

NASEM Environmental Health Matters Initiative

Indoor Air Management of Airborne Pathogens



Session 2: Case Studies

Chang-Yu Wu, University of Florida

Sep 14, 2022

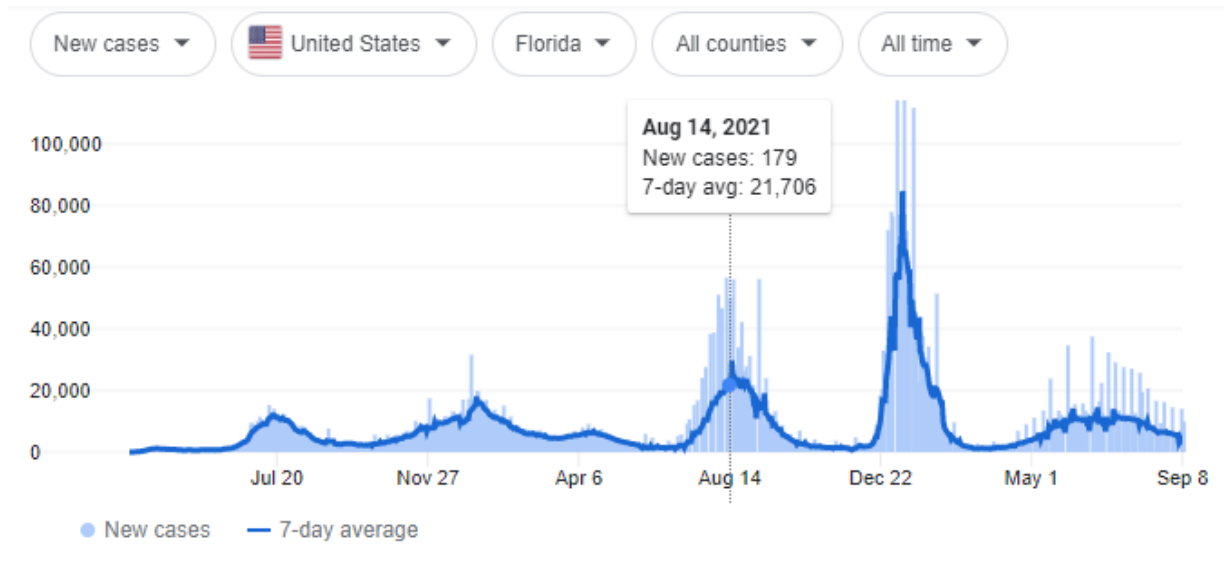
Sampling for **viable SARS-CoV-2** in 2 elementary schools

Situation

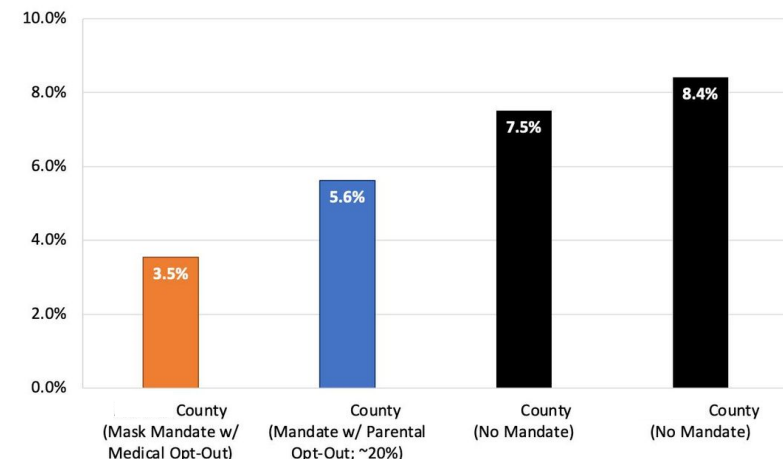
- Delta variant ravaging in sunbelt states in summer (2021)
- Community concern: protection from infection & children learning
- School district's mask mandate vs. resistance from parents and state government
- UF team's prior sampling activities¹⁻⁵

COVID-19 Weekly Situation Report: Demographics Overview
Previous week (August 20, 2021 - August 26, 2021)

County	2021 population	Cumulative (since March 1, 2020)				Previous week (August 20, 2021 - August 26, 2021)			
		People vaccinated	Percent 12+ vaccinated	Cases	Case positivity	People vaccinated	Cases	New case positivity	Cases per 100,000 population
All ages	21,975,117	12,916,873	68%	3,179,714	20.3%	192,408	151,749	16.8%	690.5
<12	2,856,074			251,661	16.9%		26,475	19.4%	927.0
12-19	1,972,084	959,082	49%	310,554	22.5%	33,127	21,740	23.1%	1102.4
20-29	2,744,987	1,315,694	48%	556,400	23.9%	32,533	19,634	17.3%	715.3
30-39	2,784,698	1,588,580	57%	544,022	23.1%	38,037	24,000	17.7%	861.9
40-49	2,669,253	1,772,047	66%	478,532	22.5%	32,166	20,019	16.7%	750.0
50-59	2,925,172	2,137,739	73%	447,444	20.2%	28,011	17,114	14.9%	585.1
60-64	1,438,783	1,160,576	81%	174,796	17.5%	10,501	6,849	13.6%	476.0
65+	4,584,066	3,983,155	87%	414,669	15.3%	18,033	15,912	11.7%	347.1



Percentage of Enrolled Students Testing Positive for COVID-19
During the 2021-2022 School Year (as of 9/21/2021)



Task

- Conduct environmental surveillance for viable SARS-CoV-2 in schools to help evaluate if protective measures implemented by school district was working

Action

- Sampling sites: two elementary schools - one urban & one rural
- Choosing sampling location: cafeteria vs. classroom
- Air sampling (70): center of cafeteria, serving line, fountain
- Surface sampling (254): dining tables after meals before disinfection
- Analysis by RT-PCR and isolation of virus
- CO₂ measurements (20): in classrooms, cafeteria, reception

Cafeteria

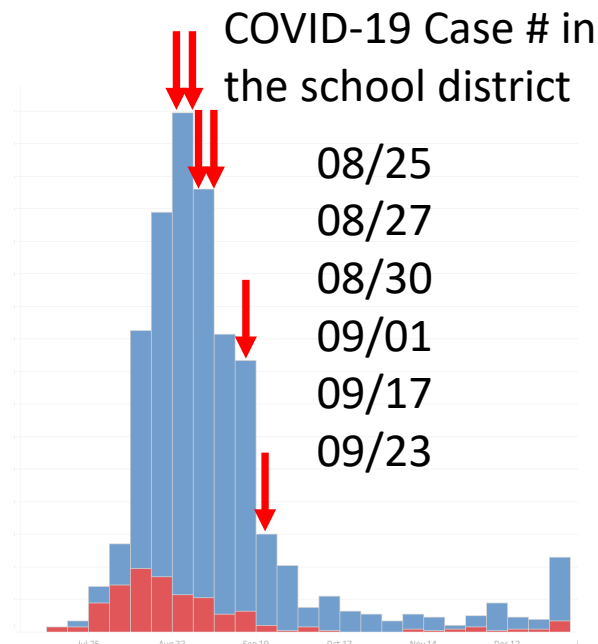
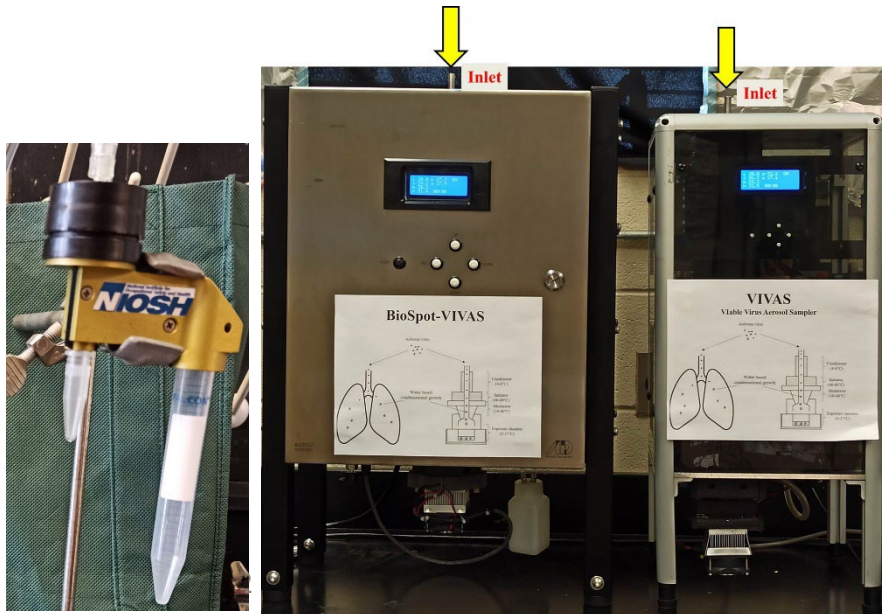


<https://www.wpr.org/waukesha-school-board-reverses-course-takes-federal-money-fund-free-school-meals>

Classroom

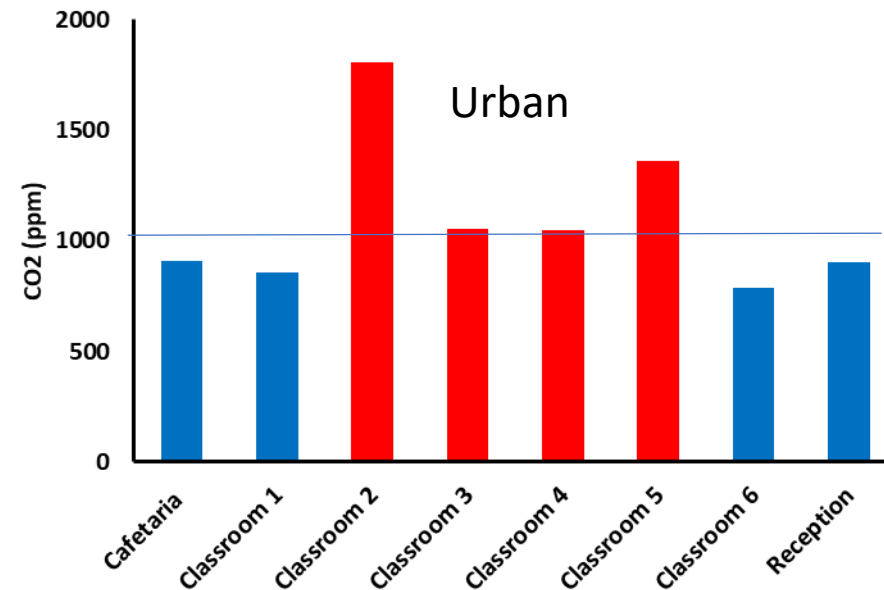
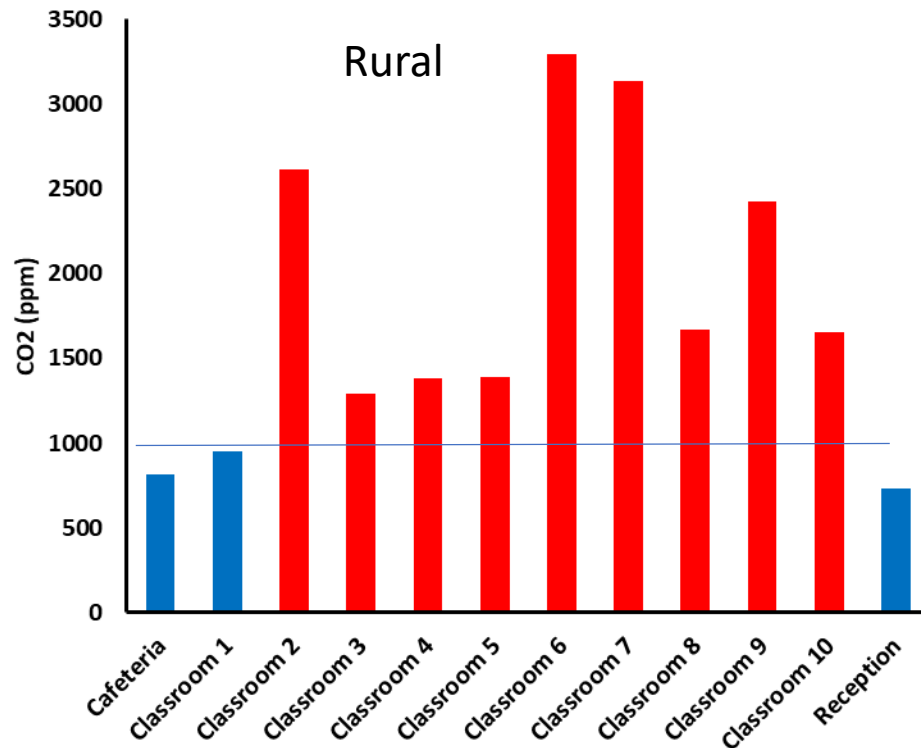


<https://www.yalemedicine.org/news/mask-mandates-ending-in-schools>



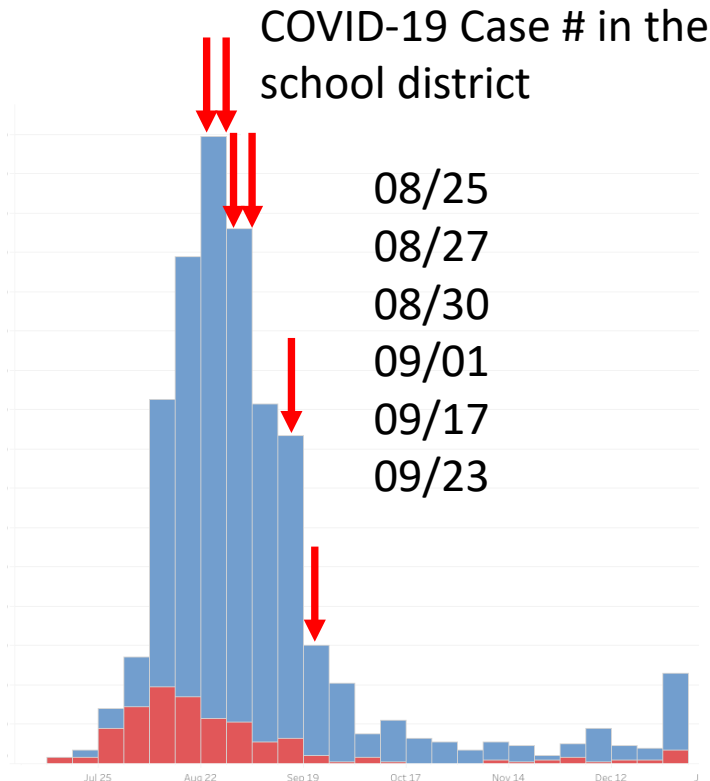
Results

- Negative for SARS-CoV-2 of all air & surface samples; positive for **parainfluenza virus 2** in 2 samples
- Ventilation: better in cafeteria than in classroom; urban better than rural
- Surface cleaning after each group

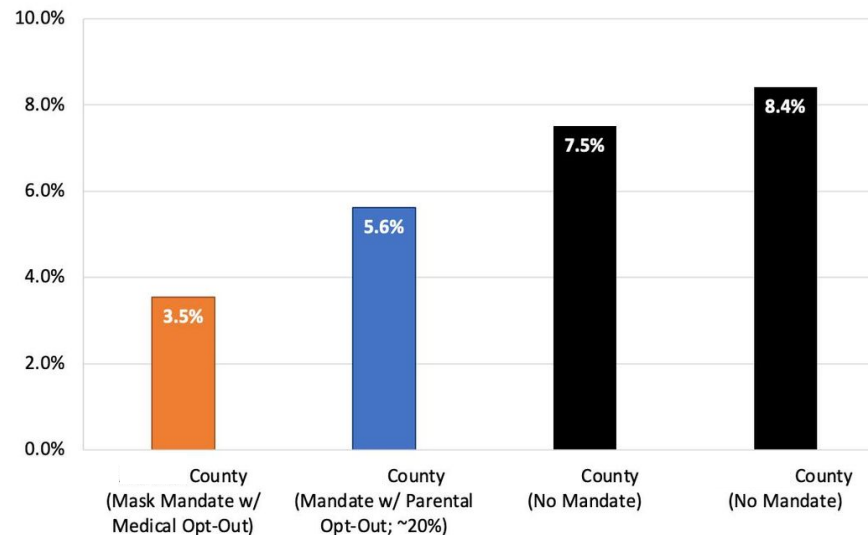


Results

- Parents/nurses/teachers
- Surveillance during the downward curve
- Unknown if there were cases on campus leading to low probability of detection



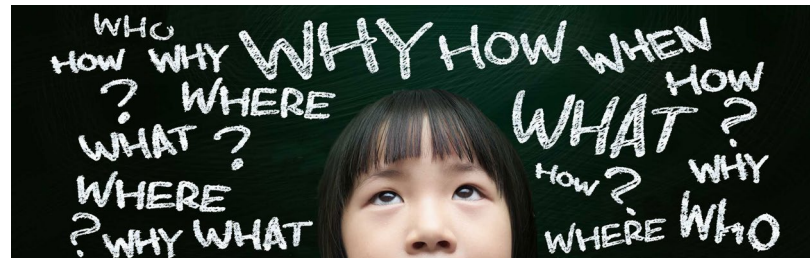
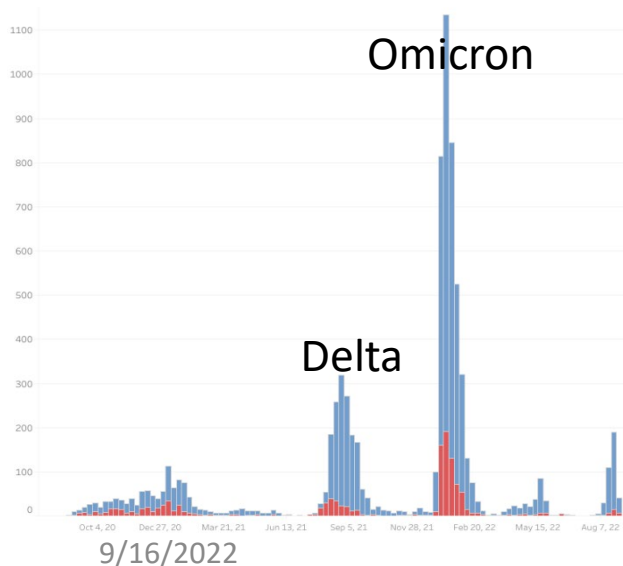
Percentage of Enrolled Students Testing Positive for COVID-19 During the 2021-2022 School Year (as of 9/21/2021)



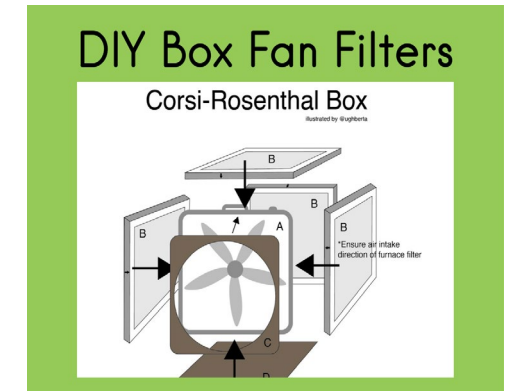
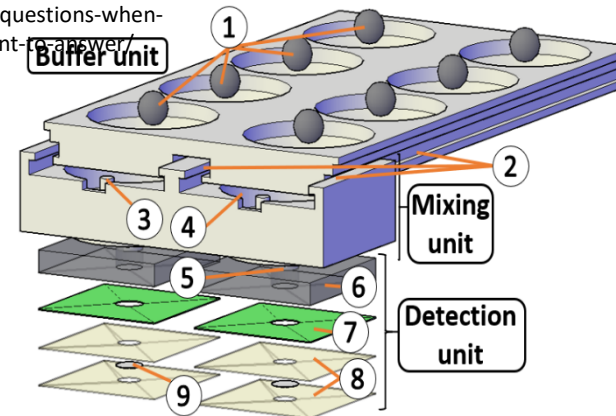
Next

- No mask mandates during the Omicron wave
- Informal education with children to transfer knowledge
- Ventilation: natural, HVAC upgrade, portable air purifiers
- On-the-spot detection capabilities⁶⁻⁷

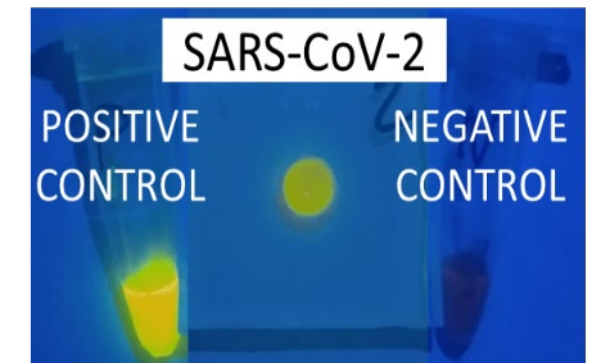
COVID-19 Case # in the school district



<https://www.lilkickers.com/blog/tough-kid-questions-when-your-child-asks-you-questions-you-dont-want-to-answer/>



<https://cleanaircrew.org/box-fan-filters/>

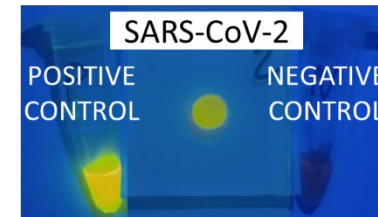


Summary

- Collaborated with school district to conduct environmental surveillance
- Layered measures might have contributed to negative detection of SARS-CoV-2 during Fall 2021
- A different surveillance strategy may be needed
- Opportunity for informal education



<https://www.lilickers.com/blog/tough-kid-questions-when-your-child-asks-you-questions-you-dont-want-to-answer/>

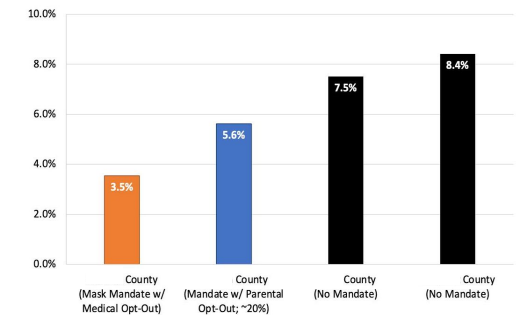


Cafeteria



<https://www.wpr.org/waukesha-school-board-reverses-course-takes-federal-money-fund-free-school-meals>

Percentage of Enrolled Students Testing Positive for COVID-19 During the 2021-2022 School Year (as of 9/21/2021)



References

1. Lednicky et al., “Collection of SARS-CoV-2 Virus from the Air of a Clinic Within a University Student Health Care Center and Analyses of the Viral Genome”, *Aerosol Air Qual. Res.*, <https://doi.org/10.4209/aaqr.2020.05.0202>, **20(6)**, 1167–1171, 2020.
2. Lednicky et al., “Viable SARS-CoV-2 in the Air of a Hospital Room with Two COVID-19 Patients”, *Int. J. Infectious Diseases*, <https://doi.org/10.1016/j.ijid.2020.09.025>, **100**, 476-482, 2020.
3. Li et al., “Environmental Surveillance and Transmission Risk Assessments for SARS-CoV-2 in a Fitness Center”, *Aerosol Air Qual. Res.*, <https://doi.org/10.4209/aaqr.210106>, **21(11)**, 210106, 2021.
4. Li et al., “Surveillance for SARS-CoV-2 in Air and Environmental Surfaces of Two Restaurants that Followed CDC Reopening Guidance”, *Aerosol Air Qual. Res.*, <https://doi.org/10.4209/aaqr.210304>, **22(1)**, 2022.
5. Nannu Shankar et al., “SARS-CoV-2 in Residential Rooms of Two Self-Isolating Persons with COVID-19”, *J. Aerosol Sci.*, <https://doi.org/10.1016/j.jaerosci.2021.105870>, **159**, 105870, 2022.
6. Manzananas et al., “Valve-Enabled Sample Preparation Device with Isothermal Amplification for Simultaneous Detection of SARS-CoV-2 and Influenza Viruses”, *ACS Sensors*, <https://doi.org/10.1021/acssensors.1c01718>, **6(11)**, 4176-4184, 2021.
7. Jiang, X. et al., “Integration of Sample Preparation with RNA-Amplification in a Hand-Held Device for Airborne Virus Detection”, *Anal. Chim. Acta*, <https://doi.org/10.1016/j.aca.2021.338542>, **1165(22)**, 338542, 2021.

Acknowledgement

- NSF Grants No. 2030844 (RAPID) and 1751854 (CBET), and NIH Grants No. R44ES030649 and R01AI158868.
- **Antarpreet Jutla (UF)**, John Lednicky (UF), Hugh Fan (UF), Sripriya Nannu Shankar (UF), William Brad Vass (UF), Carlos Manzananas (UF), Yuetong Zhang (UF), Mayank Gangwar (UF), Yuqiao Chen (UF), Jiayi Chen (UF), Bailey Magers (UF), Lauren Diaz (UF) and Emma Goldberg (UF); Arantzazu Eiguren-Fernandez (ADI); Pat Keady (ADev), Braden Stump (Adev); William Lindsley (NIOSH)

Questions?
cywu@ufl.edu

