

Mitigating COVID-19 Risks for Schoolchildren

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Lauder Professor and Dean

Yale SCHOOL OF PUBLIC HEALTH

Pediatric Grand Rounds Silverman Lecture
Upstate Medical University





A. Clement Silverman and Hilda Freeman Silverman Memorial Lecture
<https://guides.upstate.edu/c.php?g=621794&p=6548970>

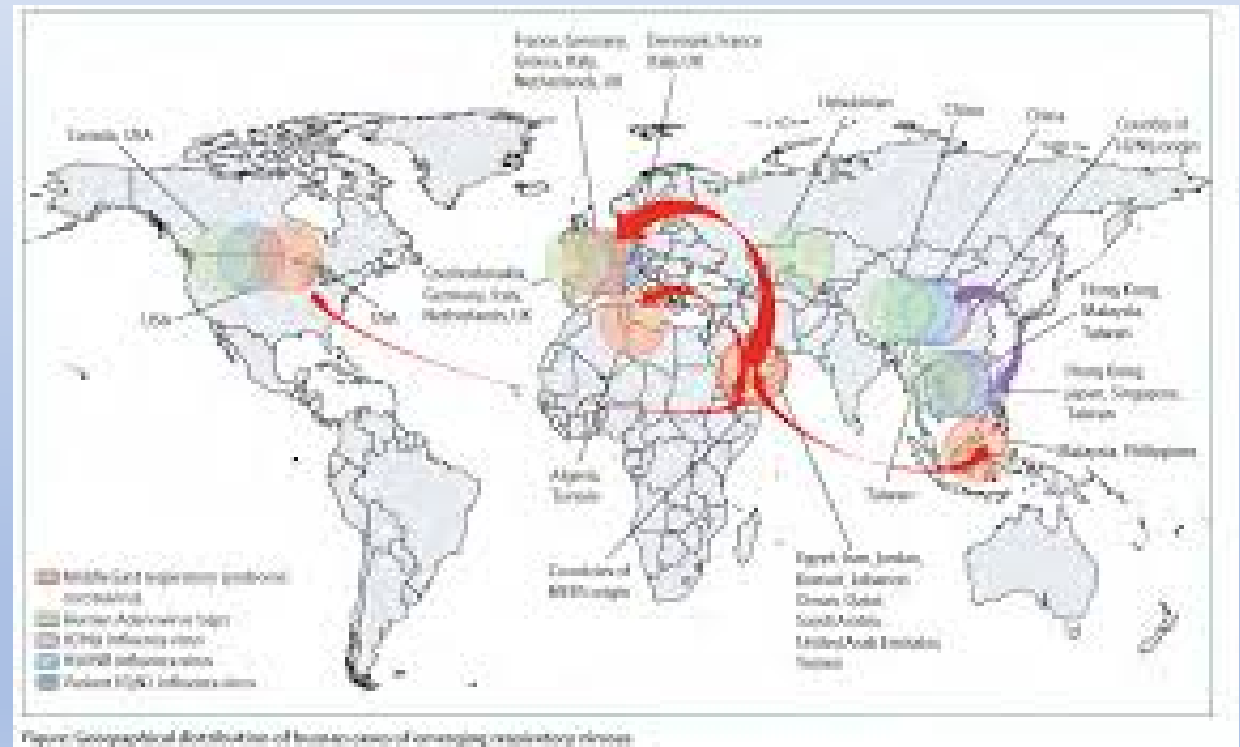


Today's Talk

- Historical note
- Global Disruption of Schools
- Vaccination in Adults/Adolescents and in Children
- COVID-19 in Children is Mild; Role of Vaccination
- Multi-layered Strategy to Keep Schools Open
- Engineering Controls; Space-Specific Strategies
- Student Mental Health during the Pandemic
- Vaccine Hesitancy
- Communication for Education

SARS and MERS

- Coronaviruses thought to be an interesting virus, but just a minor medical issue for children (cold-like symptoms), until...
 - SARS, 2003-04
 - 8000 cases, 800 deaths
 - Guangdong Province
 - Hong Kong and Toronto
 - Europe, North America, others
 - MERS, 2012-19
 - 2500 cases, 858 deaths
 - Arabian peninsula
 - 2015 outbreak, South Korea



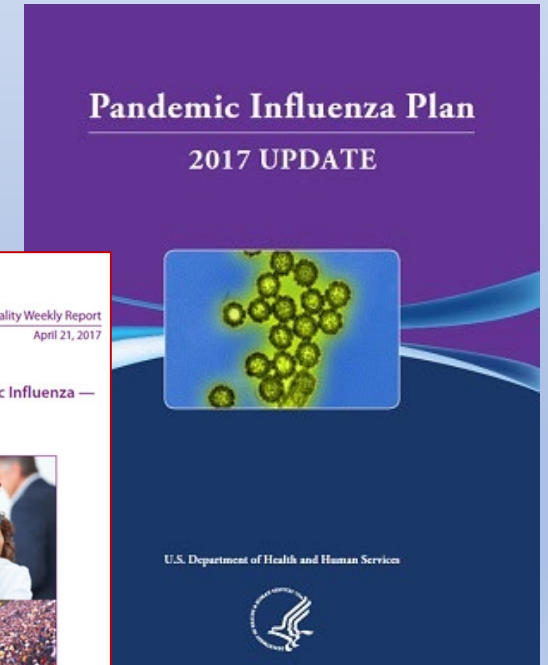
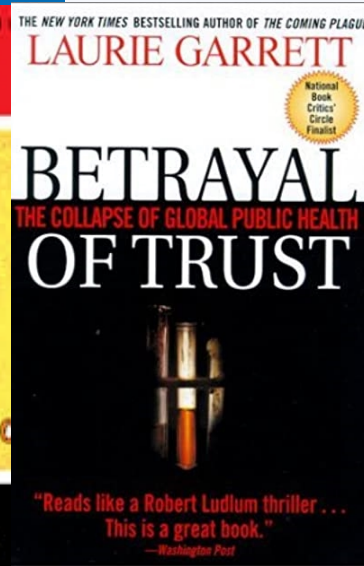
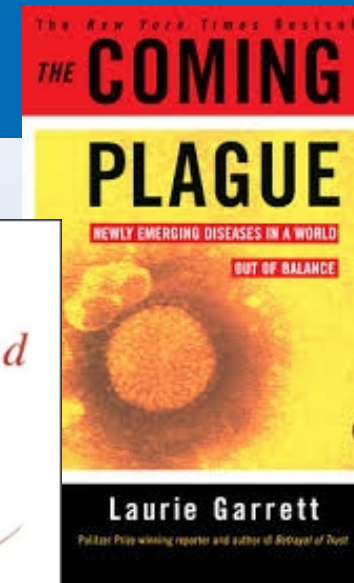
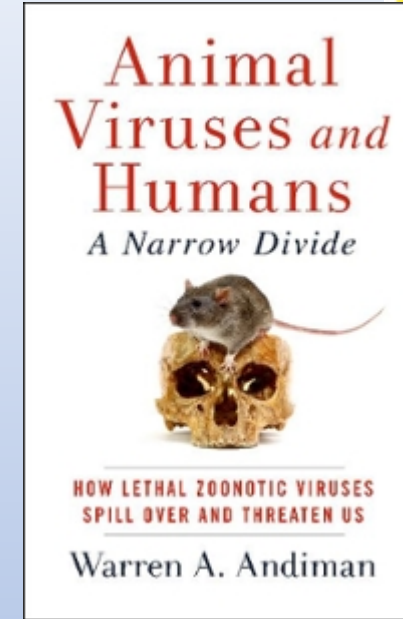
Pandemic Influenza

But SARS was not a huge surprise...

- 1918-1919 Spanish influenza
- Types of zoonotic influenza
- Risk of pandemic disease

& COVID-19 also not a surprise...

- Pandemic respiratory viral predicted for decades



1918-1919



Deadlier Than WWI

Estimated **30-100 million** people died worldwide.

- Approximately **116,500** Americans died in World War I.
- Approximately **675,000** Americans died from **Influenza** in 1918-1919.
- Hundreds of millions more were infected but did not die.
- Preferentially killed young adults, ages 15-45 years old, making this a very unusual flu.





I had a little bird,
And its name was Enza
I opened the window
And in flew Enza



THE WAY THE GERMANS DID IT AT CHATEAU-THIERRY

During the recent war approximately 1000 men from North Carolina were killed in battle.



THE WAY NORTH CAROLINIANS DO IT AT HOME

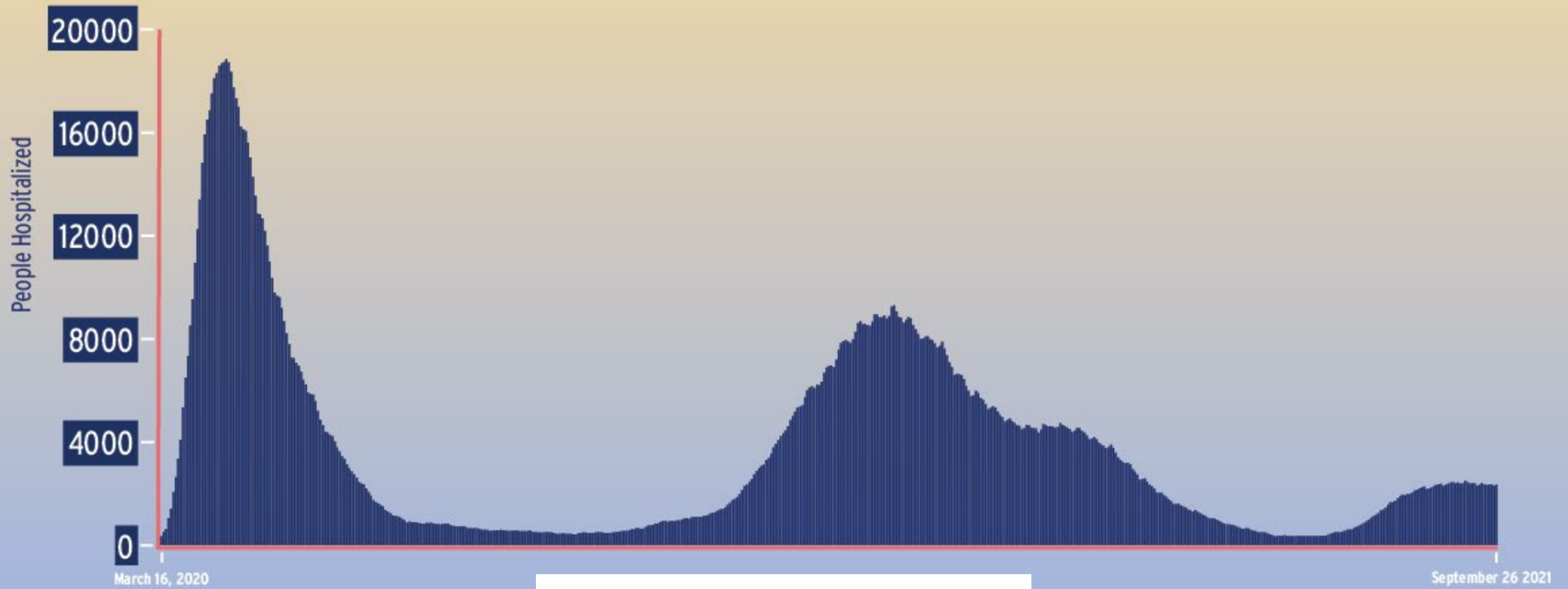
During the epidemic last fall and winter 13,044 North Carolinians laid down their lives to a "spit-borne" disease—influenza!



All theatres
CLOSED
until further
NOTICE
*At request of
MAYOR.*

TOTAL DAILY HOSPITALIZATIONS

September 26, 2021: 2,341 Total Hospitalized



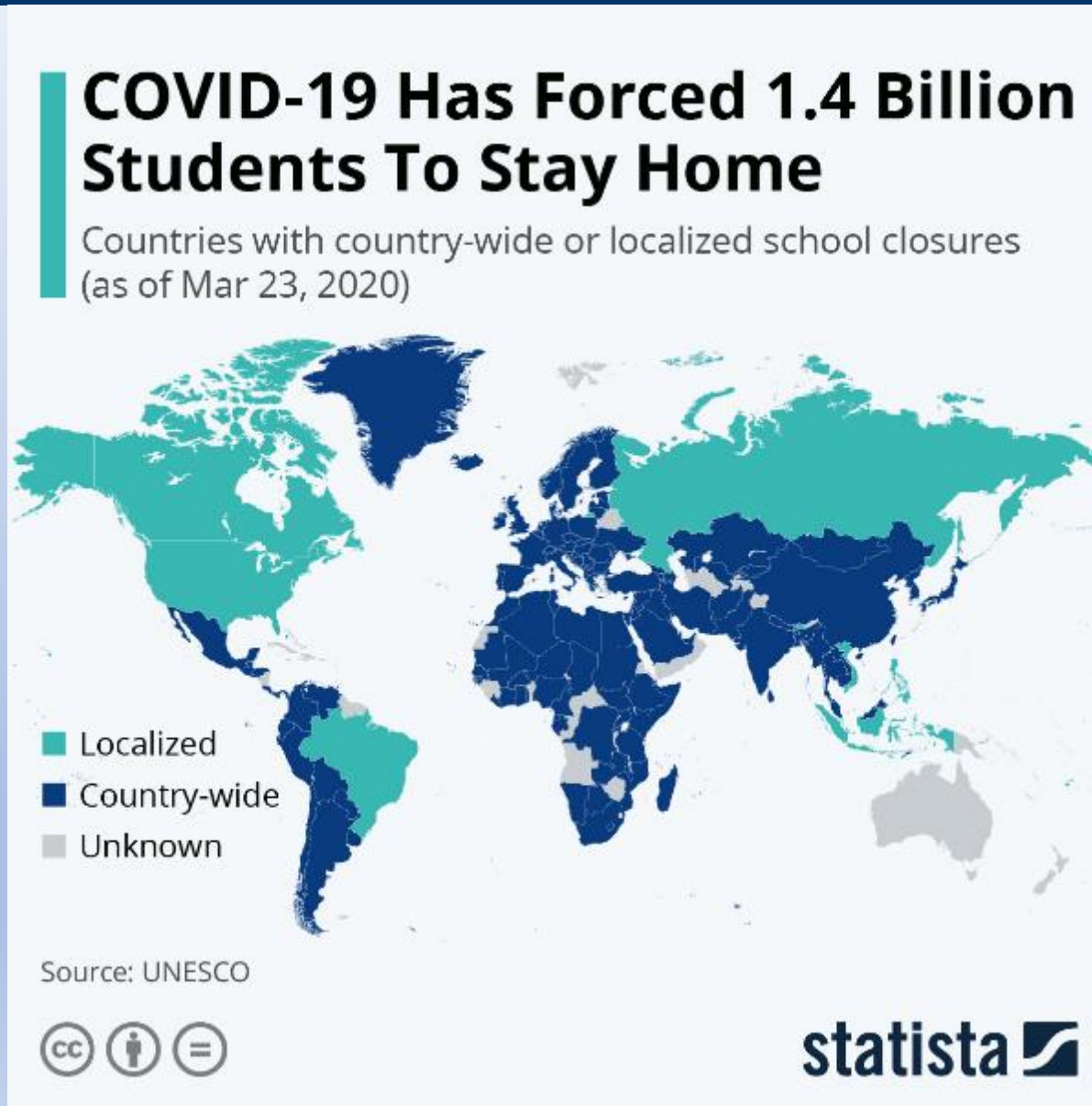
New York State update

Schools, Children, and COVID-19



Crowding
Supervision
Education
Adherence
Mixing

SCHOOLS DURING THE PANDEMIC



Galbadage, 2020



School Status / Education Modality

How is education being provided in each country?



In-person education: Schools are open, and students have returned for in-person instruction.



Hybrid education: Schools are open combining remote learning and in-person instruction.



Remote education: Schools are closed and students are exclusively learning remotely.



Mixed/multiple: Schools are operating with a combination of the following: in-person, hybrid, remote, and closed due to COVID-19.



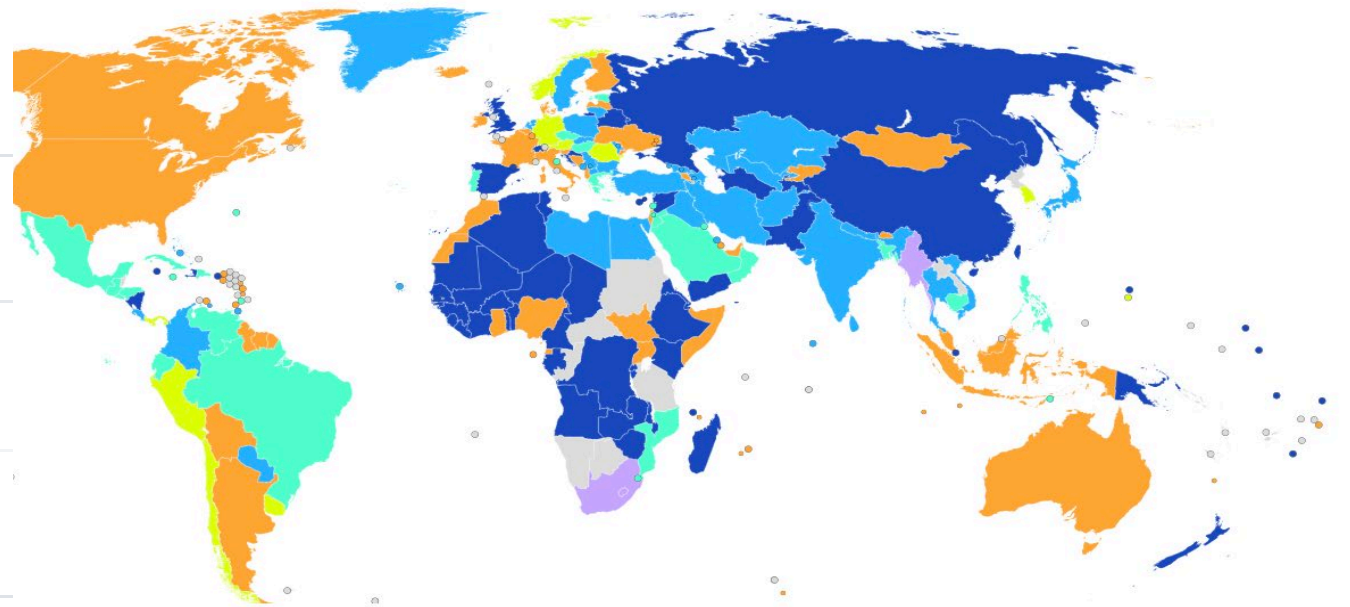
Extended Break: Schools are closed due to a regular school calendar closure (e.g., holiday).



No instruction/closed due to COVID-19: Schools are closed due to COVID-19, and no education services currently available.

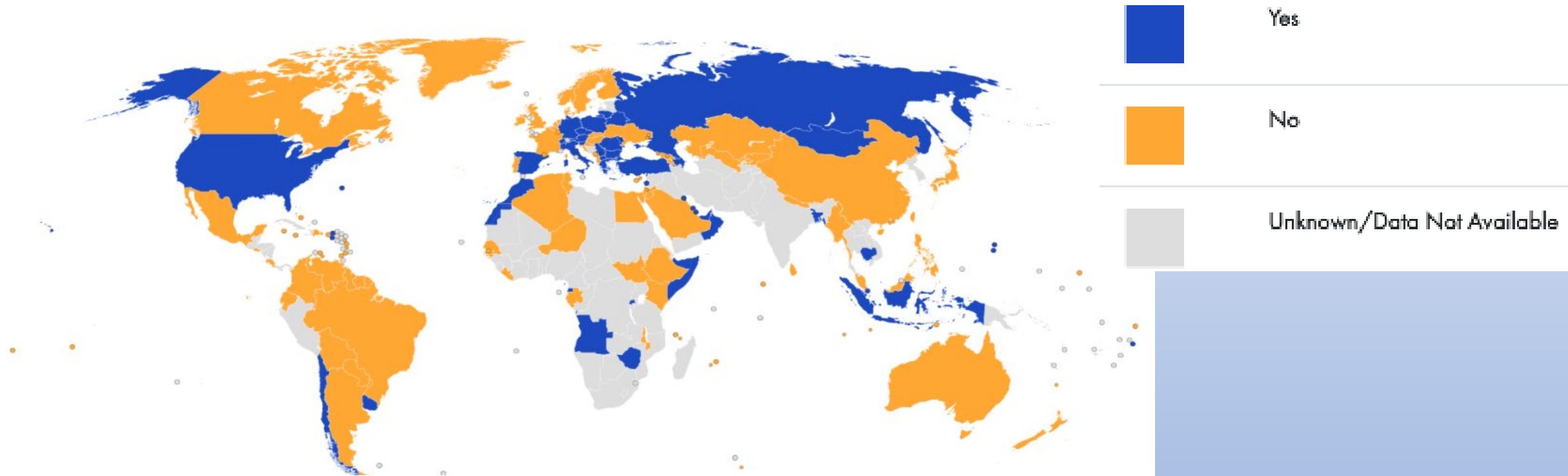


Unknown/Data Not Available: Unable to obtain information through publicly available data.



Vaccine Availability for Teachers

Are some or all teachers/school staff currently being vaccinated as a priority group?



This map displays if teachers/school staff are currently eligible for vaccination, in at least some areas of the country, as a priority group as of last survey response date.

Note: Some teachers may currently be eligible for vaccine based on age or other priority group status.

Serious long-term effects of COVID-19 are extremely rare in children

(not much cytokine storm, resembles other 4 coronaviruses of children that were recognized before SARS)

In the U.S. there have been 4661 cases of Multisystem Inflammatory Syndrome in Children (MIS-C), and 41 MIS-C related deaths out of 5.7 million children infected (as of 8-27-2021).

Australia, Switzerland, and UK studies:
Very low rates of mild symptoms (cough 4%, fatigue 2%) in children at 3-6 months after infection. “Long COVID” very rare in children.

REFS: Molteni E et al. *Lancet Child Adolesc Health* 2021;5:708-18
Radtke T et al. *JAMA* 2021;326:869-71
Say D et al. *Lancet Child Adolesc Health* 2021;5:e22-e23

COVID-19 poses a lower risk to school-age children compared to seasonal flu*

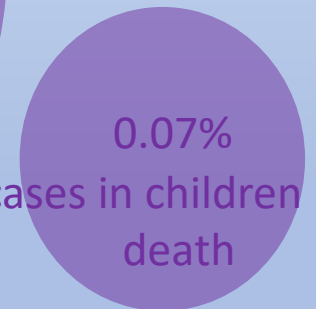
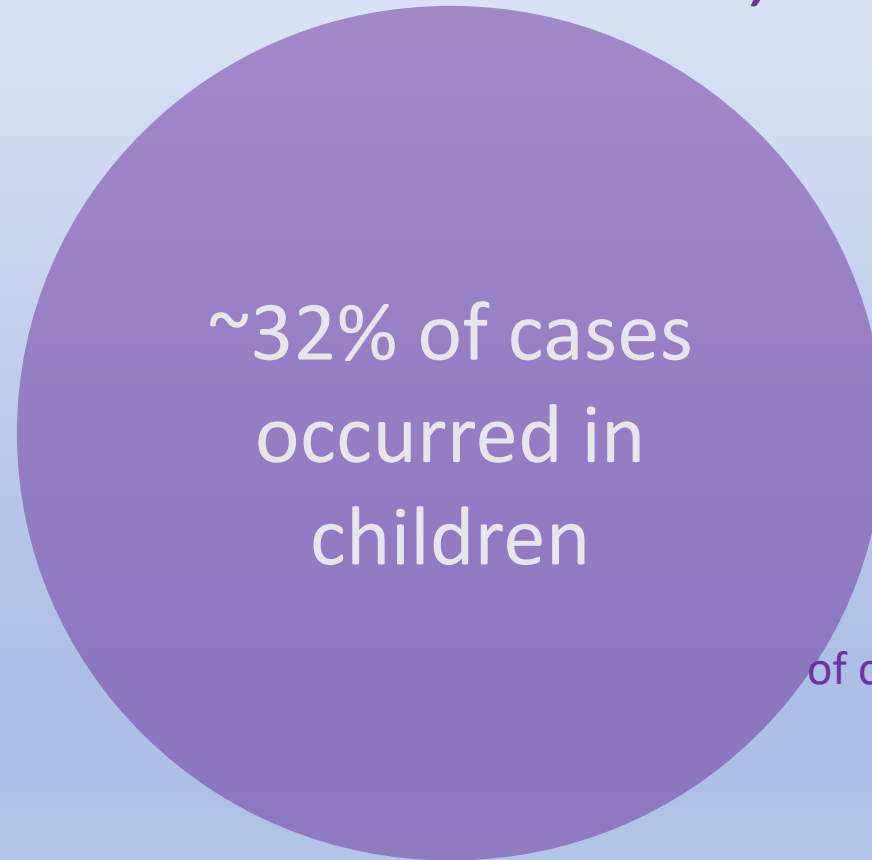
(*In contrast, COVID-19 is 2x more deadly to adults than flu)

COVID-19, 2019-2020

Influenza, 2017-2018



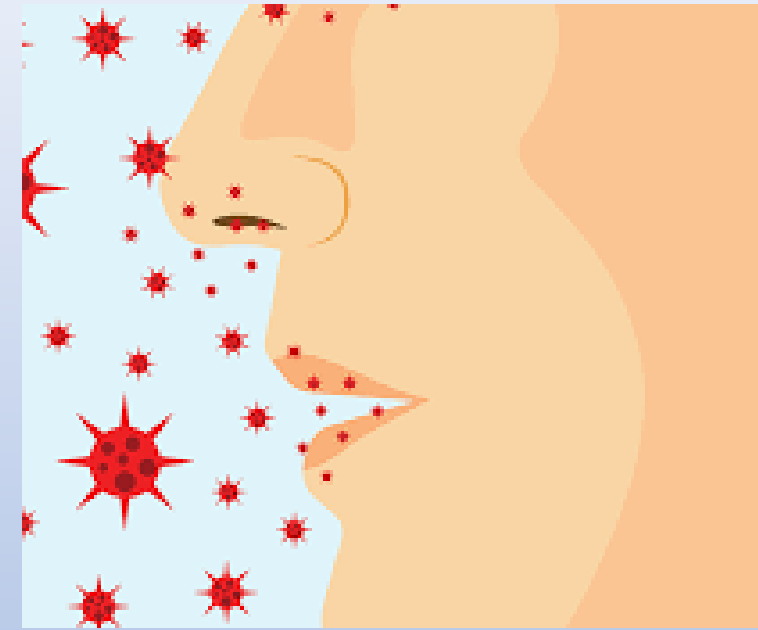
of cases in children led to death



of cases in children led to death

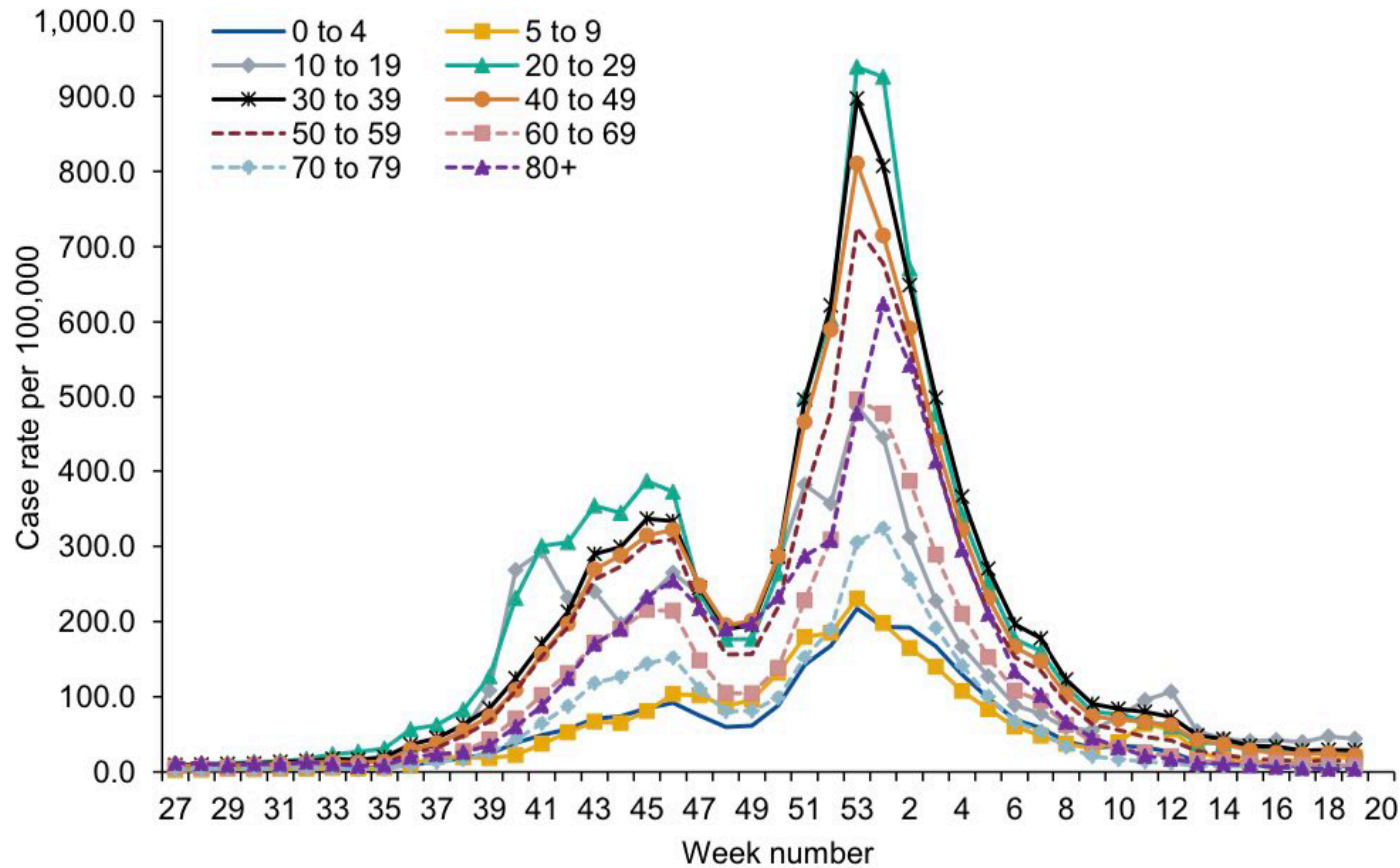
COVID-19 mRNA vaccines are remarkably effective!

- ***Breakthrough infections are rare:***
 - Real-world (HEROES) study of 4,000 healthcare and essential workers: 161 infections in the unvaccinated workers, compared with 3 infections in fully vaccinated people.
- ***Serious breakthrough infections are EXTREMELY rare***
 - CDC: 184 million Americans (56%) fully vaccinated. Death rates in fully vaccinated people from COVID-19 are <0.001%
- ***Vaccinated individuals are unlikely to pass the virus on to unvaccinated individuals, though Delta is more transmissible***
- ***Vaccines protect against infection with all known “variants of concern”***



Refs: Thompson MG et al. *MMWR* 2021; 70(13):495-500.
Levine-Tiefenbrun M et al. *Nature Med* 2021;27:790–2
Keehner J et al. *N Engl J Med* 2021. PMID: 34469645
Stamatatos L et al. *Science* 2021; PMID: 33766944
Skelly DT et al. *Nat Commun* 2021;12(1):5061.
Geers D et al. *Sci Immunol* 2021;6:eabj1750.
Tarke A et al. *Cell Rep Med* 2021;2:100355

COVID-19 case rate in the U.K. by age group



Vaccinating
adults
protects
unvaccinated
children

Then why vaccinate children?

- Through Sept. 22, 2021, deaths from COVID-19:
 - 0-4 years: 170
 - 5-18 years: 374
- MIS-C and Long COVID are vaccine-preventable complications
- Missed days of school; isolation and quarantine are disruptive
- Risk to vulnerable children and adults
- Achieving herd immunity in the face of vaccine hesitancy in adults
- Prepare for future infectious or pathogenic variants

What have we learned about COVID-19 over the last year?

	Old guidance	Current guidance
COVID-19 is spread through respiratory route (rarely surfaces)	Limit shared objects. Frequent cleaning	Objects can be shared in class
Outdoor transmission of COVID-19 is exceedingly rare	Masks outdoors	Masks not required outdoors
The risk for within-school transmission of COVID-19 is low (based on U.S. data)	Test after 72 hour or quarantine after travel	No test after travel
Vaccines protect adults/adolescents from severe disease and reduce COVID-19 transmission	Teachers stay in cohort	Vaccinated teachers can move between cohorts Vaccinated adolescents, too
Within school transmission did not increase in schools with 3 feet of distancing	6 feet distancing	3 feet distancing
COVID-19 in children is generally mild (milder than flu). Serious long-term effects are extremely rare.		

Risks and Benefits of current COVID-19 policies in school

What are the **HARMS** of ongoing restrictions (masks/distancing/low classroom density)?

- Disruption to learning
- Fear/anxiety and other mental health challenges in children
- Unnecessary use of staff resources and time

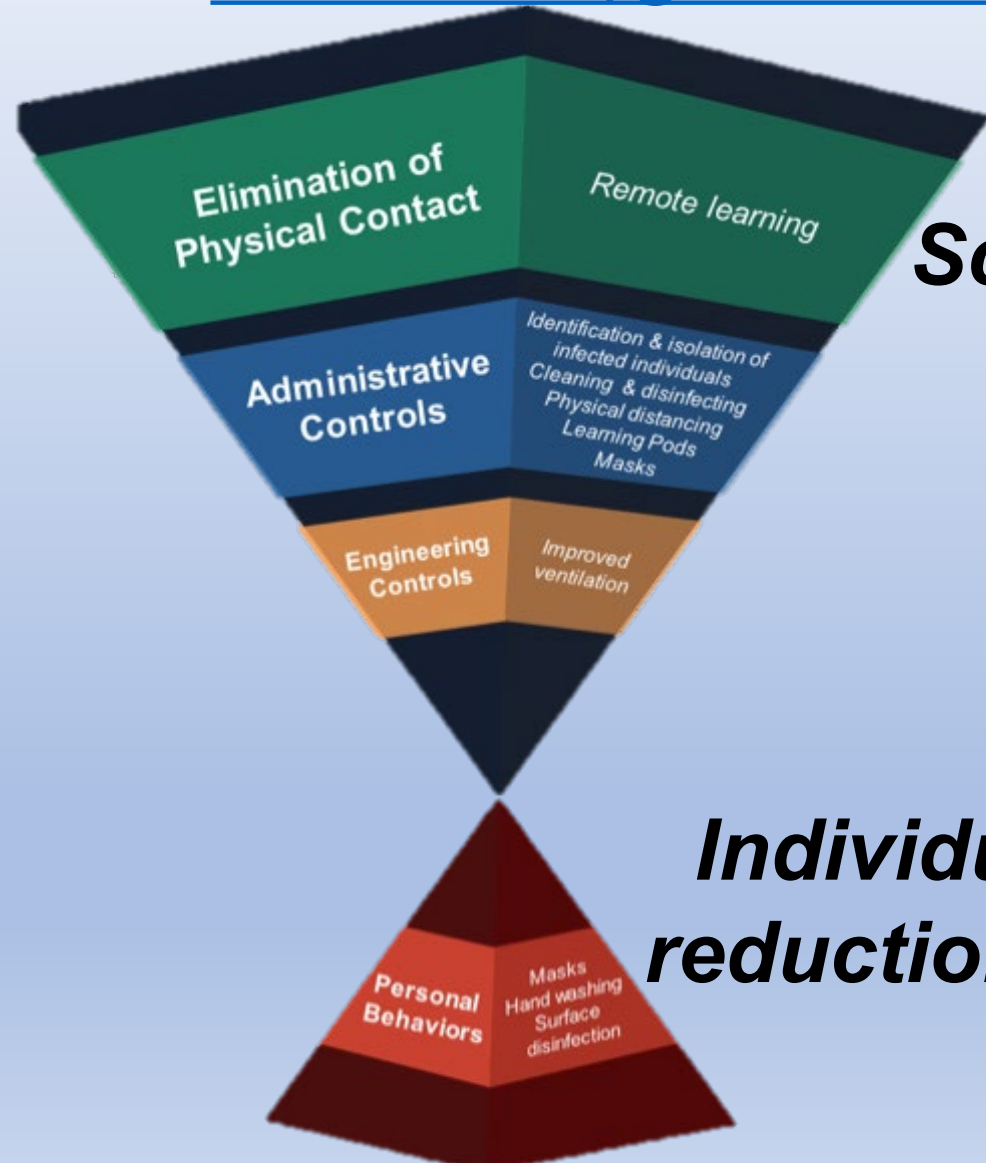
What are the **BENEFITS** of ongoing restrictions?

- Protect unvaccinated or vulnerable members of the community?
- Protect children from COVID-19?



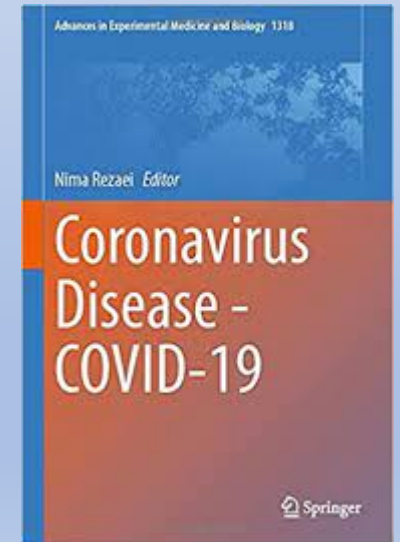
Multi-layered Strategy to Reopen Safely

<https://ysph.yale.edu/community-education-covid-19/reopening-information/guidance-for-reopening-schools/>



School directed initiatives for disease control

Individual-level risk reduction approaches



Engineering Controls

Mechanical Ventilation
(Extended Operation)

Mechanical Ventilation
(Outdoor Air)

Mechanical Ventilation (Filters)

Natural Ventilation

Supplemental Ventilation

Administrative Controls

Class Scheduling

Pod Model

Outdoor Spaces

Occupancy

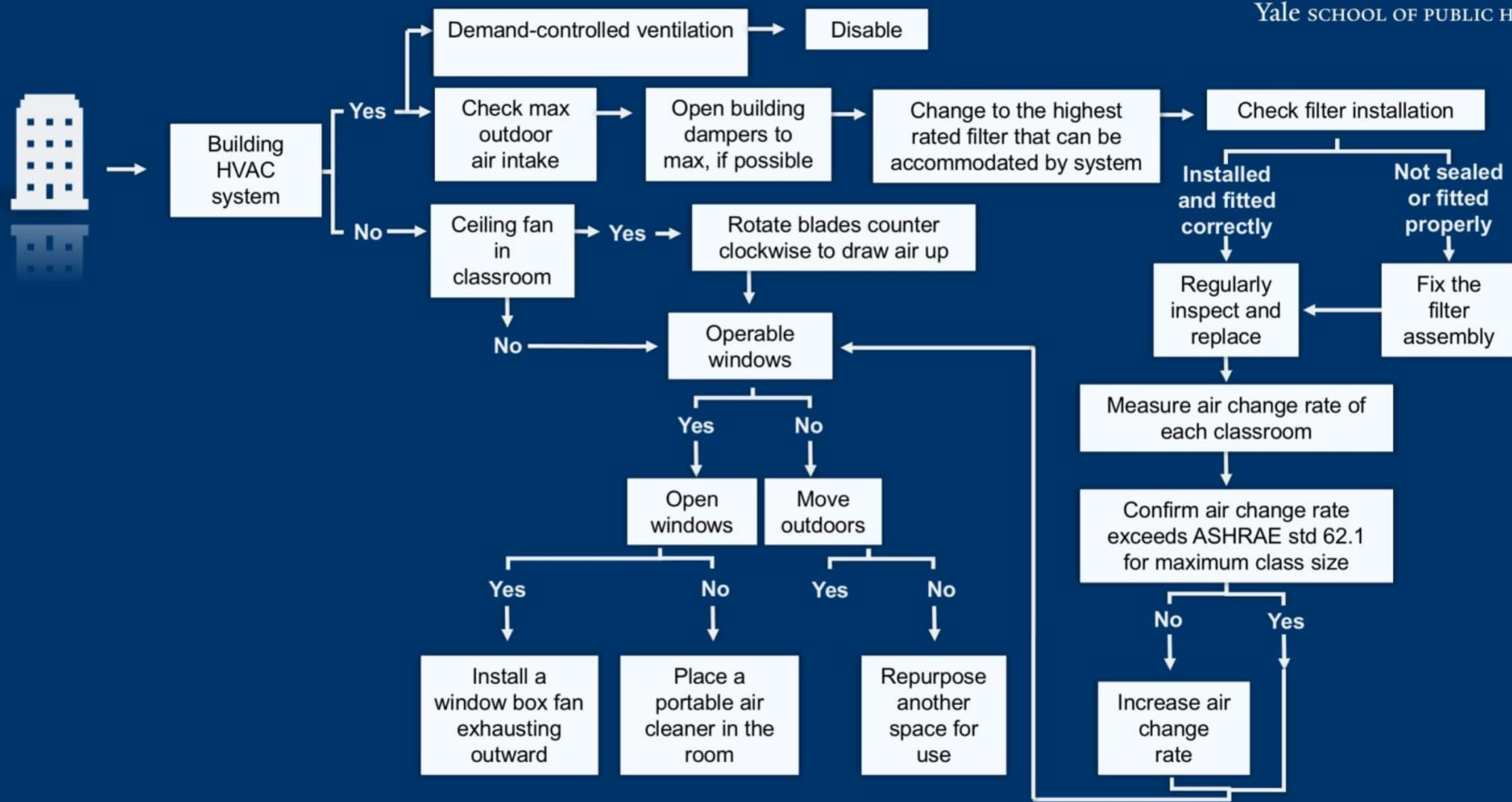
Outdoor Spaces

Physical Distancing

Symptom Checks

Non-Essential Visitors

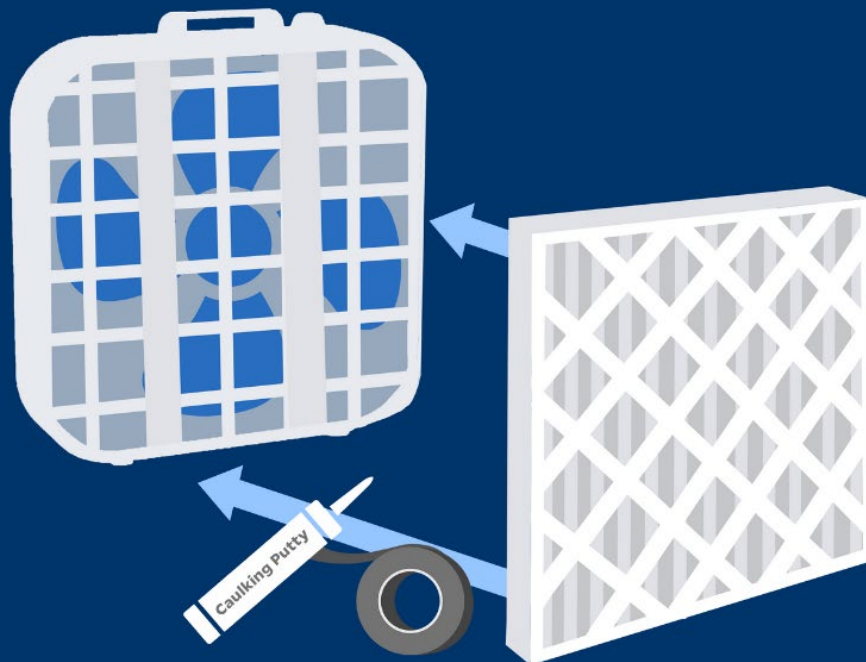
Li D, Lin EZ, Brault MA, Paquette J, Vermund SH,
Godri Pollitt KJ. Reopening Schools After a
Novel Coronavirus Surge. *Adv Exp Med Biol*
2021;1318:785-813. PMID: 33973212.



Adapted from: Li D, Lin EZ, Brault MA, Paquette J, Vermund SH, Pollitt KJG. Reopening Schools After a Novel Coronavirus Surge (Chapter in press). In: Rezaei N (Ed.): Coronavirus disease (COVID--19). City: Springer Nature, 2020.

publichealth.yale.edu/research/covid-19/schools/

LOW-COST AIR PURIFIER



WHAT YOU NEED:

- 20" x 20" box fan
- 20"x20"x2" MERV13 or higher rated (i.e. HEPA) filter
- Tape
- Caulking putty

HOW TO ASSEMBLE:

Attach the filter to the back of the fan with caulking putty and tape.

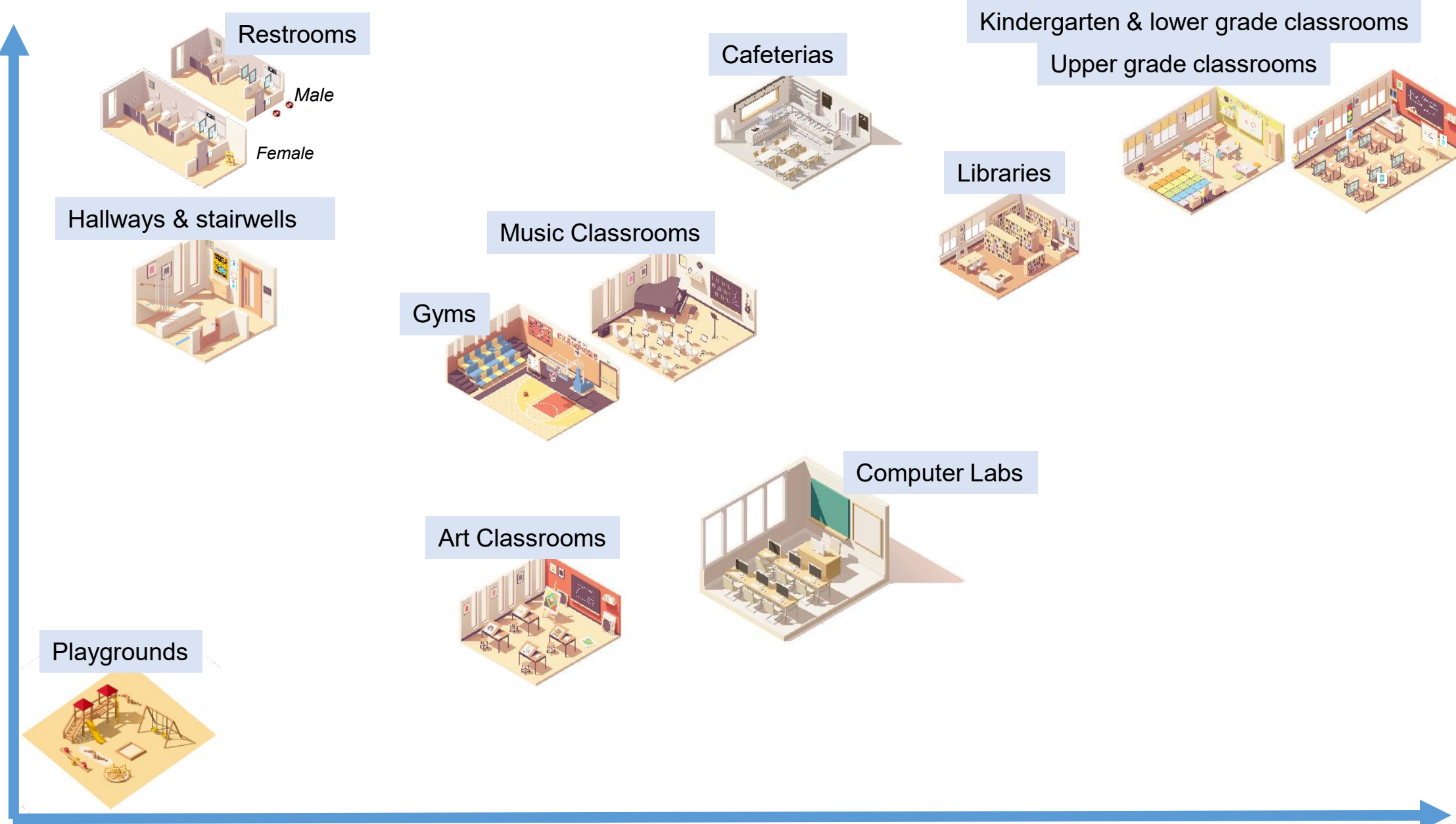
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Administrative & engineering strategies

Importance of Risk Reduction Strategies

Administrative & other alternative strategic planning



- Short-term occupancy
- Less occupants

Occupancy Period per Day
& Number of Occupants

- Long-term occupancy
 - More occupants



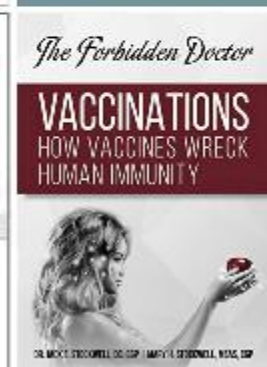
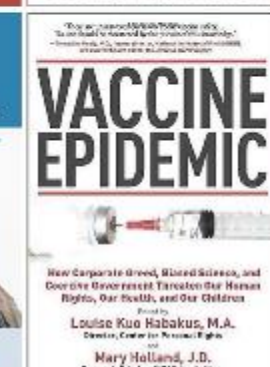
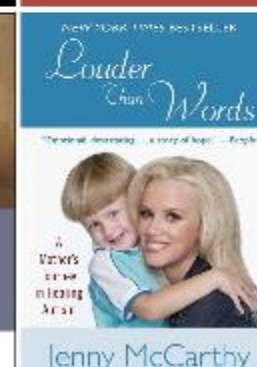
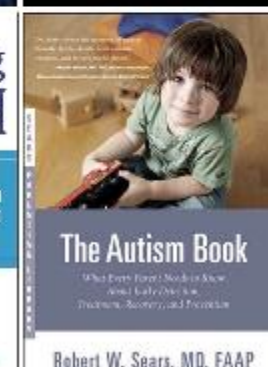
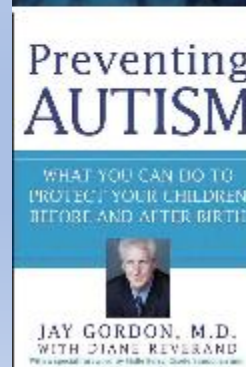
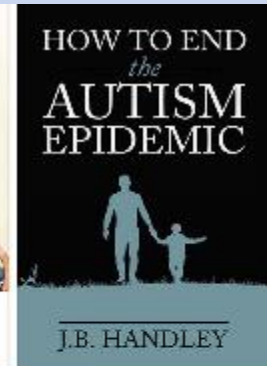
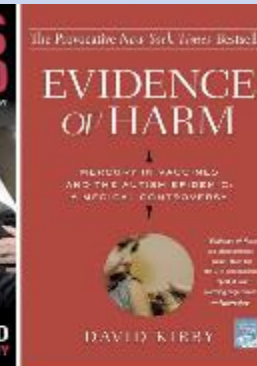
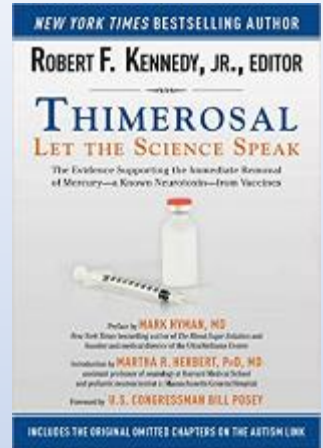
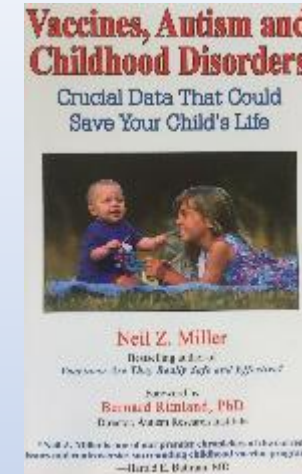
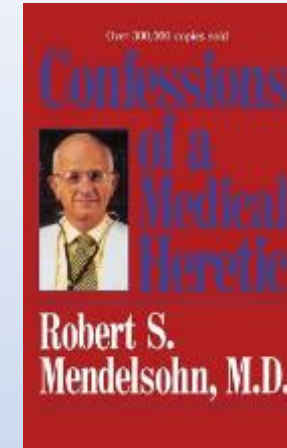
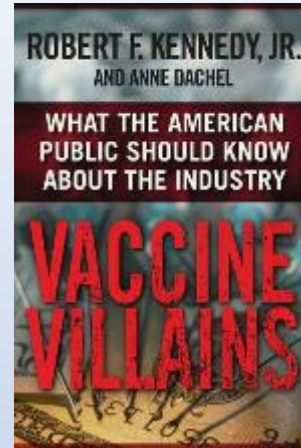
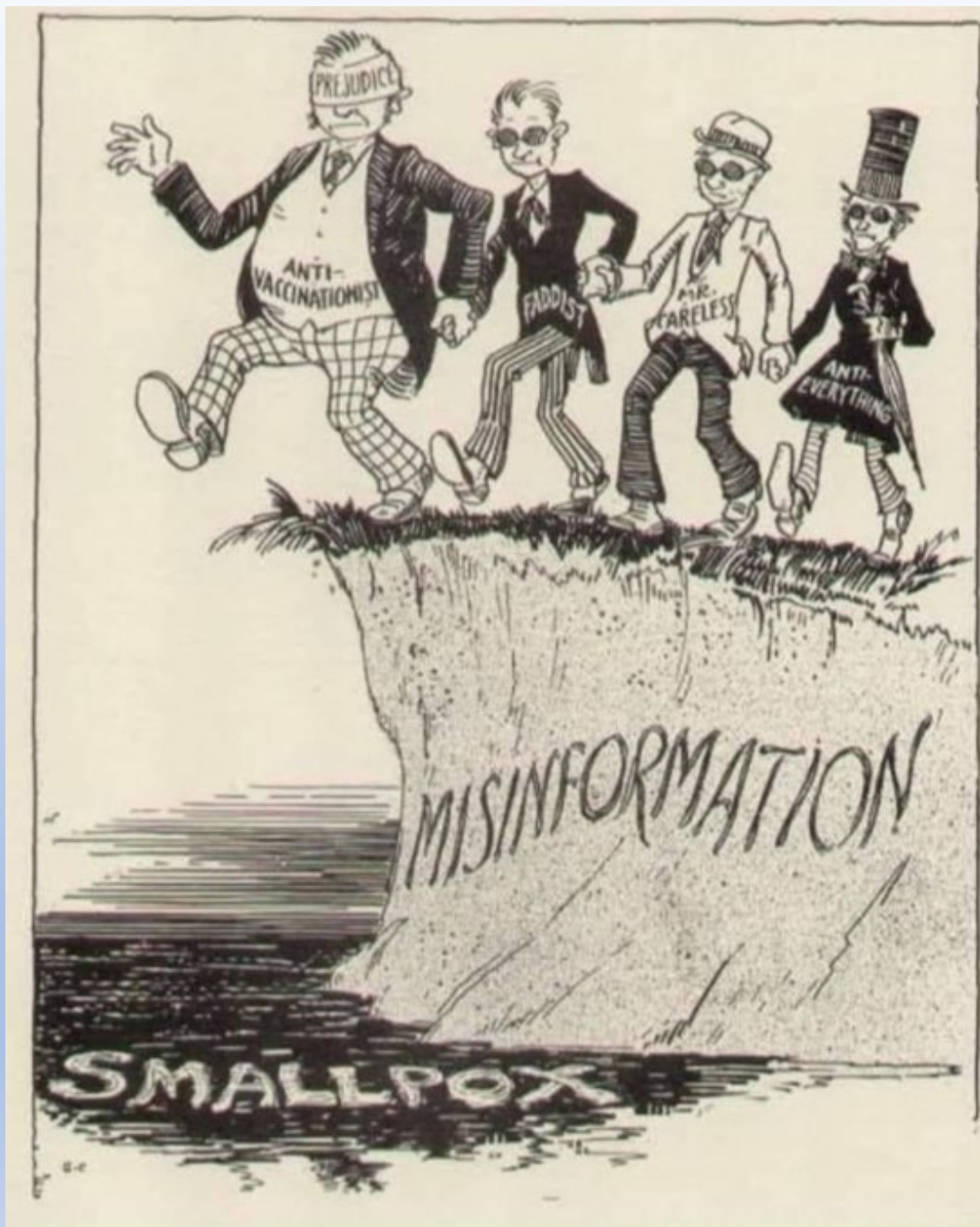
K-12 Student Mental Health during COVID-19

- Increases in mental health related ED visits for youth suicidal ideation
- Sleep disruption, COVID fear, anxiety, depressive symptoms, boredom, sadness, clinginess, ED visits, suicide ideation
- Parents' report of impact: 1/4 worse mental health; 1/7 worse child behaviors
- School underperformance (limitations of virtual learning; disadvantaged children)
- Factors
 - Protective factors: ave. >30 mins physical activity/day, having siblings, predictable home environment/routines, feeling socially supported, COVID prevention adherence
 - Risk factors: pre-COVID mental illness, early life stresses, older students, in virtual learning, higher fear, girls, loss of childcare, changes in insurance status, food insecure

Xiao H, et al. Social Distancing among Medical Students during the 2019 Coronavirus Disease Pandemic in China: Disease Awareness, Anxiety Disorder, Depression, and Behavioral Activities. *Int J Environ Res Public Health* 2020;17(14):5047.

Huang D, et al. Social Media Survey and Web Posting Assessment of the COVID-19 Response in China: Health Worker Attitudes Toward Preparedness and Personal Protective Equipment Shortages. *Open Forum Infect Dis* 2020;7(10):ofaa400.

Vaccine confidence issues/Vaccine hesitancy are also no surprise



Vaccine enthusiasm vs. hesitancy

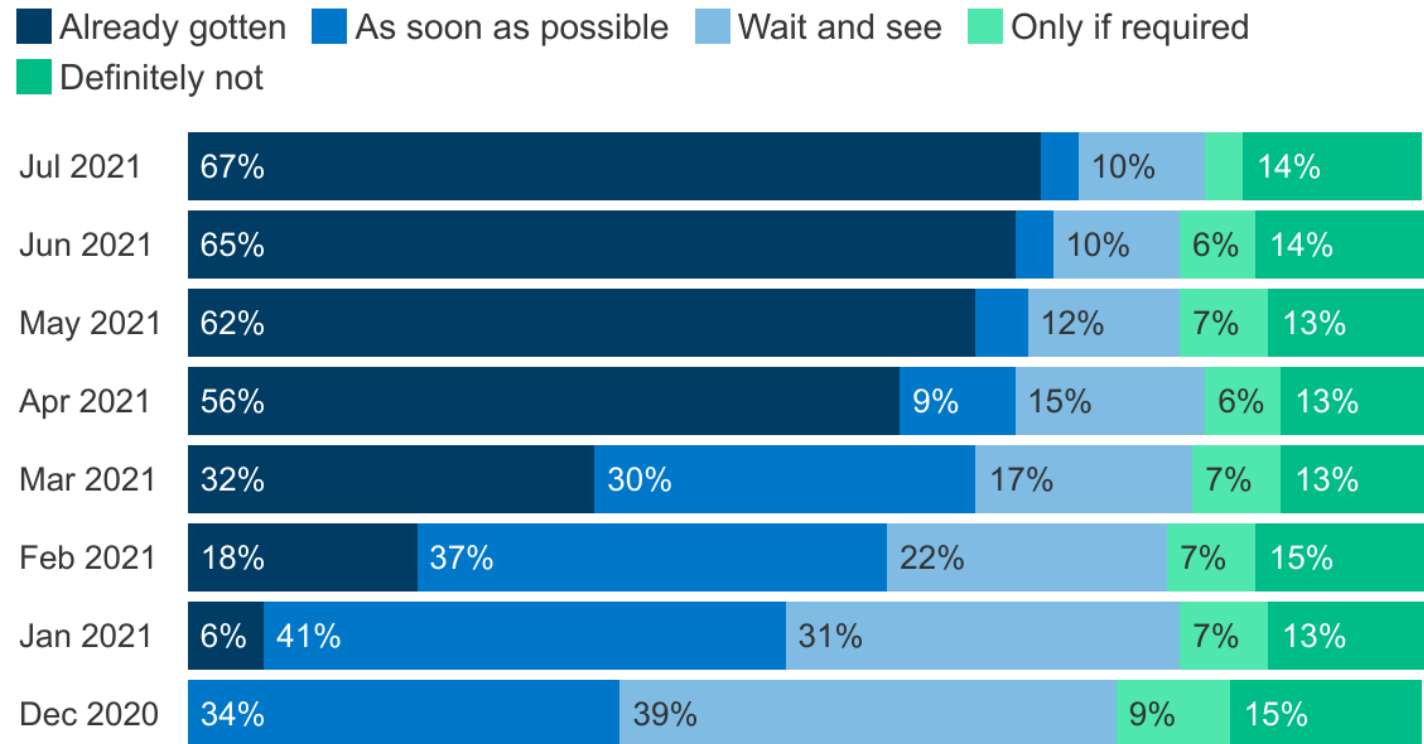
- If a coronavirus vaccine is determined to be safe by scientists and is available for free to everyone who wanted it, would you --definitely get it, --probably get it, --probably not get it. or --definitely not get it?

KFF COVID-19 Vaccine Monitor:
Began in December 2020

Figure 1

Seven In Ten Adults Have Either Gotten A COVID-19 Vaccine Or Plan To Do So ASAP

Have you personally received at least one dose of the COVID-19 vaccine, or not? As you may know, an FDA-authorized vaccine for COVID-19 is now available for free to all adults in the U.S. Do you think you will...?



NOTE: December 2020 survey did not have an option for respondents to indicate they had already been vaccinated. Jan-Apr 2021 question wording: "When an FDA authorized vaccine for COVID-19 is available to you for free, do you think you will..." See topline for full question wording.

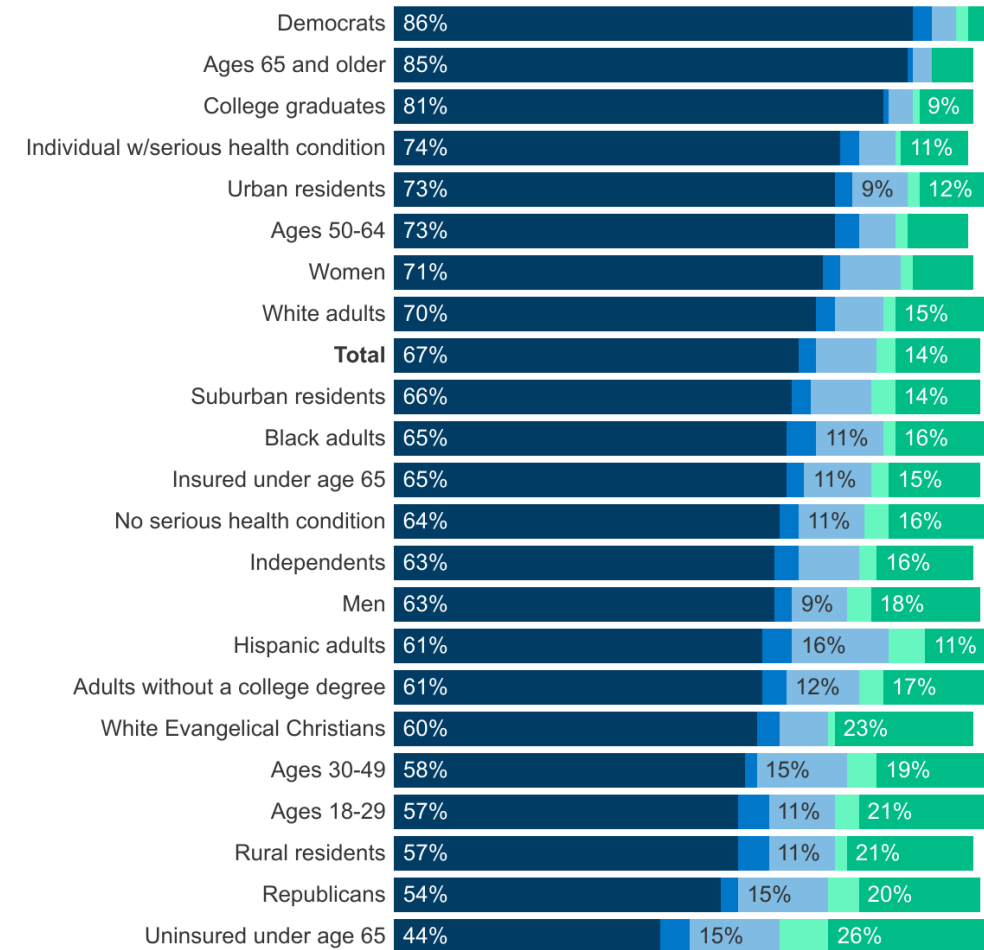
SOURCE: KFF COVID-19 Vaccine Monitor

Figure 3

Republicans, Rural Residents, Younger Adults, And Uninsured Lag In Vaccine Uptake

Have you personally received at least one dose of the COVID-19 vaccine, or not? As you may know, an FDA-authorized vaccine for COVID-19 is now available for free to all adults in the U.S. Do you think you will...?

■ Already received at least one dose
 ■ Get vaccinated ASAP
 ■ Wait and see
 ■ Only if required
 ■ Definitely not



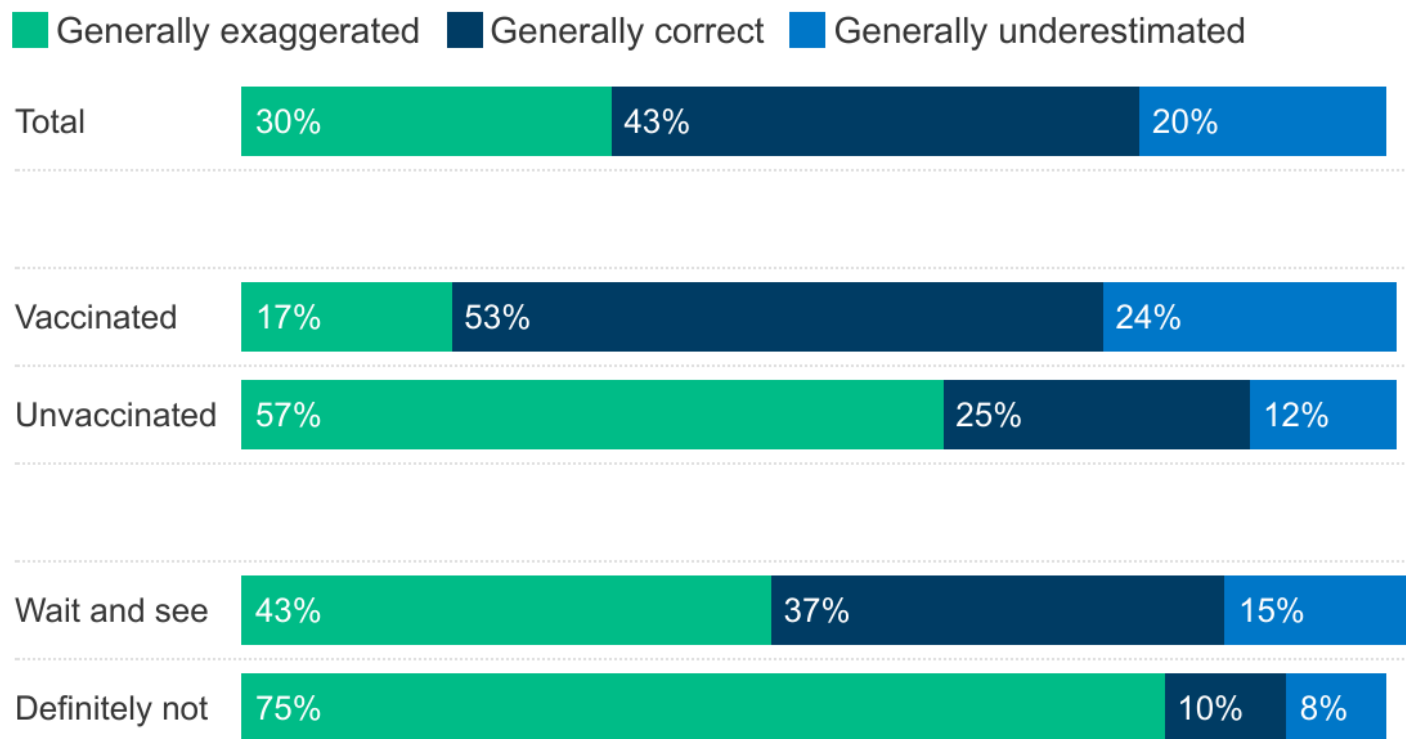
NOTE: See topline for full question wording.

SOURCE: KFF COVID-19 Vaccine Monitor (July 15-27, 2021)

Figure 6

Views Of The Seriousness Of Coronavirus Are Closely Tied To Vaccine Intentions With Most Who Say They Won't Get Vaccinated Also Saying The Pandemic Has Been Exaggerated

Thinking about what is said in the news, in your view is the seriousness of coronavirus generally exaggerated, generally correct, or is it generally underestimated?



NOTE: See topline for full question wording.
SOURCE: KFF COVID-19 Vaccine Monitor (July 15-27, 2021).

Figure 12

Public Divided Across Vaccination Status, Partisanship On Whether Federal Government Should Recommend Employers Mandate Vaccines Among Employees

Do you think the federal government should recommend that employers require their employees to get the COVID-19 vaccine unless they have a medical exception, or not?

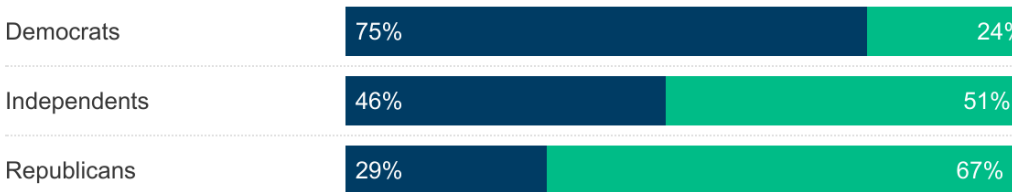
■ Should recommend ■ Should not recommend



COVID-19 vaccination status



Party identification



Health care workers



NOTE: See topline for full question wording.
SOURCE: KFF COVID-19 Vaccine Monitor (July 15-27, 2021)

Personality and COVID-19 Protection

- ✓ Individuals who resent authority are twice as likely to never wear a mask.
- ✓ Individuals who believe the truth about coronavirus is being kept from the public are twice as likely to never wear a mask.

Source: Resnicow K et al. *J Med Internet Res* 2021;23(4):e23488.



COVID-19 Vaccination* Communication:

Applying Behavioral and Social Science
to Address Vaccine Hesitancy and
Foster Vaccine Confidence**

COVID-19 Vaccination*

Communication: Applying Behavioral
and Social Science to Address
Vaccine Hesitancy and Foster
Vaccine Confidence

Chou W-YS, Burgdorf CE, Gaysynsky
A, Hunter CM.

NCI/NIH and Office of Behavioral and
Social Science Research, Division of
Program Coordination, Planning, and
Strategic Initiatives, NIH

Sherry Pagoto, Ph.D., University of Connecticut

Meeka Demaree, Ph.D., M.D., University of Kansas

https://obssr.od.nih.gov/wp-content/uploads/2020/12/COVIDReport_Final.pdf

<https://www.cdc.gov/vaccines/covid-19/health-systems-communication-toolkit.html>

Persuading the Resistant and Conspiratorial - I

- Affirm/Agree As Far As You Can → Validating and respecting concerns
 1. You're right the pharmaceutical industry is making a lot of money on this
 2. You're right the vaccine was developed in record time
 3. You're right the government has historically treated African Americans horribly
 4. You've thought about this a lot
 5. You value your freedom

Persuading the Resistant and Conspiratorial - II

- Move the motive from Protecting Self to Helping Others
- Preserve independence
- Consider the “Be a Protector” Approach

Keep in mind:

- Counterarguing likely counterproductive
- Information alone will likely not convert

YSPH activities in addressing vaccine hesitancy

- Saying “yes” to every possible webinar or media invitation for communities and policymakers
 - Governor’s Task Force: Jason Schwarz, Albert Ko, Jim Hadler, Rick Martinello (YSM)
 - FaceBook; NASEM; the WHO: Saad Omer, Inci Yildirim, Fauzia Malik, YIGH post-docs
 - The Creative Coalition; USC Hollywood Health and Society; Rotary International: Sten Vermund
 - GAVI: Global Health Leadership Initiative: Erika Linnander and team

Evidence and commentary for Vaccine policy and projection

- Schoch-Spana M, et al, Omer SB, Orenstein WA, et al. **The public's role in COVID-19 vaccination: Human-centered recommendations to enhance pandemic vaccine awareness, access, & acceptance in the U.S.** *Vaccine* 2020
- Bokemper SE, Huber GA, Gerber AS, James EK, Omer SB. **Timing of COVID-19 vaccine approval and endorsement by public figures.** *Vaccine* 2021
- Paltiel AD, Schwartz JL, Zheng A, Walensky RP. **Clinical Outcomes Of A COVID-19 Vaccine: Implementation Over Efficacy.** *Health Aff (Millwood)* 2021
- Caban-Martinez AJ, Silvera CA, Santiago KM, et al. **COVID-19 Vaccine Acceptability among U.S. Firefighters and Emergency Medical Services Workers: A Cross-Sectional Study.** *J Occup Environ Med* 2021

The Washington Post and Yale School of Public Health form the Covid Counting Consortium (3C) to understand the impact of covid-19 on the U.S.

Obituaries partner Legacy.com to share obit data with the consortium



Jonah Markowitz for The New York Times

Virus detection wristbands:



USNews NEWS » News Best Countries Best States Healthiest Communities Cities The Report Photos Events America 2020

HOME / NEWS / HEALTH NEWS

Saliva-Based COVID-19 Test Might Be Alternative to Deep Nasal Swab

April 27, 2020, at 2:00 p.m.

By Dennis Thompson
HealthDay Reporter

MONDAY, April 27, 2020 (HealthDay News) — Testing for the COVID-19 coronavirus can be an unpleasant affair, with a doctor or nurse shoving a cotton swab deep into your nasal cavity to get a good sample.

YOUR TIME IS NOW ALABAMA

COVID-19

Potential Fund Impact: COVID-19 Solutions in Progress

- In modeling and data sciences – predicting transmission dynamics and effects on the most vulnerable, development of monitoring tools, and more.
- In technology and devices – developing a wristband for airborne virus detection
- In testing – using saliva as an alternative to nasal swabs
- In viral genomics and serologic discovery

From Refining Tests to Tracing Its Path, an Innovative Yale Scientist Battles the Coronavirus



The Debates!

- <https://ctmirror.org/category/ct-viewpoints/is-classroom-teaching-advisable-during-covid-19-with-precautions-absolutely/>



- <https://ctmirror.org/category/ct-viewpoints/response-to-is-classroom-teaching-advisable-during-covid-19-with-precautions-absolutely/>



Our Ongoing Projects

- Explore the knowledge, attitudes, and practices concerning COVID-19 and adherence to prevention practices
- Explore attitudes and concerns regarding a return to in-person learning vs. online learning
- Learn more about the emotional and mental health needs of students, parents, and teachers/staff in the context of COVID-19
- Identify barriers and challenges to school safety through COVID-19 coordinators
- Explore the effectiveness of digital contact tracing on school safety

Conclusions

- Shuttered classrooms hurt vulnerable students the most
- Schools can be run safely in this pandemic with rigorous and disciplined structure and cooperation
 - Investments are essential
 - Compromises must be made
- Now we have vaccines!

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Thank you for inviting me to give today's Silverman Memorial Lecture