

SARS-CoV-2 transmission in a grade school and a university—two case studies

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Game plan

- ▶ Review a few recent articles on pediatric/young adult COVID-19 transmission in unvaccinated, school settings...and the clinical picture
- ▶ Reminder of some earlier transmission studies and facts that warrant revisiting...since the saga continues to unfold
- ▶ Quiz at the end

Objectives

- ▶ Cite evidence related to transmission for SARS-CoV2 among grade school children exposed to an infected adult teacher, and among unvaccinated college students with and without mask wearing

Take home messages related to today's articles

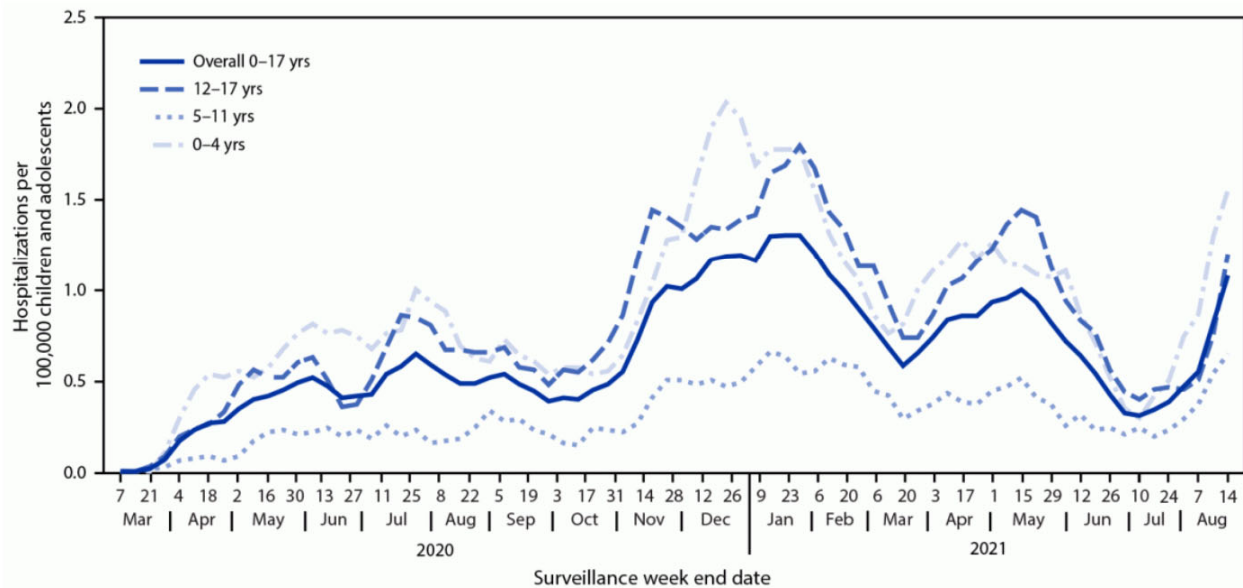
- ▶ Encourage your patients, friends, family, children, strangers to wear masks in school settings and do not take them off—risk can be substantial even with short exposures
- ▶ Be vigilant about physical distancing and other non-pharmacologic strategies for Covid control
- ▶ Encourage vaccination



Background on school transmission

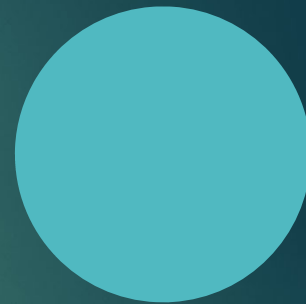
- ▶ This topic is timely given recent and upcoming school openings...one of the hottest topics related to Covid-19
- ▶ Also timely related to mask and vaccine mandates and the emotional/political response caused by such mandates, or lack thereof
- ▶ Many of us in the country are having trouble 'connecting the dots'...we do not want our children to get sick but many parents do not want them or their teachers subject to mandates of any kind
- ▶ The data on pediatric case counts, transmission, and even outcomes of illness have all evolved in past months, as is covered daily on national news media and public health reports

FIGURE 2. COVID-19–associated weekly hospitalizations per 100,000 children and adolescents,* by age group — COVID-NET, 14 states,[†] March 1, 2020–August 14, 2021 (3-week smoothed running averages)[§]



Symptoms/signs of pediatric COVID-19

- ▶ Fever, cough, SoB
- ▶ Myalgia
- ▶ Runny nose
- ▶ Sore throat
- ▶ Headache
- ▶ Nausea/vomiting
- ▶ Abdominal pain
- ▶ Diarrhea
- ▶ MIS-C in a very small percent



Take home messages from earlier talk months ago

- ▶ A low proportion of all COVID-19 cases occurs among children/adolescents in the US and worldwide
- ▶ A very low proportion of deaths has occurred so far in pediatric population, of all COVID-19-related deaths among all ages
- ▶ Different studies worldwide have presented variable conclusions re: transmission potential from child to child, and child to adult...but most studies show lower risk compared with older people transmitting infection
- ▶ Different concentrations of ACE2 receptors may explain lower infection acquisition in peds populations, and, why risk increases with age

Transmission snapshots presented earlier in this ECHO series

- ▶ US: YMCA study of 40,000 kids aged 1-14 showed NO positives
- ▶ France: 40% of teens were seropositive in household clusters, with 11% of the adult contacts of these teens showing seropositivity
- ▶ Northern France cluster: a 9 year old with mild symptoms, coinfecting with flu, showed NO subsequent SARS transmission to 112 school contacts during infectious period. Flu was transmitted, however, to contacts.
- ▶ Australia: low transmission of infected children to household contacts (NCIRS, 2020)

Summary points presented earlier in the series

- ▶ Children get COVID-19 less often and in a less severe form than most adults
- ▶ Children are probably more likely to get infected from an older teen or adult, than from another child
- ▶ Children <9 years old do not seem to be a major source of outbreaks or household clusters...different story for older children, as disease incidence and prevalence climbs with age

Marin County school outbreak, MMWR Sept 3, 2021

- ▶ Recent event in an elementary school, Delta variant etiology
- ▶ Well-sleuthed by public health officials with good lab data back up, including whole genome sequencing of viral specimens
- ▶ Easily attributed to an index case teacher, unvaccinated, symptomatic, who removed his/her/their mask for a short time (on several occasions) while reading to the grade school students in the class
- ▶ Family transmission was evaluated through the exposed/infected students in the classroom
- ▶ Instructive visuals for the data (see next slides for those of you interested in data visualization)

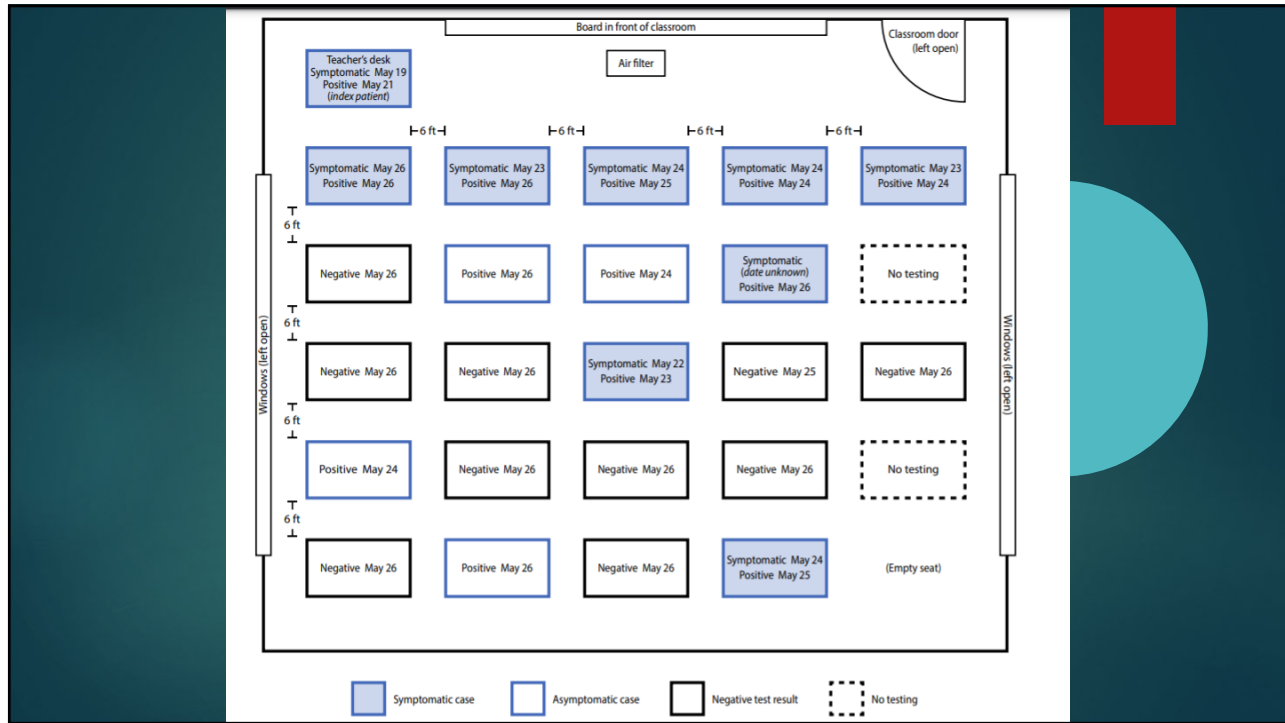
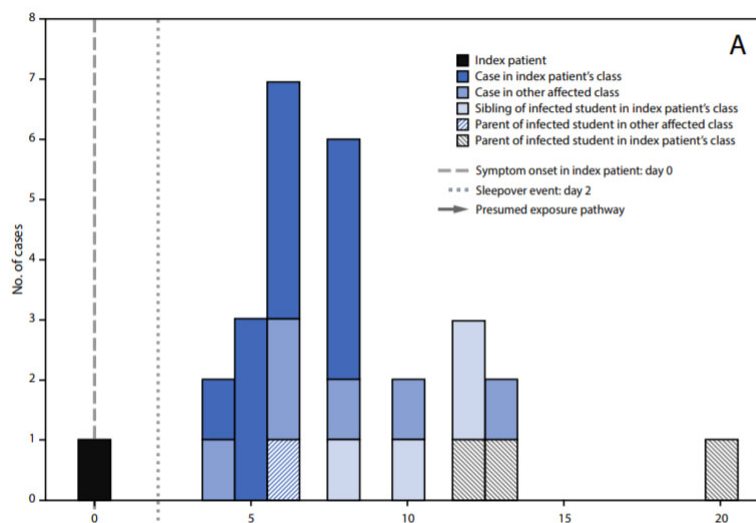
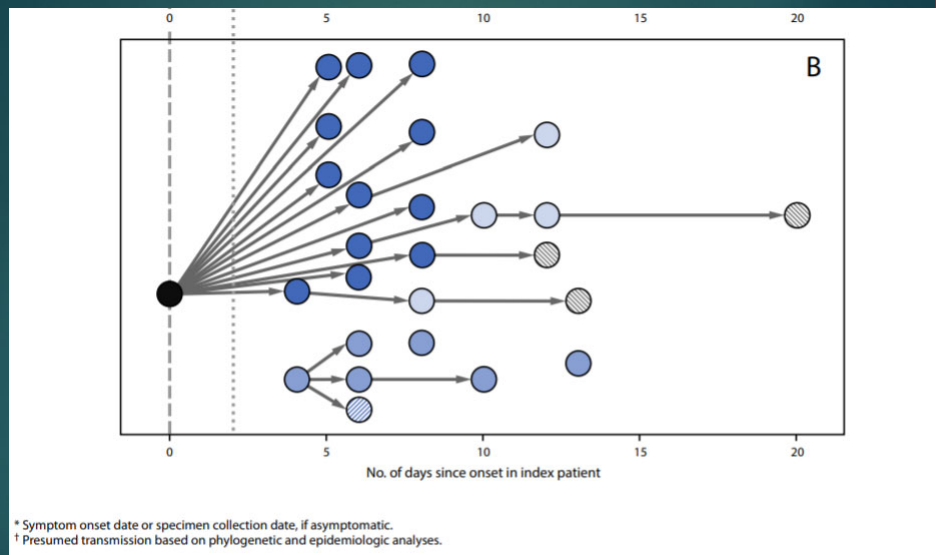


FIGURE 2. Timeline of SARS-CoV-2 illness onset* after onset in the index patient (A) and presumed transmission† pathway (B) among students, siblings, and parents, relative to onset in the index patient — Marin County, California, May 2021





Potential limitations

- ▶ Incomplete testing of exposed children/sibs/parents
- ▶ Whole genome sequencing of virus not available for index case
- ▶ Perhaps some infections of children occurred (from infected teacher) related to distancing (with masks on) and was not entirely a result of the unmasked 'reading event' in the classroom
- ▶ Tracing could not progress into the surrounding community due to resistance to testing...thus limiting understanding of the extent of this spread


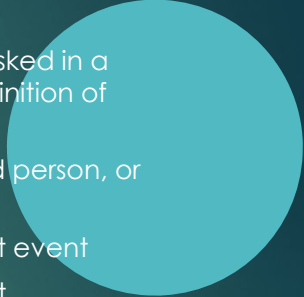


Welcome to Campus: Watch a Tour

What will be your favorite spot on campus? Learn all about SLU's academic buildings, residence halls and places to gather.

SARS-CoV-2 Transmission to Masked and Unmasked Close Contacts of University Students with COVID-19 — St. Louis, Missouri, January–May 2021 (MMWR)

- ▶ 12,000 students at a single private university
- ▶ Spring semester, Jan-May, 2021 (pre-Delta)
- ▶ 1000 diagnostic tests and 8000 surveillance tests performed
- ▶ A large proportion of the students were unvaccinated, making this a great study opportunity re: evaluation of non-vaccination mitigation strategies in a typical university setting
- ▶ Good compliance with study protocol and contact tracing—main thrust was to determine transmission risk from Covid-19 patients to close contacts, depending on whether or not masks were worn
- ▶ Exposure event was defined as being within 6 feet for 15 minutes or more in a 24 hour period (inside or outside) with a known Covid-19 patient

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- ▶ If either the infected student, or the contact, were unmasked in a close physical encounter of > 15 minutes...that fit the definition of unmasked exposure event
 - ▶ Students could have one exposure event to one infected person, or multiple exposures to one or more infected persons
 - ▶ Mask use was recorded (and analyzed) for each contact event
 - ▶ Saliva based testing with RT-PCR 5 to 7 days after contact

Key findings



- ▶ 265 positive test results of the 9000 tests administered
- ▶ 378 close contacts were identified as related to the 265 students (1.4:1)
- ▶ 6.9% of close contacts reported strictly masked exposures
- ▶ 93.1% close contacts reported an unmasked exposure
- ▶ Close contacts reported a median of ONE exposure overall
- ▶ 30.7% of contacts were positive...32.4% among unmasked and 7.7% among masked exposures to a known infected student (OR=5.4, 95% CI 1.5-36.5)
- ▶ No fully vaccinated contacts were infected
- ▶ Each additional exposure increased odds of positive test result (OR= 1.4, 1.2-1.6)

- ▶ Median number of exposures was 2.0 for close contacts with positive test results, and 1.0 for close contacts with negative results
- ▶ The percentage of positive test results among close contacts in this study (30.7% overall) was similar to that observed in previous studies
- ▶ Key message: Wearing masks consistently and having few close encounters with persons with Covid-19 substantially reduces transmission in a university setting where students are mostly unvaccinated.

TABLE. Demographic characteristics, mask use, and number of exposure incidents of close contacts* of SARS-CoV-2–infected students, by SARS-CoV-2 test results — Saint Louis University, United States January–May 2021

Characteristic	SARS-CoV-2 test results, no. (%)			p value [†]
	All (n = 378)	Negative (n = 262)	Positive (n = 116)	
Sex				
Female	268 (70.9)	175 (66.8)	93 (80.2)	0.012
Male	110 (29.1)	87 (33.2)	23 (19.8)	
Housing status				
Off-campus	115 (30.4)	84 (32.1)	31 (26.7)	0.358
On-campus	263 (69.6)	178 (67.9)	85 (73.3)	
Student level				
Graduate	33 (8.7)	23 (8.8)	10 (8.6)	1.000
Undergraduate	345 (91.3)	239 (91.2)	106 (91.4)	
Vaccination status[§]				
Fully vaccinated	18 (4.8)	18 (6.9)	0 (—)	0.007
Partially vaccinated	24 (6.3)	19 (7.3)	5 (4.3)	
Unvaccinated	336 (88.9)	225 (85.9)	111 (95.7)	
Student athlete				
No	330 (87.3)	228 (87.0)	102 (87.9)	0.939
Yes	48 (12.7)	34 (13.0)	14 (12.1)	
Reserve Officers' Training Corps member				
No	376 (99.5)	261 (99.6)	115 (99.1)	1.000
Yes	2 (0.5)	1 (0.4)	1 (0.9)	
Member of student fraternity or sorority				
No	239 (63.2)	168 (64.1)	71 (61.2)	0.670
Yes	139 (36.8)	94 (35.9)	45 (38.8)	
Health major with clinical responsibilities				
No	294 (77.8)	201 (76.7)	93 (80.2)	0.541
Yes	84 (22.2)	61 (23.3)	23 (19.8)	
Mask use				
Masked exposure only	26 (6.9)	24 (9.2)	2 (1.7)	0.016
Any unmasked exposure	352 (93.1)	238 (90.8)	114 (98.3)	
No. of exposure incidents,[¶] median (IQR)	1.0 (1.0, 2.0)	1.0 (1.0, 2.0)	2.0 (1.0, 3.0)	<0.001

Abbreviations: IQR = interquartile range.

Limitations

- ▶ Contact tracing was self reported
- ▶ Few vaccinated students, thus, this variable could not be included in regression models
- ▶ Much missing data on outdoor vs indoor exposures
- ▶ Substantial missing data on exposure TIME...which might be very important but we cannot assess that variable in this study
- ▶ Pre-Delta variant study...so, less transmissible variants involved...findings may differ now



Watch: How These Students Found
Their Home at SLU

Parting thoughts on Covid in colleges

- ▶ Carlos Del Rio, MD, from Emory University suggests that, if most college or university students are vaccinated and wear masks most of the time, with vaccine efficacy around 50% for Delta variant...colleges will avoid mini-epidemics but transmission will still occur, similar to flu. (see UCSF Grand Rounds on Covid)

Boarding school results (a reminder)

- ▶ 5% of faculty/staff were positive over the short study period of this private boarding school among 800 students (9th – 12th grades)
- ▶ 1% of students positive (n=8)
- ▶ Only two students likely to have picked up virus on campus...the remainder had 'traced exposures' to infected persons off campus
- ▶ Conclusion: extensive measures can work, in this type of setting—they include consistent masking, consistent distancing, quarantine before school started, rapid testing, no cafeteria, harsh enforcement with expulsion after 'three strikes', reduced sports activities on campus

Quiz

- ▶ How can you incentivize college students to get vaccinated against Covid? (For the country's older population, even large amounts of money, free game tickets, free beer, and free alcohol shots did not work)
- ▶ How can you incentivize parents to get their children < 12 years old vaccinated, if vaccine is licensed soon for that age group?
- ▶ If you were a parent of a healthy 10-year old who wanted to attend school in person, what public health, environmental or other adjustments would you want to see put into place in their school/s?

References

- [SARS-CoV-2 Transmission to Masked and Unmasked Close Contacts of University Students with COVID-19 — St. Louis, Missouri, January–May 2021](#)
- [Outbreak Associated with SARS-CoV-2 B.1.617.2 \(Delta\) Variant in an Elementary School — Marin County, California, May–June 2021](#)