancing of 1 m or more and provide quantitative estimates for models and contact tracing to inform policy.

## Racial/Ethnic Disparities

*Historically marginalized race/ethnic populations are experiencing disproportionate burden of COVID-cases, hospitalizations and mortality.*

CDC. [Excess Deaths Associated with COVID-19, by Age and Race and Ethnicity — United States, January 26–October 3, 2020](#) — 10/20/20

CDC. [Race, Ethnicity, and Age Trends in Persons Who Died from COVID-19 — United States, May–August 2020](#) — 10/16/20

[Variation in Risk of COVID-19 Infection and Predictors of Social Determinants of Health in Miami–Dade County, Florida](#) — 10/08/20

The study found a positive association between a social disadvantage index and COVID-19 rates in Miami-Dade County. The Social Deprivation Index includes income, education, employment, housing, household characteristics, transportation, racial/ethnic minority status and high needs status components.

[Assessing the Impact of Neighborhood Socioeconomic Characteristics on COVID-19 Prevalence Across Seven States in the United States](#) — 09/22/20

The study findings suggest that neighborhood socioeconomic characteristics are associated with COVID-19 prevalence.

[COVID-19 Among American Indian and Alaska Native Persons – 23 States, January 31 – July 3, 2020](#) — 8/19/20

Analysis of COVID-19 reports from 23 US states found that the cumulative incidence of COVID-19 among American Indian and Alaska Native populations was 3.5 times that of non-Hispanic White populations.

[Association of Race with Mortality Among Patients Hospitalized With Coronavirus Disease 2019 \(COVID-19\) at 92 US Hospitals](#) — 8/18/20

A national study found that for those able to access hospital care, mortality did not differ between Black or White patients.

[Assessment of COVID-19 Hospitalizations by Race/Ethnicity in 12 States](#) — 8/17/20

A comparison of percentage of cumulative hospitalizations and the percentage of the state's population of different race/ethnic groups found that in almost all states that reported race/ethnicity data, Black and Hispanic populations made up disproportionately higher percentages of hospitalizations.

[Disparities in Incidence of COVID-19 Among Underrepresented Racial/Ethnic Groups in Counties Identified as Hotspots During June 5 – 18, 2020 – 22 States, February – June 2020](#) — 8/14/20

High percentages of cases in 79 hotspot counties are in racial/ethnic minority groups such as Hispanics, Blacks or African Americans, American Indians and Alaska Native and Native Hawaiians or Pacific Islanders.

[National Disparities in COVID-19 Outcomes between Black and White Americans](#) — 8/7/20

Compared to White patients with COVID-19, Black patients had 1.4 times the risk of hospitalization, 1.7 times the risk of requiring ICU care, 1.8 times the risk of requiring ventilatory support and 1.4 times the risk for death.

[SARS-CoV-2 and Influenza Co-infection](#)

*With influenza cases already being reported in the U.S. this 2020-2021 flu season, there is growing concern about the COVID-19 pandemic overlapping with the seasonal influenza epidemic.*

[Interactions between SARS-CoV-2 and Influenza and the impact of coinfection on disease severity: A test negative design](#) — 9/22/20

Between January 20th and April 25th, 2020 over 19,000 patients were tested for both SARS-CoV-2 and influenza. Only 58 were co-infected. The authors indicate a low co-infection rate suggests pathogenic competition between the two viruses, consistent with existing evidence for such competition between influenza and other coronaviruses.

[COVID-19 and Influenza Co-Infection: Report of Three Cases](#) — 8/18/20

Three cases of COVID-19 and influenza co-infection are presented. This report highlights the importance of healthcare providers being aware of patients who may be co-infected with more than one respiratory disease, in which symptoms presented may be similar but require varied treatment.

[Coinfection with SARS- CoV-2 and influenza A virus](#) — 7/1/20

A case report of SARS-CoV-2 and influenza A in a 57-year-old Japanese man highlights the importance of considering co-infection during differential diagnosis and supports further investigation of the efficacy of favipiravir for treatment of COVID-19.

[Rates of Co-infection Between SARS-CoV-2 and Other Respiratory Pathogens](#) — 4/15/20

In March 2020, non-SARS-CoV-2 respiratory pathogens were identified in 24 patients with positive SARS-CoV-2 tests, the most common of which were rhinovirus/enterovirus, respiratory syncytial virus, and other non-SARS-CoV-2 coronaviruses.

[School Closure – Mental Health](#)

[Psychological and Behavioral Impact of Lockdown and Quarantine Measures for COVID-19 Pandemic on Children, Adolescents and Caregivers: A Systematic Review and Meta-Analysis](#) – 12/27/20

Anxiety, depression, irritability, boredom, inattention and fear of COVID-19 are predominant new-onset psychological problems in children during the COVID-19 pandemic.

[High Levels of Stress Due to the SARS-CoV-2 Pandemic among Parents of Children with and without Chronic Conditions across the USA – 10/19/20](#)

The COVID-19 pandemic has introduced unprecedented levels of stress for parents, especially those of children with chronic conditions. Mental health effects are expected to continue for months/years and preparation is needed to meet an increasing demand for mental health care.

[Mental health and its correlates among children and adolescents during COVID-19 school closure: The importance of parent-child discussion – 10/12/20](#)

Mental health problems and resilience co-existed in children and adolescents during the COVID-19 outbreak. Open communication between parents and children about the pandemic should be encouraged to help children and adolescents cope with mental health problems in public health crisis.

[The potential impact of the COVID-19 pandemic on child growth and development: a systematic review – 9/23/20](#)

Tools used to mitigate the threat of a pandemic may threaten child [growth and development](#).

## Testing

[Performance of an Antigen-Based Test for Asymptomatic and Symptomatic SARS-CoV-2 Testing at Two University Campuses – Wisconsin, September – October 2020 – 1/1/21](#)

Compared with reverse transcription–polymerase chain reaction (RT-PCR) testing, the Sofia antigen test had a sensitivity of 80.0% and specificity of 98.9% among symptomatic persons; accuracy was lower (sensitivity 41.2% and specificity 98.4%) when used for screening of asymptomatic persons.

[Field performance and public health response using the BinaxNOW Rapid SARS-CoV-2 antigen detection assay during community-based testing – 12/26/20](#)

The assay maintained high sensitivity performance across ages and those with and without symptoms. Assay specificity was 99.9%.

[Implementation of a Pooled Surveillance Testing Program for Asymptomatic SARS-CoV-2 Infections on a College Campus – Duke University, Durham, North Carolina, August 2–October 11, 2020 – 11/20/20](#)

This report from Duke University in Durham, NC showed how the use of frequent surveillance testing, stringent contact tracing, and pooled testing could be used to maintain low transmission of COVID-19 in a college setting. Pooled testing balances resource availability with supply-chain disruptions, high throughput with high sensitivity, and rapid turnaround with an acceptable workload.

[A pooled testing strategy for identifying SARS-CoV-2 at low prevalence – 10/21/20](#)

This conceptual hypercube algorithm has been proposed to pool (or combine) and test samples for SARS-CoV-2 using RT-PCR. The presented method offers a 100-fold cost reduction. It is most applicable in low prevalence contexts and may serve as a means for efficient routine testing on a massive scale. Field trials of this strategy are currently underway in Rwanda and South Africa.

## Travel

[A large national outbreak of COVID-19 linked to air travel, Ireland, summer 2020](#) — 10/21/20

Thirteen cases were directly linked to an international flight arriving in Ireland which was only at 17% capacity. Nine of the 13 passengers who tested positive reported wearing masks on the flight.

[In-flight transmission of SARS-CoV-2: a review of the attack rates and available data on the efficacy of face masks](#) — 9/25/20

A recent perspective piece suggests that transmission on flights may be largely prevented by mask use based on a limited comparison of 6 flights without and 12 flights with mandatory masking.

[Transmission of SARS-CoV-2 During Long-Haul Flight](#) — 9/18/20

A study from March 2020 reported 16 confirmed cases of SARS-CoV-2 associated with a 10-hour commercial flight from London, UK, to Hanoi, Vietnam, on March 2, 2020. Twelve (75%) cases were passengers seated in business class with the symptomatic, index case (attack rate 62%), with seating proximity (defined as within 2 meters or two or less seats away) strongly associated with increased risk of infection (RR 7.3, 95% CI 1.2-46.2).

[In-Flight Transmission of SARS-CoV-2](#) — 9/18/20

In March 2020, four cases of COVID-19 (a married couple and two flight attendants) were associated with a flight from Massachusetts to Hong Kong. All four cases had phylogenetically identical strains of SARS-CoV-2. The latter two cases identified were flight attendants identified through contact tracing, suggesting that they were infected during the flight.

[Spatial transmission of COVID-19 via public and private transportation in China](#) — 3/14/20

A study evaluating the role of public transportation to and from Wuhan, China on daily and cumulative number of COVID-19 cases reported. There were associations between the frequency of each transportation method from Wuhan and both daily and cumulative numbers of COVID-19 cases in cities receiving transportation ( $p < 0.001$ ) with a steady increase for trains and buses.