



Mitigating Inherent Risk

Formulating Strategies and Action Plans to
Address the Effects of the Coronavirus

Adam Schwalje MD DMA



Disclaimer



Mitigating Inherent Risk

- **General principles of risk reduction**
- Aerosols
 - Aerosol production
 - Aerosol mitigation
 - Ventilation
 - Distance
 - Time
 - Musician-specific considerations
- Local Variations
 - Experiences at UI
- Decision Making
 - Load the Boat
 - Stacking solutions



General Principles of Risk Reduction

- Ethics and Risk Management
 - Medical Ethics in Decision Making
 - Nonmaleficence
 - Beneficence
 - Autonomy
 - Justice

Beauchamp, Tom L., and James F. Childress. Principles of Biomedical Ethics / Tom L. Beauchamp, James F. Childress. Fourth ed. New York: Oxford University Press, 1994.



General Principles of Risk Reduction

- Ethics and Risk Management
 - Risk Management Principles
 - Decision-oriented
 - Begins with Diagnosis
 - Analytic / deliberative risk characterization: Accurate, balanced, informative (shared decision making)
 - Judgement

Stern, Fineberg, National Research Council . Committee on Risk Characterization, Stern, Paul C., and Fineberg, Harvey V. Understanding Risk : Informing Decisions in a Democratic Society / Paul C. Stern and Harvey V. Fineberg, Editors. Washington, D.C.: National Academy Press, 1996.



Mitigating Inherent Risk

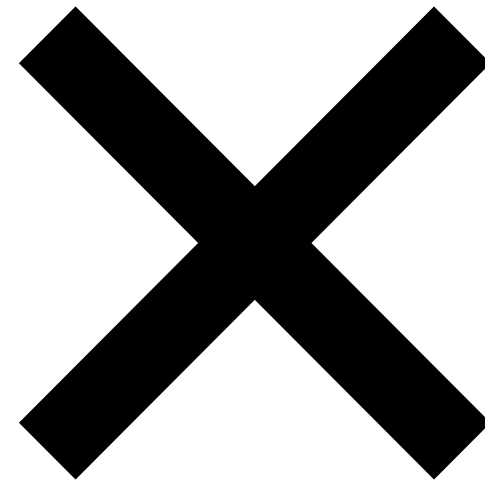
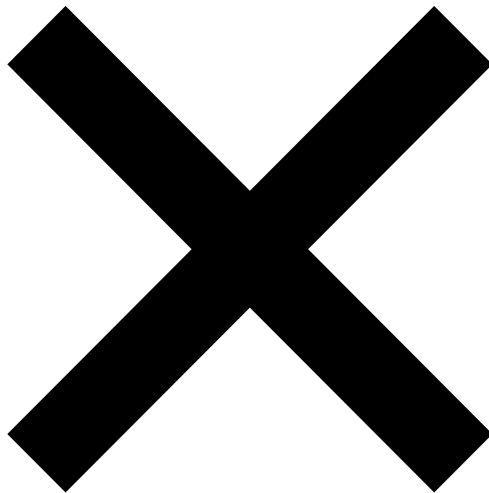
- General principles of risk reduction
- **Aerosols**
 - **Aerosol production**
 - Aerosol mitigation
 - Ventilation
 - Distance
 - Time
 - Musician-specific considerations
- Local Variations
 - Experiences at UI
- Decision Making
 - Load the Boat
 - Stacking solutions



Aerosol production

Previous data: Speaking and Vuvuzela

Vuvuzela



Asadi S, Wexler AS, Cappa CD, Barreda S, Bouvier NM, Ristenpart WD. Aerosol emission and superemission during human speech increase with voice loudness. *Sci Rep.* 2019;9(1):2348. Published 2019 Feb 20. doi:10.1038/s41598-019-38808-z

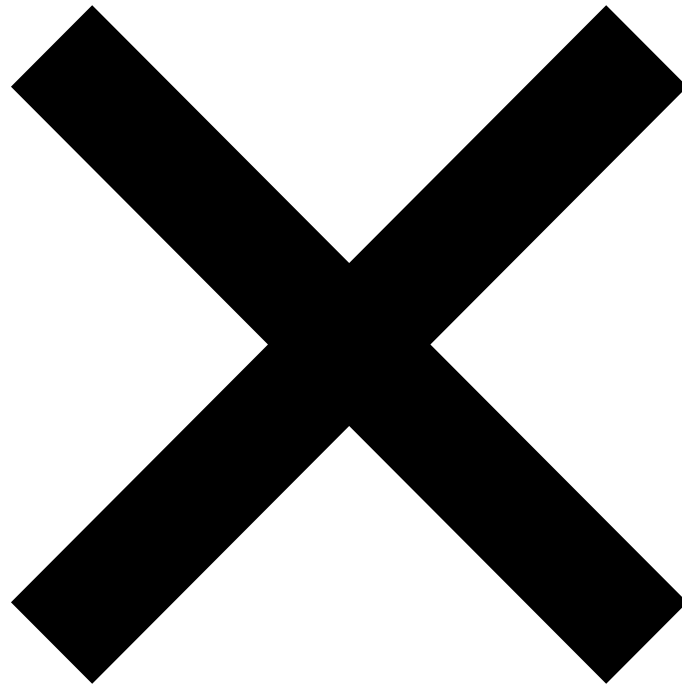
Lai, K. M., Bottomley, C., & McNERney, R. (2011). Propagation of respiratory aerosols by the vuvuzela. *PLoS ONE*, 6(5). <https://doi.org/10.1371/journal.pone.0020086>



Aerosol Production

Boulder preliminary results- soprano

As measured in clean room, Dr. Shelly Miller, PI

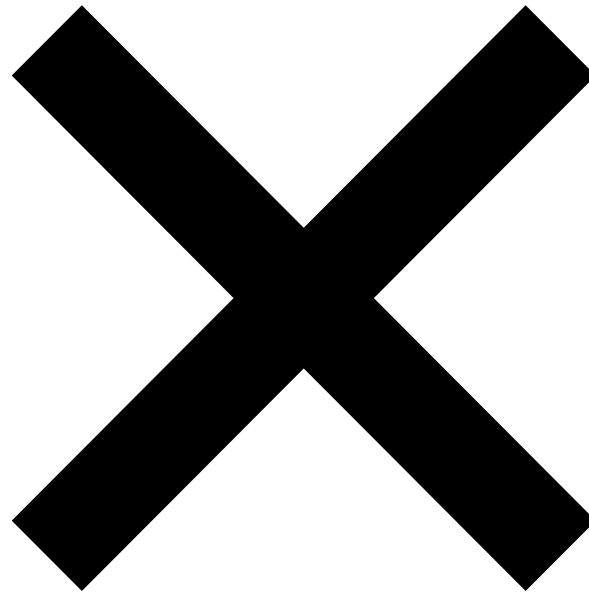





Aerosol Production

Boulder preliminary results- clarinet


As measured in clean room, Dr. Shelly Miller, PI





Summary of Studies on Winds, Brass, and Singing Aerosol Production

Group	Space	n winds / n players	n brass / n players	n voices / n singers	Aerosols created?
Boulder	clean room	4/4	4/4	1/1	Y
Cincinnati	studio	3/3	4/4	1/2	Y
Minneapolis	clean-ish room	6/10	4/6		Y
London	clean room		8/7		Y but < than heavy breathing
Odense	studio	4/4	4/4		Y but << than coughing
Ft Collins	*in progress				



Defining the Problem: Music Making is an Edge Case

- Winds, brass, and singers are at *higher than baseline risk* of disseminating COVID-19 during performance
- *Not specifically addressed* by most federal, state, local, university guidelines
 - CDC K-12 back-to-school guidelines label as “critical” SARS-CoV-2 mitigation strategies such as social distancing, cloth face coverings, hand hygiene, and use of cohorting.
 - **If the mitigation strategies cannot be implemented, activities should be limited or cancelled.**
 - CDC higher education guidance: “When there is minimal to moderate community transmission”... **“Cancel or modify courses where students are likely to be in very close contact,** such as lecture courses with close seating, or music or physical activity classes where students are likely to be in close proximity.”

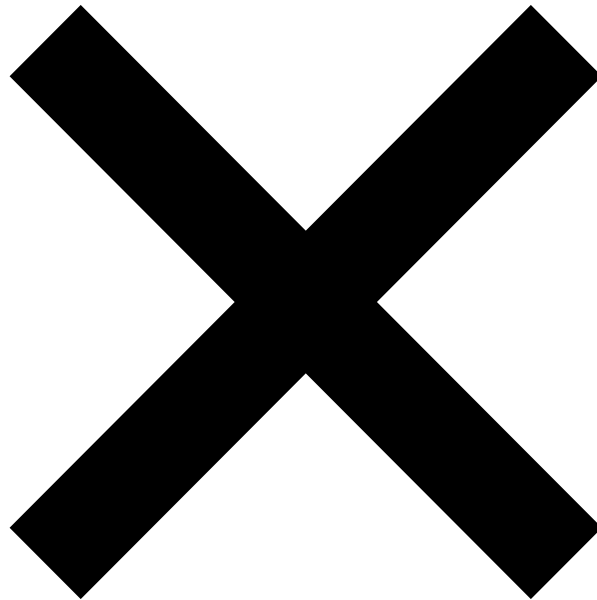


Mitigating Inherent Risk

- General principles of risk reduction
- **Aerosols**
 - Aerosol production
 - **Aerosol mitigation**
 - Ventilation
 - Distance
 - Time
 - Musician-specific considerations
- Local Variations
 - Experiences at UI
- Decision Making
 - Load the Boat
 - Stacking solutions



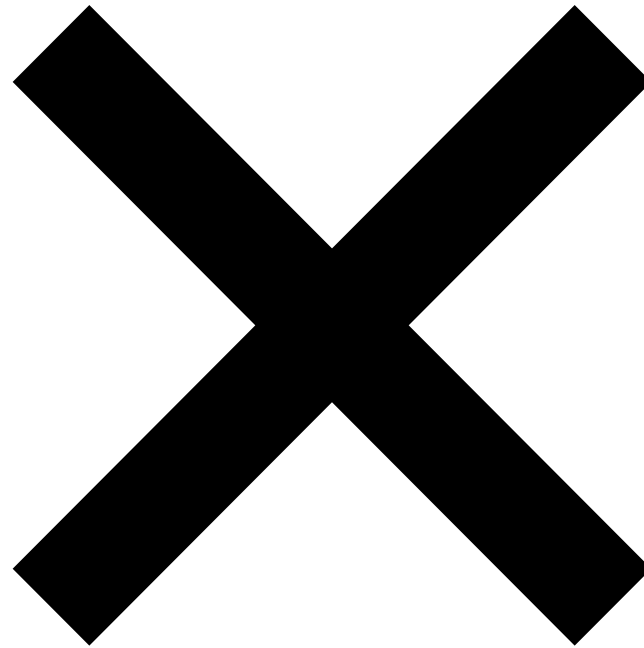
Aerosol mitigation: Ventilation



“These numerical findings need to be compared to actual experimental data as numerical simulations cannot replace experiments when studying new transport phenomena, especially the ones that threaten human life.”



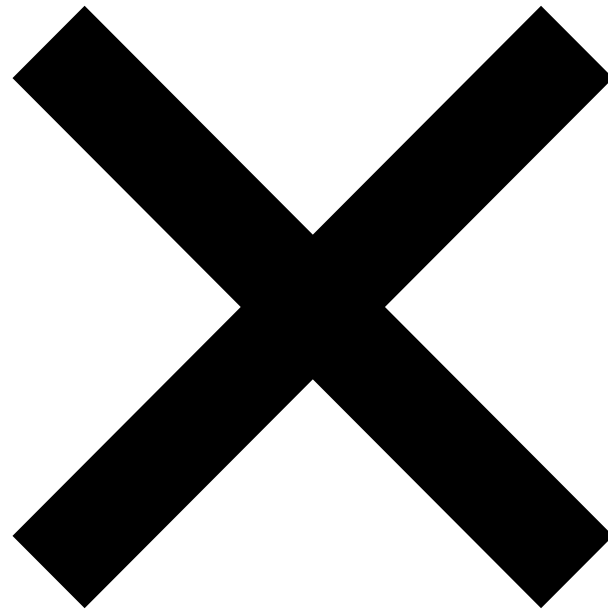
Aerosol Mitigation: Ventilation



“Such inefficient particles [*sic*] removal through ventilation is largely associated with the presence of many stable circulation regions in the large space..., which increases particle residence time, causes the majority of particles deposited to surfaces..., and forms hot spots of surface contamination...”



Aerosol mitigation: Distance

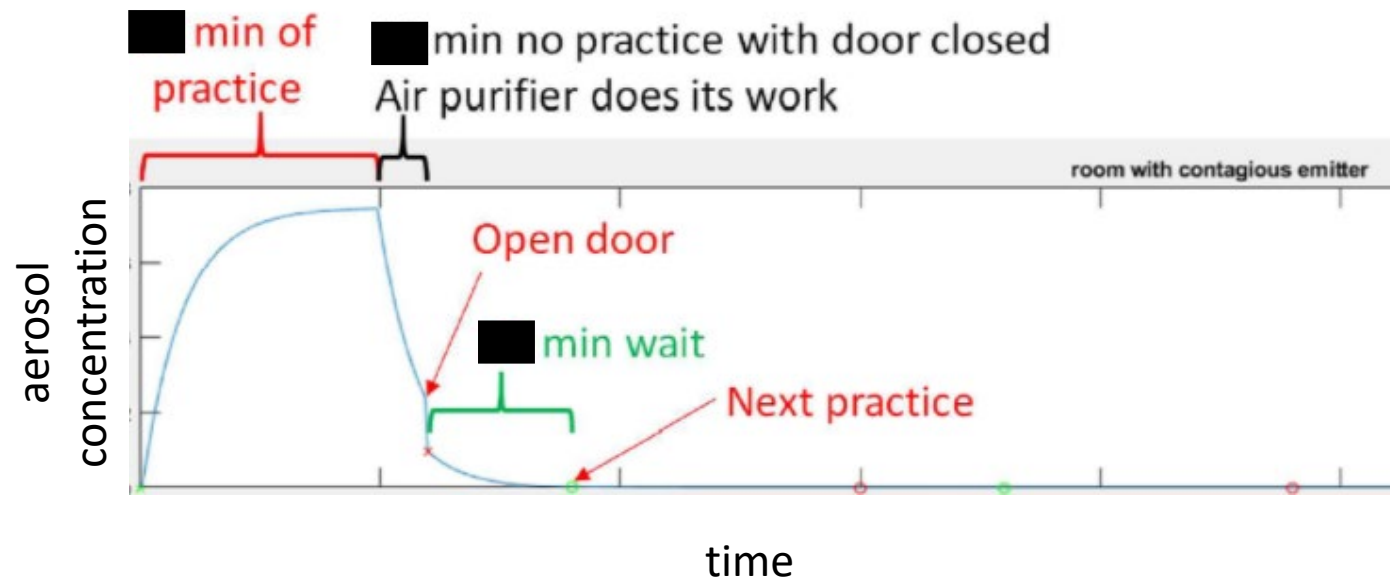


Aerosol mitigation: Time

Dose = exposure x time

Dose ~ Infection risk

Dose ~ Severity of Infection





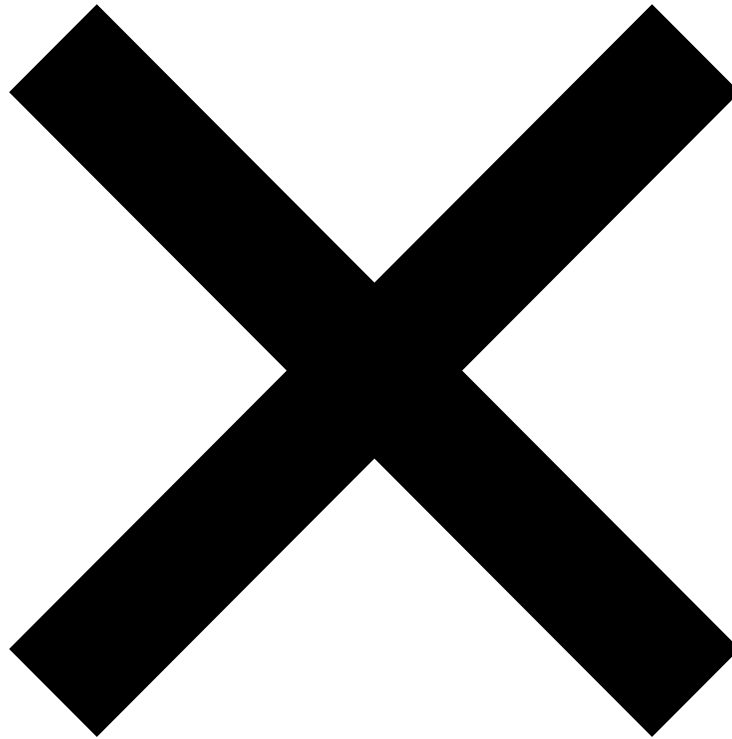
Mitigating Inherent Risk

- General principles of risk reduction
- Aerosols
 - Aerosol production
 - Aerosol mitigation
 - Ventilation
 - Distance
 - Time
 - **Musician-specific considerations**
- Local Variations
 - Experiences at UI
- Decision Making
 - Load the Boat
 - Stacking solutions



HEPA filtration

Measured in Cincinnati practice room (6 air changes per hour), Dr. Jun Wang, PI

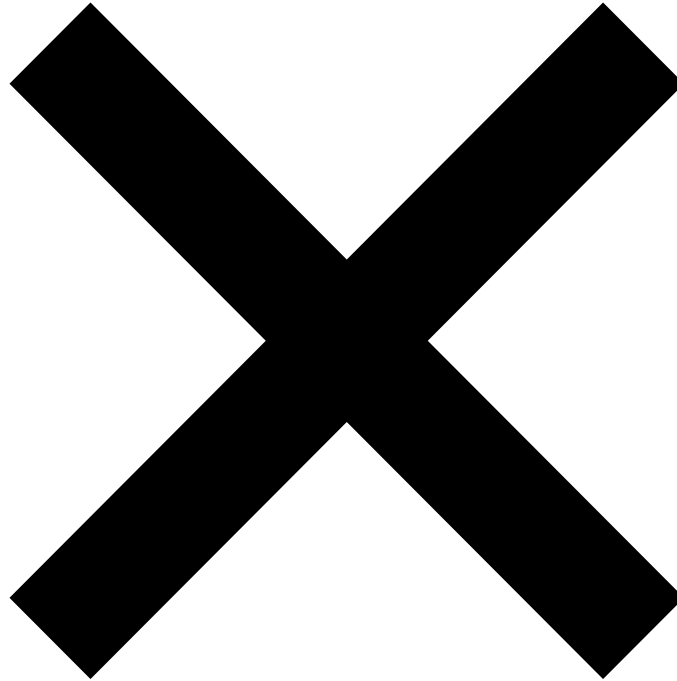




Modified masks

Data from Boulder study

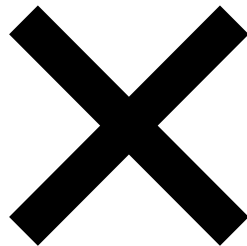
- 1- did not tolerate**
- 1- increase**
- 2- slight decrease**
- 3- decrease**





Masks for singers

Data from Boulder study: **1 Orator and 1 non-operatic singer**
****well-fit mask****

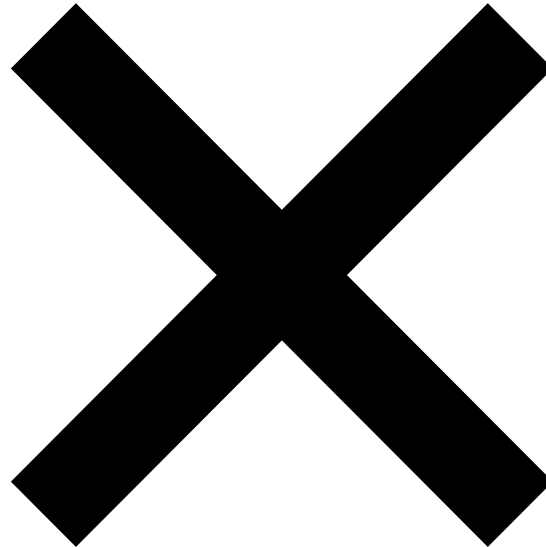


Modified from:

<https://www.nfhs.org/media/4030003/aerosol-study-prelim-results-round-2-final.pdf> accessed August 8, 2020



Bell covers



Data from Boulder

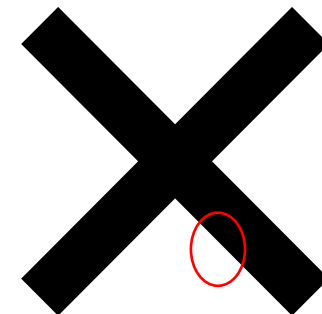
- 2- could not use**
- 3- slight decrease**
- 3- decrease**

<https://www.nfhs.org/media/4030003/aerosol-study-prelim-results-round-2-final.pdf> accessed August 8, 2020

Alexander Stuart Parker, Kenneth Crookston. Investigation into the Release of Respiratory Aerosols by Brass Instruments and Mitigation Measures with Respect to Covid-19. medRxiv 2020.07.31.20165837; doi: <https://doi.org/10.1101/2020.07.31.20165837> [posted August 4, 2020, preprint]

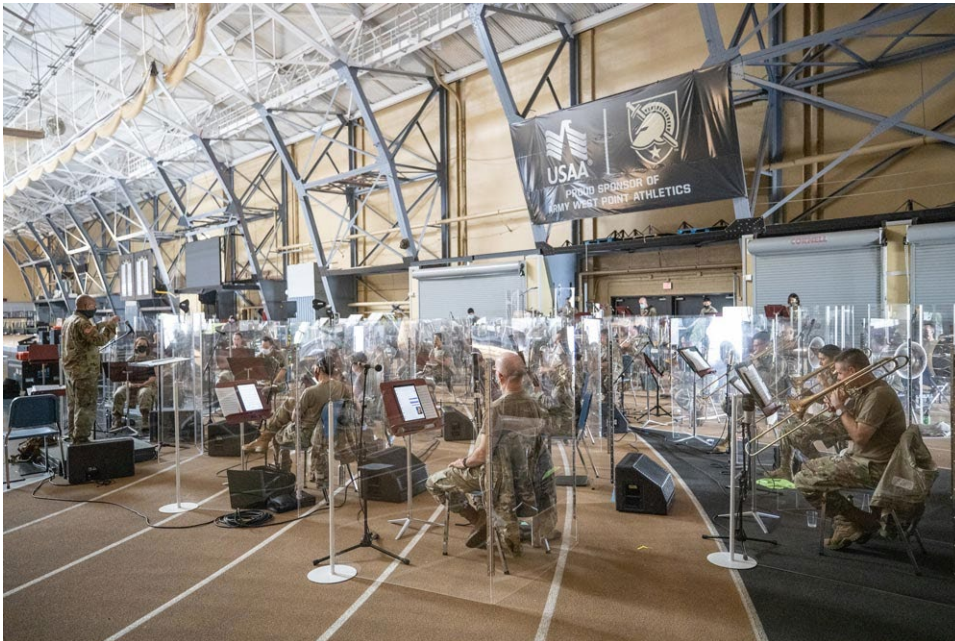
“aerosol-type” particles from brass

Data from London
All brass- decrease



Shields

- Can protect against larger droplets
- Largely ineffective against aerosols



<https://www.westpointband.com/westpointmusicresearchcenter/army-band-covid-19-risk-mitigation-for-large-groups.html>



Associated Behaviors

- Emptying spit valves
- Blowing out tone holes
- Instrument swabs / feathers
- Sharing instruments (i.e., methods class, contrabassoons)
- On and offstage movement
- Classroom activities (sight singing)

Reeds

JULY 2020

REED SANITATION FOR SARS-COV-2

INFOGRAPHIC CREATED BY RYAN FOX

DR. ADAM T SCHWALJE, MD, DMA

BASED ON CORRESPONDENCE WITH VIROLOGIST, DR. PETER W KRUG, PH.D



NO REED SHARING

Short term reed sharing is not a viable practice going forward until after community spread of the virus is over and/or a vaccine is made available. No short-term disinfection procedure that does not damage the reed's playing ability should be considered at this point.

REGARDING SHORT TERM SOAK IN ALCOHOL

All disinfectants registered by EPA are for disinfection (after cleaning) on hard, *nonporous* surfaces.

[HTTPS://WWW.EPA.GOV/CORONAVIRUS](https://www.epa.gov/coronavirus)

Respiratory secretions are full of proteins, cell debris, etc. and at the microscopic level this sputum, as it dries, will protect virus from immediate inactivation by drying and disinfection. On a porous surface like wood, these tiny microparticles lodge themselves into the pores of the wood, making them difficult to access and dislodge by mere soaking in liquid.

- DR. PETER W KRUG, PH.D

RECOMMENDED PROTOCOL FOR REED MAKERS

PREPARED FOR OTHERS/DISTRIBUTION

1

WASH HANDS OFTEN

Prepare reed as usual, and disinfect in 75% ethanol (could use Everclear) for 2 minutes completely submerged.

2

ALLOW REED TO DRY OVERNIGHT

Mail the reed to the purchaser.

3

QUARANTINE THE REED

Upon receipt, open the vial and let it sit out in ambient air for at least 4 days, preferably a week prior to use. **During this time, if the reedmaker gets sick, the reed should be disposed of.**

Dr. Schwalje co-authored an article entitled "[Wind Musicians' Risk Assessment in the Time of COVID-19](https://bit.ly/2Z9FFNT)" published on the Iowa Protocols, provided by the University of Iowa.

[HTTPS://BIT.LY/2Z9FFNT](https://bit.ly/2Z9FFNT)

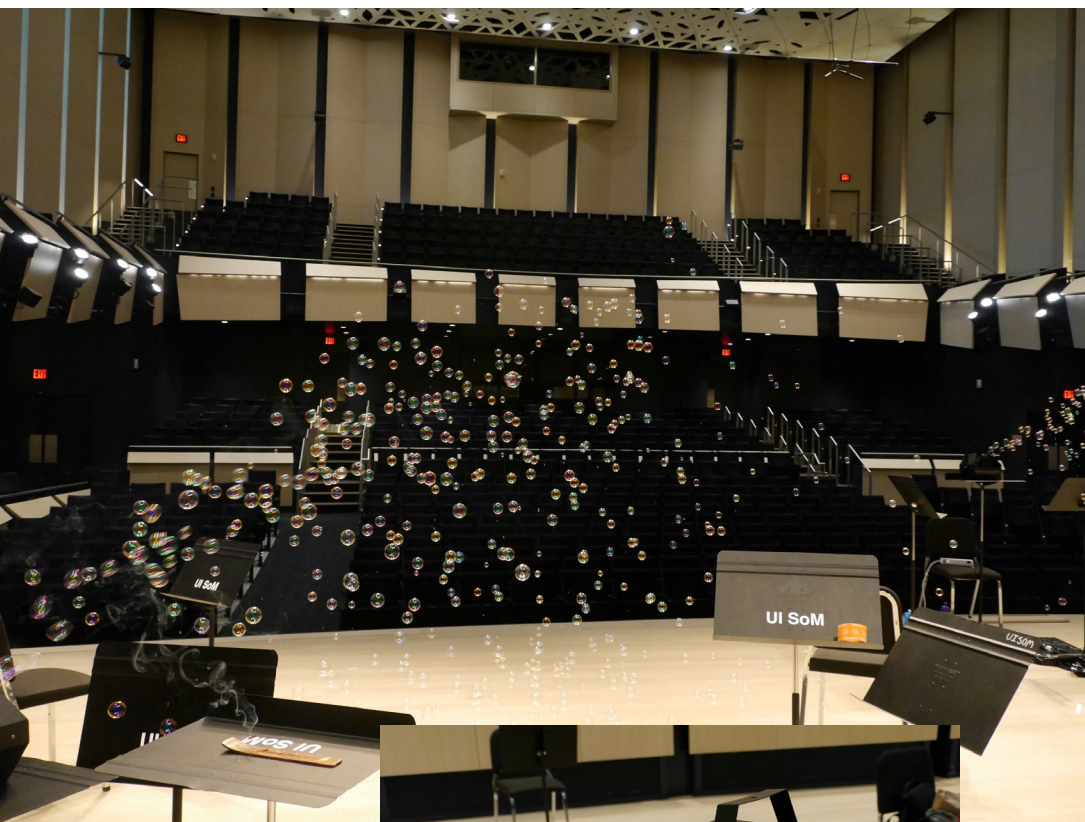


Mitigating Inherent Risk

- General principles of risk reduction
- Aerosols
 - Aerosol production
 - Aerosol mitigation
 - Ventilation
 - Distance
 - Time
 - Musician-specific considerations
- **Local Variations**
 - Experiences at UI
- Decision Making
 - Load the Boat
 - Stacking solutions



UI Ventilation





Mitigating Inherent Risk

- General principles of risk reduction
- Aerosols
 - Aerosol production
 - Aerosol mitigation
 - Ventilation
 - Distance
 - Time
 - Musician-specific considerations
- Local Variations
 - Experiences at UI
- **Decision Making**
 - Load the Boat
 - Stacking solutions



Importance of Analysis, Deliberation, Shared decision-making

**These are the kinds of things teachers have
been trying to figure out *on their own*:**

“ Can I fit [a high number of] woodwind methods students in my room with [a low number of] air changes per hour for hour-long classes?”

“ Can I put up a clear shower curtain to protect myself from my student’s aerosols?”

“I’m planning to have all my students put their instruments in a bag to play them.”



Analysis and Deliberation

- Load the Boat
 - Music making is an “edge case”
 - Marshall local resources: Building engineer, facilities management, ventilation designer, aerosol expert, infectious disease physician, local hospital / medical school, testing / research labs

Defining your problem

- Online risk calculators
- Air change rate?
CO2 monitoring
(fire extinguishers)
- Smoke (incense)
- Nebulizer
- Particle counter
(~\$2500)

COVID-19 Aerosol Transmission Estimator		File --> Make a Copy OR Download to Excel (Click GREEN links below if don't see option)	
Developed by:	Prof. Jose L. Jimenez, Dept. of Chem. and CIRES, Univ. of Colorado-Boulder	Shortcut:	https://tinyurl.com/covid-estimator
Short description of this tool in CIRES Press Release:	Simplified version of this tool by Nat Geographic	Direct copy in Google Drive (as Google Sheet)	Direct download into Excel
5 min. read on aerosol evidence:	Patterns of transmission	Extensive discussion in my Twitter Threads	Come back for new versions
Recorded webinar on this tool:	1. Description & Tour (watch first)	2. Q&A session	3. Short intro by A. Mishra
Informacion en español / castellano:	1. Descripción y demostración	2. Entrevista PF	3. Entrevista HA
Subscribing to email list for tool:	https://groups.google.com/forum/#!forum/covid-estimator		
Using extensive input and feedback from many people (But any mistakes are my own):	Linsey Marr, Shelly Miller, Giorgio Buonanno, Lidia Morawska, Don Milton, Julian Tang, Jarek Kumitski, Xavier Querol, Matthew McQueen, Charles Stanier, Joel Eaves, Alfred Trukenmueller, Ty Newell, Greg Blonder, Andrew Maynard, Nathan Skinner, Clark Vangilder, Roger Olsen, Alex Mikszewski, Prasad Kasibhatla, Joe Bruce, Paul Dabisch, Yumi Roth, Andrew Persily, Susan Masten, Sebastien Tixier, Amber Kraver, Howard Chong, John Fay, Dustin Poppendieck, Jim Bagrowski, Gary Chaulkin, Richard Meehan, Jarrell Wenger, Alex Huffman, Bertrand Waucquez (only listing the most important here, many others have contributed feedback as well over email and Twitter. Thanks a lot to everyone!)		
Version & date	3.4.14	13-Aug-20	





Decision Making

- Stack solutions
 - Unknown risks, unknown benefits
- Maintenance / active surveillance



Decision Making

- Do the hard work to figure out how to make music safely in your spaces, with your people, in your community