

# COVID-19 Simulation Integrated Model (COVSIM) to Inform Local Decision-Making

## COVID-19 Modeling Projections for Schools Part 1: Model Background



THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL





Copyright - COVSIM Research Group (a CDC-funded modeling collaboration between UNC, NC State, and ECU) Learn more at covsim.hosted-wordpress.oit.ncsu.edu









Georgia

Tech

#### an Georgia Health Tech Analyt Stevar Store of International Internationa

## The "COVSIM" Model team

The COVSIM team is one of six modeling teams funded by CDC and the Council for State and Territorial Epidemiologists to:

- (a) forecast SARS CoV-2 infections and outcomes,
- (b) estimate the impact of intervention scenarios, and
- (c) support state and local decision-makers











## **Our Modeling Objective**

## To estimate the proportion of susceptible students infected throughout a school semester, depending on incoming protection as well as masking and testing policies.



Copyright - COVSIM Research Group







Georgia Tech





# Imagine a school...

Student population: 500







THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

Georgia

Tech

#### ian Georgia Healt Tech Analy Stewart School of & Systems Engine

# Imagine a school...



- Student population: 500
- > 2-3 students begin infected with COVID-19 at the start of the semester





Georgia

- Student population: 500
- > 2-3 students begin infected with COVID-19 at the start of the semester

1

Some students have either already had COVID-19 or have received the vaccine ("incoming protection"), or are susceptible to becoming infected



Georgia

CAROLINA

at CHAPEL HILL



Georgia

- Student population: 500
- > 2-3 students begin infected with COVID-19 at the start of the semester

1

at CHAPEL HILI

Some students have either already had COVID-19 or have received the vaccine ("incoming protection"), or are susceptible to becoming infected



Georgia





Georgia

- Student population: 500
- > 2-3 students begin infected with COVID-19 at the start of the semester

1

- Some students have either already had COVID-19 or have received the vaccine ("incoming protection"), or are susceptible to becoming infected
- > Every week, one new student becomes infected with COVID-19 outside the school

Georai







Georgia

- Student population: 500
- > 2-3 students begin infected with COVID-19 at the start of the semester

1

- Some students have either already had COVID-19 or have received the vaccine ("incoming protection"), or are susceptible to becoming infected
- > Every week, one new student becomes infected with COVID-19 outside the school

Georgia

> Availability of random RT-PCR testing and isolation among students every week



Random testing and isolation of COVID-19 positive students



Availability of random RT-PCR testing and isolation among students every week  $\triangleright$ 

1

THE UNIVERSITY

at CHAPEL HILL

of NORTH CAROLINA





Georgia Health Tech Analytics

-lealth &

itarian



Copyright - COVSIM Research Group



# COVID-19 Simulation Integrated Model (COVSIM) to Inform Local Decision-Making

## COVID-19 Modeling Projections for Schools Part 2: Model Results



THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL





Copyright - COVSIM Research Group (a CDC-funded modeling collaboration between UNC, NC State, and ECU) Learn more at covsim.hosted-wordpress.oit.ncsu.edu

### **COVSIM**



UNIVERSITY NORTH CAROLINA at CHAPEL HILL

1

Georgia Tech

ems

nterdisciplinary Research Center

Health & Humanitarian Georgia Health Tech Analytics itewart School of Industrial & Systems Engineering





1

**NC STATE** 

UNIVERSITY

**COVSIM** 

EDWARD P. FITTS DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING lealth &

tarian

Georgia Health Tech Analytics

Georgia Tech

CAROLINA

at CHAPEL HILL

## **COVSIM**



of NORTH CAROLINA at CHAPEL HILL

I



Health & Humanitarian

lems

aterdisciplinary Research Cente



Copyright - COVSIM Research Group

## COVSIM



THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

1

Georgia Health Tech Analytics Stewart School of Industrial & Stewart School of Industrial

Health & Humanitarian

aterdisciplinary Research Cente



Copyright - COVSIM Research Group





Copyright - COVSIM Research Group







THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL





## COVSIM



THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

I

Georgia Tech Stevart School of Industrial & System Seguration

Health &

ary Research Cente

nitarian





## **<u>New Infections</u>** among 500 Students after 1 semester

- Elementary School Setting (incoming protection = 30%)
- Middle School Setting (incoming protection = 40%)
- High School Setting (incoming protection = 50%)





## **<u>New Infections</u>** among 500 Students after 1 semester



- Middle School Setting (incoming protection = 40%)
- High School Setting (incoming protection = 50%)





## **<u>New Infections</u>** among 500 Students after 1 semester



- Middle School Setting (incoming protection = 40%)
- High School Setting (incoming protection = 50%)





# <u>New Infections</u> among 500 Students after 1 semester (R<sub>0</sub> = 5 vs R<sub>0</sub> = 4)

-lealth &

terdisciplinary Research Cente

tarian

Georgia Health

Tech M Analytics

Systems Engineerin

- Elementary School Setting (incomin protection = 30%)
- Middle School Setting (incoming protection = 40%)
- High School Setting (incoming protection = 50%)





## What does this all mean?

- 1. The Delta variant is *very* infectious; kids under 12 years old are not yet eligible for vaccines and therefore remain unprotected
- 2. Without masks or testing, up to 90% of susceptible students may become infected by the end of the semester (if only 30% have incoming protection)
- 3. Masks and testing, in combination, can prevent 40-70% of new infections (or more with high-quality, well-fitting masks)



Georgia

Georgia

 Additional cases in the community--including among elderly grandparents and other family members--especially when community rates are already increasing (<u>Goldhaber, 2021</u>)

1

EDWARD P. FITTS DEPARTMENT OF

INIVERSIT

- More infected students leads to more days of school absences, forcing caregivers to take time off work
- Multi-inflammatory syndrome or Long-Covid, which occurs among nearly half of students and can last up to 8 months (<u>Buonsenso, 2021a</u>, <u>Buonsenso 2021b</u>)



Georai

Georgia

- Virtual learning is associated with...
  - Prolonged mental health concerns among students (Golberstein, 2020)
  - Minimal or no learning gains (Engzell, 2021)

EDWARD P. FITTS DEPARTMENT 0

• Recall: the risk of severe disease for COVID-19 *remains reduced* for those of younger ages, in the event they do become infected within school

The best place for K12 children this fall is the classroom: universal masking and routine testing can ensure that they and their families remain safe and that their learning journey can continue smoothly



## For additional information, please visit <u>covsim.hosted-</u> <u>wordpress.oit.ncsu.edu/</u> or write to us at <u>covsim-</u> <u>team@ncsu.edu</u>

Georgia

Tech

Health

Systems Engineerin