

OCTOBER 22, 2020
DAVID LUZZI
SENIOR VICE PROVOST
FOR RESEARCH
NORTHEASTERN
UNIVERSITY

COVID-19 TESTING: WHAT WE'VE LEARNED AT THE UNIVERSITY LEVEL

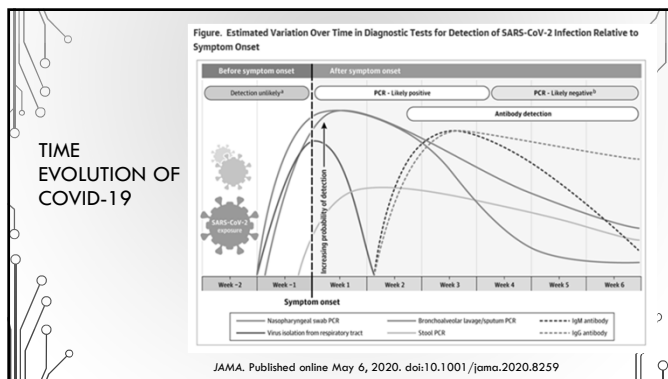
NEUSHA WEBINAR

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COVID-19 AND SARS-COV-2

- COVID-19 is the disease caused by the virus SARS-CoV-2
 - SARS-CoV-2, the second pandemic variant of the family of Coronaviruses that causes disease with severe impact on the pulmonary system
 - As of today, 41,310,004 cases, 1,133,699 deaths globally, case fatality rate of 2.7%
- Technically,
 - SARS-CoV causes Severe Acute Respiratory Syndrome
 - SARS-CoV-2 causes COVID-19
- SARS-CoV, the first pandemic variant first appeared in China in 2002 and went pandemic in 2003, ending in July 2003
 - Globally, 8,098 cases, 774 deaths, with case fatality rate of 9.7%

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TYPES OF TESTING SIR – SUSCEPTIBLE, INFECTED, RECOVERED

- Viral Testing – presence of the virus - infected
 - RNA extraction – transcription – fluorescence-labeled PCR
 - Antigen – detection of viral membrane proteins
- Serological Testing – detection of IgM, IgG, and IgA antibodies
 - IgM and IgA – antibodies to the virus – infected
 - IgG – antibodies to the virus – immune (?)

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RT-PCR TESTING

THE GOLD STANDARD

Broad Protocol	CDC Protocol	Thermo Protocol
Throughput 2 wells per patient	Throughput 3 wells per patient	Throughput 1 well per patient
Specificity 1 primer; 1 gene (N2 gene primer)	Specificity 2 primers; 1 gene (N1, N2 gene primer)	Specificity 3 primers; 3 genes (S, ORF1a/b, N gene primers)
Sensitivity LOD (500 copies/mL) NU would need EUA	Sensitivity LOD 10,000 copies/mL No EUA needed	Sensitivity LOD 50 copies/mL No EUA needed

- ~30,000 base pairs in the RNA genome of SARS-CoV-2
- SARS-CoV2 mutation rate unknown and primers may not bind if mutations arise; multiple gene targets decrease the rate of false-negatives.

SARS-CoV2 Genome

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SENSITIVITY AND SPECIFICITY

- False Negatives = $(100\% - \text{Sensitivity})$
 - PCR at Northeastern – 96% (4% False Negatives)
- False Positives = $(100\% - \text{Specificity})$
 - PCR at Northeastern – “99%+” (no evidence of False Positives)
 - Very important issue for Surveillance Testing
 - At Northeastern, we test circa 5,000 students / day
 - Best antigen tests, ~2% false positives → 100 false positives / day

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ABBOTT BINAXNOW

- Antigen Test – Testing for surface proteins
- Federal Health and Human Services Fact Sheet
 - <https://www.hhs.gov/sites/default/files/abbott-binaxnow-fact-sheet.pdf>
- FDA Guidance
 - <https://www.fda.gov/media/141570/download>
- Sensitivity: 97.1%
- Specificity: 98.5%
- NOTE: not clear whether this was at symptom onset

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COVID-19 PROGRESSION, SYMPTOMS ONSET

- Symptoms appear ~Day 5 after infection, but many cases asymptomatic, especially in the young
- Possibility of spread onset ~Day 3
- Peak of viral load in the body ~Day 8
- Possibility of spread ceases ~Day 12-14; origin of isolation, quarantine rules
- Transmission Rates govern spread - R_0 , R_D , R_{eff}
 - $R_{eff} = 1$; stable conditions; >1 exponential growth in viral cases

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WHAT WE KNOW

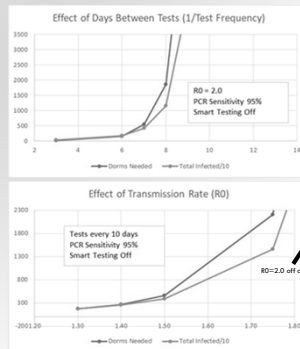
- R_0 for Boston peaked at 2.7 at lower densities and lower intermixing than happens on campus, but without mitigations
- R_0 dropped below 1.0 under economic shutdown, stay-at-home recommendation, increasing use of face masks and physical distancing
- At Northeastern, current mitigation efforts and aggressive testing regimen has R_{eff} well below 1.0
- Human behavior is a wildcard and important

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SUPER-SPREADER EVENTS

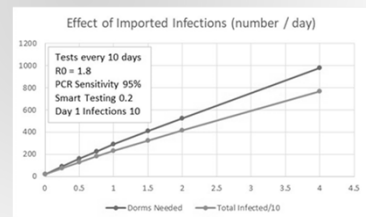
- “ R_0 ” is an average – in practice, “super spreader events” responsible for majority of infections
- Studies on Ebola show that 3% of cases were responsible for 61% of infections
- Other disease studies show that 20% of population responsible for 80% of transmission potential

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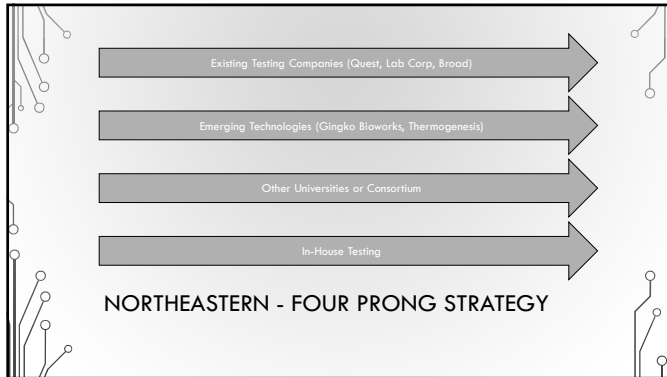
EFFECTS OF TESTING FREQUENCY & R_0 

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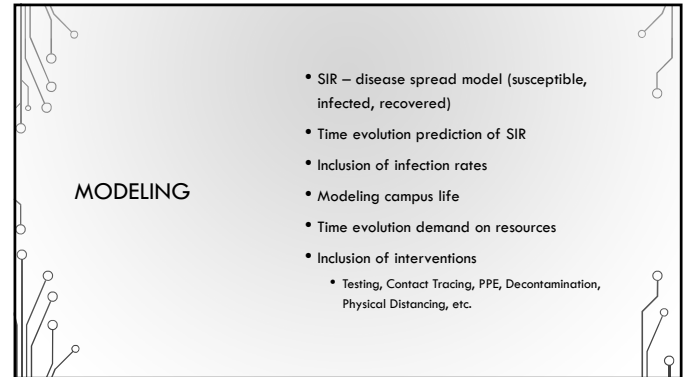
WHAT IS THE BOSTON EFFECT?



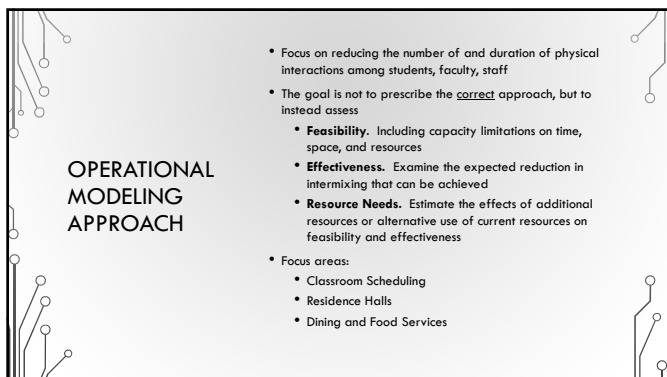
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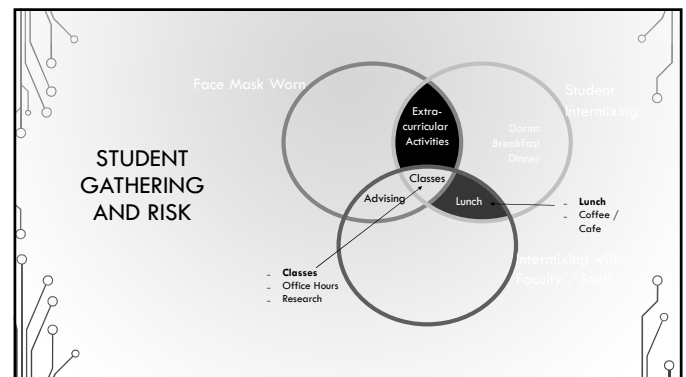
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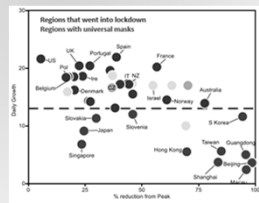


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MITIGATIONS – IMPORTANCE OF MASKS

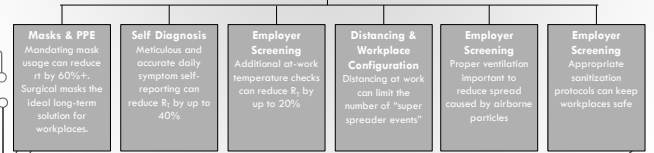


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REDUCING R_{EFF} ROADMAP

WORKPLACE NORMS

- Lower cost / complexity than testing & tracing, but highly effective



Effective implementation of workplace norms can have a significant impact on R_t

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NORTHEASTERN TESTING PROTOCOLS

- RT-PCR
 - Avoiding false positives
- Students: every 3 days; Anterior Nares
 - Arrival: Days 1, 3, 5
 - Symptomatic and Close Contacts tested in separate sterile facility
- Employees: twice per week

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NORTHEASTERN TESTING RESULTS TO DATE

- >250,000 tests conducted
- ~110 positive tests, mostly students, 60% off-campus
 - Immediate intervention: isolation, quarantine
- 514 close contacts: 13 tested positive

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Social Determinants of Health & COVID-19 Testing

The Public Health Perspective

Nate Horwitz-Willis, DrPH, MPH, MPA

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Social Determinants of Health (SDOH)

- Our Schools are Institutions within and across our Communities - Not Islands
- Upstream & Downstream Factors
- The Human Life-course



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The Upstream Factors: Lead to the Downstream impacts in how people engage with the SDOH and how disease outcomes manifest.

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COVID-19 Testing Adequacy Across the United States

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States that HAVE COVID-19 K-12 School District Case Data Available

Source: New York Times, What We Know About Coronavirus Cases in K-12 Schools So Far, September 21, 2020

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States that HAVE SOME COVID-19 K-12 School District Case Data Available

Source: New York Times, What We Know About Coronavirus Cases in K-12 Schools So Far, September 21, 2020

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States that DO NOT HAVE COVID-19 K-12 School District Case Data Available

Source: New York Times, What We Know About Coronavirus Cases in K-12 Schools So Far, September 21, 2020

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434,989

K-12 School Aged COVID-19 Cases in the United States

Source: CDC and Prevention, CDC COVID Data Tracker as of October 21 12:15 PM

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K-12 Aged Children in the Community and COVID-19

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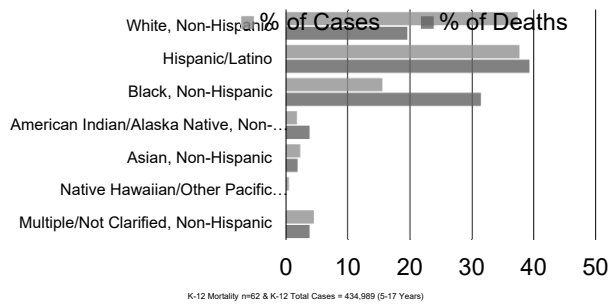
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K-12 COVID-19 Disease Burden (Inclusive of Morbidity and Mortality)

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Case and Mortality Disparity of Children (5 - 17 Years)



Source: CDC and Prevention: CDC COVID Data Tracker as of October 21 12:15 PM

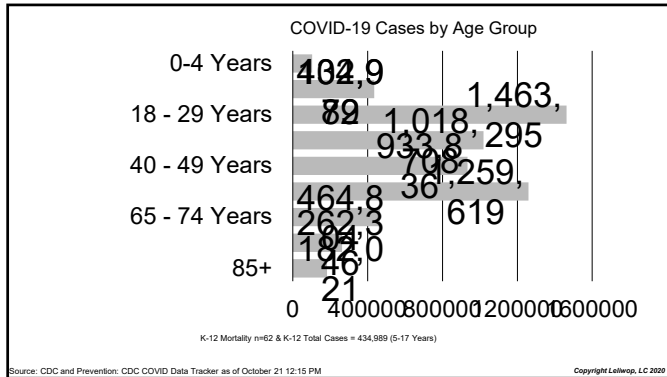
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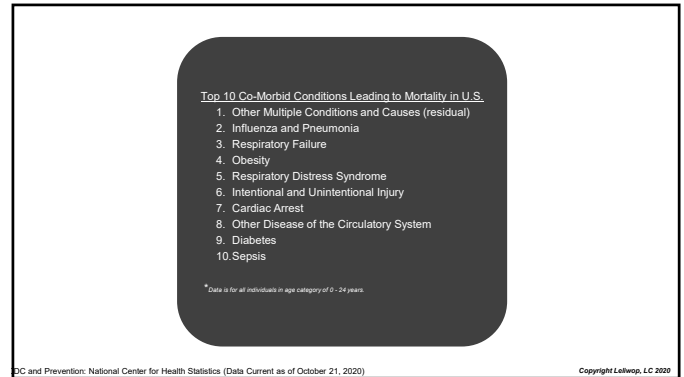
COVID-19 Implications for K-12 Youth

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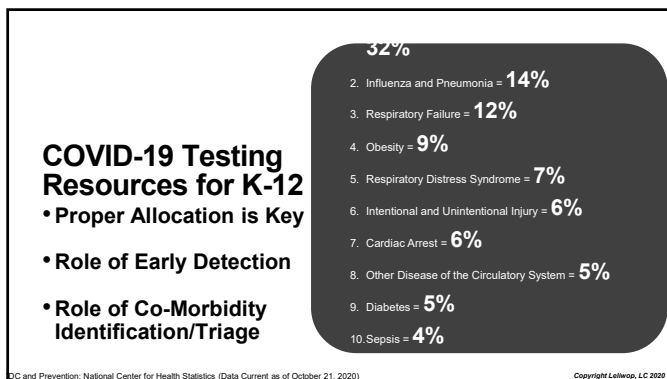
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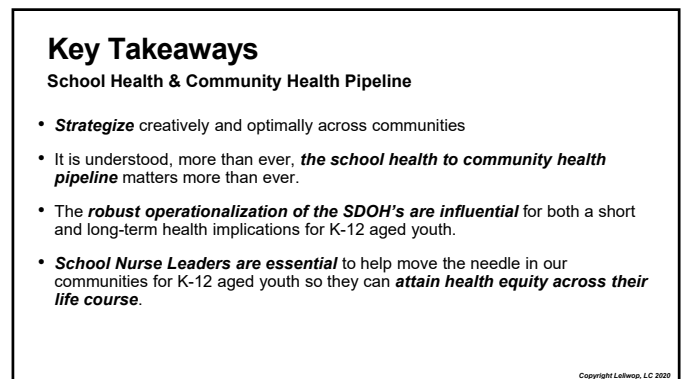
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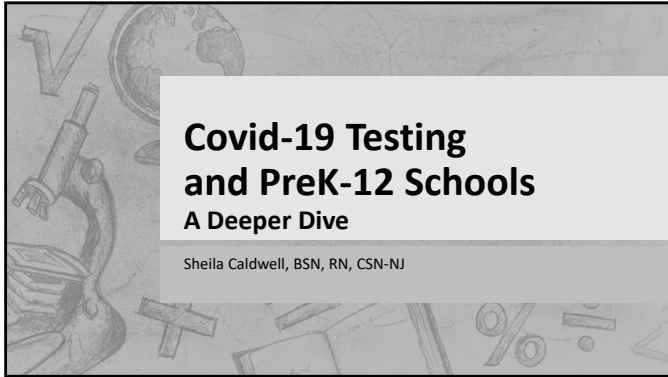
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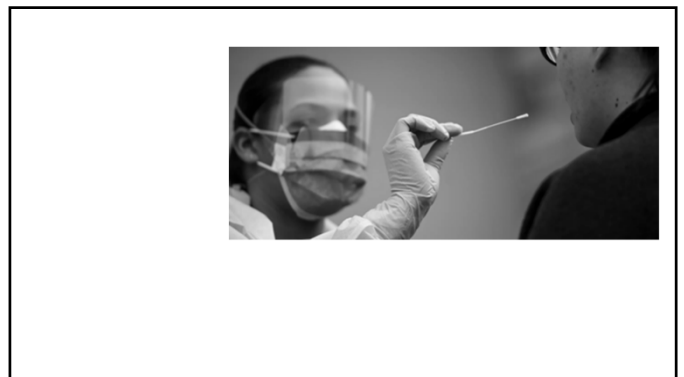
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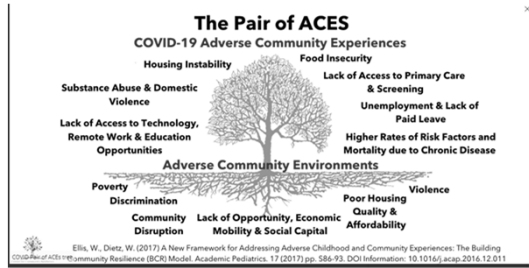
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CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Coronavirus Disease 2019 (COVID-19)

Interim Considerations for Testing for K-12 School Administrators and Public Health Officials

Updated Oct. 13, 2020

Languages ▼

Print



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CDC Centers for Disease Control and Prevention
 CDC 24/7: Saving Lives, Protecting People™

Coronavirus Disease 2019 (COVID-19)

Close Contact

Someone who was within 6 feet of an infected person for a cumulative total of 15 minutes or more over a 24-hour period* starting from 2 days before illness onset (or, for asymptomatic patients, 2 days prior to test specimen collection) until the time the patient is isolated.

** Individual exposures added together over a 24-hour period (e.g., three 5-minute exposures for a total of 15 minutes). Data are limited, making it difficult to precisely define "close contact;" however, 15 cumulative minutes of exposure at a distance of 6 feet or less can be used as an operational definition for contact investigation. Factors to consider when defining close contact include proximity (closer distance likely increases exposure risk), the duration of exposure (longer exposure time likely increases exposure risk), whether the infected individual has symptoms (the period around onset of symptoms is associated with the highest levels of viral shedding), if the infected person was likely to generate respiratory aerosols (e.g., was coughing, singing, shouting), and other environmental factors (crowding, adequacy of ventilation, whether exposure was indoors or outdoors). Because the general public has not received training on proper selection and use of respiratory PPE, such as an N95, the determination of close contact should*

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**COVID TESTING -
 PASCO COUNTY
 SCHOOLS**

LISA KERN, MSN, RN, NCSN
OCT 22, 2020

#OURSTORY - LESSONS LEARNED

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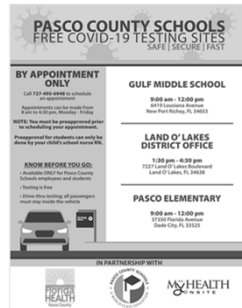
WHO WE ARE

PASCO SCHOOLS NOW
 Navigating School in 2020-2021

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OUR TESTING MODEL

- Currently prioritizing testing for SYMPTOMATIC students and staff
- Developed partnership with employee health and wellness provider and local department of health (DOH)
- School nurses assess/evaluate, enter on database
- Recently hired 2 schedulers to field calls and set up appointments
- Three drive-up locations across county
- Only using PCR - oral swab



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TESTING BENEFITS/RISKS

- School nurses continue to support student health with a focus on quick identification of students (and staff) with COVID-like illness, isolating and offering testing
- Results usually available within 48 hours which enhances safe contact tracing efforts
- Drive through testing eliminates exposure within school setting and protects health services staff
- Results automatically reported to DOH

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TESTING SUCCESSES AND CHALLENGES

Initial central location (averages 60/wk.)
2nd location phased in after 1 week (40/wk.)
3rd test center opened 10/5 (30/wk.)


We've worked about 250 cases involving students or staff since school started (8/24)

Identified close to 1,000 community cases involving school staff and/or students

Tested 711 students and staff since start of testing (9/16)

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**Wellesley Public Schools
Department of Nursing Services**



COVID-19 Testing in Schools
 October 23, 2020
 Northeastern University

WELLESLEY PUBLIC SCHOOLS
Learning • Caring • Innovating

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WPS Reopening Goal

Minimize Risk
Maximize Opportunity for Learning and Growth


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Minimize Risk.....

Mitigations Strategies

- Face Masks
- Hand Hygiene
- Physical Distancing
- Air Filtration
- Cleaning / Disinfecting




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Our next strategy.....

Returning students and staff to school

Surveillance Testing



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Phase 1 Baseline Testing



Teacher and Staff Testing

- Concentric by Ginkgo
- Saliva Testing
- 1,000 + staff tested
- No positives

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Phase 1 con't



Student Testing

- Eurofins / Boston Heart
- Shallow nasal swab
- Tested 92% of the student population
- 3,400 students
- 1 positive (asymptomatic)

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Phase 2



Weekly Surveillance Screening

- Mirimus
- Pool testing
- Week of Oct. 19th: 400 staff
- Week of Oct. 26th: 1,000 staff
- Week of Nov 2: 3,400 (1,000 staff and 2,400 students every week)
- Total of 10 week testing

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School Nurse Management

Our practice is changing
 Expanding our roles in Public Health Nursing
 Nursing involved with testing vendors
 Voice at the table
 Many options available
 Need the right fit for the district



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Decision Making / Metrics

Open / Close / Hybrid / Remote

Metrics

- 1) Average daily # new cases (state, county, town)
- 2) Positivity rates (state, county, town)
- 3) Rates in staff home communities
- 4) School based COVID response (classroom, school, district closure)
- 5) Surveillance testing

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A COVID 19 TESTING PROGRAM IN BOARDING SCHOOL: A COMPONENT OF INFECTION CONTROL

ADRIA PAVLETIC, MA, MN, RN, NCSN
OCT. 22, 2020

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2 WEEK PRE ARRIVAL SELF QUARANTINE
PRE ARRIVAL PREP
PRE ARRIVAL COVID TEST
QUARANTINE UNTIL RESULTS READY
DE-DENSIFY THE CAMPUS
....LIVING SPACES
....LEARNING SPACES
WEEKLY COVID19 PCR TESTING



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OUR TESTING PROGRAM

- Full financial support from our school
- Partnership with CIC Health
- Broad Institute testing platform
- Mid nasal self-swab tests observed by our health services team
- Results returned in ~24hrs or less
- Reporting to our health services nurses
- Email notification of students/parents/fac-staff
- Entered into EHR /SNAP as conditions



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