

# Emory ATLANTA Fall 2021 COVID-19 Model, including vaccination

A model analysis of COVID-19 transmission and control at Emory University

4/16/2021

## Summary

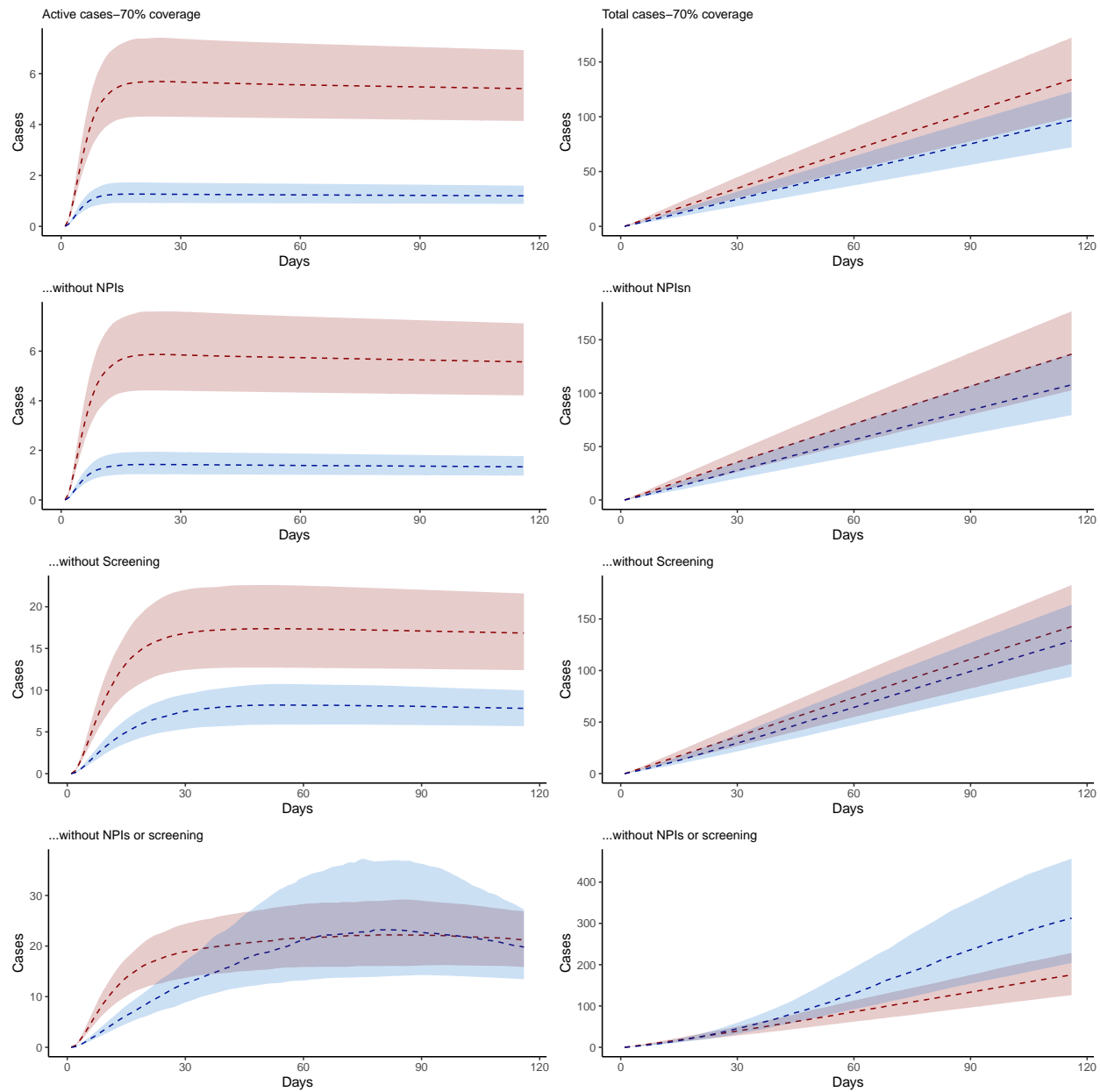
This iteration of the model builds on the Spring and Fall 2020 versions, but now includes vaccination as well as pre-existing immunity from prior natural infections. See [model publication](#) and [online model](#) for more details of the base model.

Vaccination is modeled in a simple way, such that successfully vaccinated individuals are protected from both infection and COVID-19 disease. Vaccine efficacy (or the proportion of vaccines who respond to vaccination) is 90%. In addition, we assume that 20% have been previously infected with previous infection providing 90% protection.

We explore vaccine coverage ranging from 50% to 90%. For now, students and staff are vaccinated at the same level in each simulation, though with the mandate for students, their coverage is likely to be higher.

Baseline scenarios assume non-pharmaceuticals interventions (NPIs) remain in place and that screening of asymptomatic people is performed weekly.

## Plots for 70% Coverage scenarios



Measure	50% coverage	...without NPIs	...without screening	...without NPIs or screening
StudentCases	145 (60-294)	173 (71-352)	234 (95-508)	952 (260-1711)
StudentCasesPeak	2 (1-4)	2 (1-5)	15 (6-38)	93 (18-243)
StudentHosps	9 (2-23)	10 (3-28)	14 (4-41)	51 (11-155)
StudentDeaths	0 (0-1)	0 (0-1)	0 (0-1)	1 (0-4)
StudentIsolate	123 (51-248)	145 (59-290)	0 (0-0)	0 (0-0)
StudentIsolatePeak	15 (6-31)	18 (7-37)	0 (0-0)	0 (0-0)
StudentIsolateDays	1522 (630-3079)	1794 (732-3608)	0 (0-0)	0 (0-0)
StudentQuarantined	592 (99-1797)	698 (120-2149)	0 (0-0)	0 (0-0)
StudentQuaPeak	73 (12-224)	87 (15-268)	0 (0-0)	0 (0-0)
StudentQuarantinedDays	7331 (1228-22300)	8616 (1480-26669)	0 (0-0)	0 (0-0)
StaffCases	196 (81-366)	204 (85-381)	217 (89-415)	340 (145-686)
StaffCasesPeak	4 (2-8)	4 (2-9)	13 (6-27)	26 (10-67)
StaffHosps	20 (6-51)	21 (6-54)	22 (6-58)	33 (9-93)
StaffDeaths	2 (1-6)	2 (1-6)	2 (1-6)	3 (1-10)
Tests	497227 (497227-497227)	497227 (497227-497227)	0 (0-0)	0 (0-0)
TestsPerCapita	16 (16-16)	16 (16-16)	0 (0-0)	0 (0-0)

## Summary results – 50% Vaccine Coverage

Measure	70% coverage	...without NPIs	...without screening	...without NPIs or screening
StudentCases	117 (41-198)	131 (46-220)	153 (55-281)	420 (99-754)
StudentCasesPeak	2 (1-3)	2 (1-3)	10 (3-18)	35 (7-77)
StudentHosps	8 (2-16)	8 (2-17)	10 (2-21)	26 (5-68)
StudentDeaths	0 (0-0)	0 (0-1)	0 (0-1)	1 (0-2)
StudentIsolate	101 (34-172)	111 (38-186)	0 (0-0)	0 (0-0)
StudentIsolatePeak	12 (4-21)	14 (5-23)	0 (0-0)	0 (0-0)
StudentIsolateDays	1246 (421-2131)	1376 (473-2307)	0 (0-0)	0 (0-0)
StudentQuarantined	559 (67-1202)	620 (77-1357)	0 (0-0)	0 (0-0)
StudentQuaPeak	69 (8-150)	77 (10-169)	0 (0-0)	0 (0-0)
StudentQuarantinedDays	6917 (833-14921)	7663 (948-16839)	0 (0-0)	0 (0-0)
StaffCases	163 (55-249)	166 (57-257)	173 (60-272)	214 (80-344)
StaffCasesPeak	4 (1-6)	4 (1-6)	11 (4-18)	14 (5-25)
StaffHosps	18 (4-36)	18 (4-37)	19 (4-39)	24 (5-48)
StaffDeaths	2 (0-4)	2 (0-4)	2 (0-4)	2 (1-5)
Tests	497227 (497227-497227)	497227 (497227-497227)	0 (0-0)	0 (0-0)
TestsPerCapita	16 (16-16)	16 (16-16)	0 (0-0)	0 (0-0)

## Summary results – 70% Vaccine Coverage

Measure	90% coverage	...without NPIs	...without screening	...without NPIs or screening
StudentCases	82 (22-150)	86 (24-162)	93 (26-181)	134 (35-292)
StudentCasesPeak	1 (0-2)	1 (0-2)	6 (2-13)	9 (2-23)
StudentHosps	6 (1-12)	6 (1-13)	7 (1-14)	10 (2-23)
StudentDeaths	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-1)
StudentIsolate	70 (18-117)	74 (19-125)	0 (0-0)	0 (0-0)
StudentIsolatePeak	9 (2-15)	9 (2-16)	0 (0-0)	0 (0-0)
StudentIsolateDays	866 (223-1455)	911 (236-1554)	0 (0-0)	0 (0-0)
StudentQuarantined	480 (38-817)	493 (40-864)	0 (0-0)	0 (0-0)
StudentQuaPeak	59 (5-101)	61 (5-107)	0 (0-0)	0 (0-0)
StudentQuarantinedDays	5933 (465-10130)	6104 (497-10721)	0 (0-0)	0 (0-0)
StaffCases	118 (30-188)	119 (31-190)	122 (32-198)	129 (35-210)
StaffCasesPeak	3 (1-4)	3 (1-4)	8 (2-14)	8 (2-15)
StaffHosps	15 (2-25)	15 (2-25)	15 (2-26)	16 (2-28)
StaffDeaths	1 (0-3)	1 (0-3)	2 (0-3)	2 (0-3)
Tests	497227 (497227-497227)	497227 (497227-497227)	0 (0-0)	0 (0-0)
TestsPerCapita	16 (16-16)	16 (16-16)	0 (0-0)	0 (0-0)

### Summary results – 90% Vaccine Coverage

## Parameters

This table shows the parameter inputs into the model and their ranges used in sensitivity analysis. The ‘value’ column shows our base case scenario for what we expect to be the most likely set of conditions and interventions.

Parameter	Value	Lower	Upper
Populations			
Total students	15,000		
Students living on campus	4,500	4,500	4,500
Staff and faculty	15,266		
Natural history and clinical			
Latent period (days)	3	2	4
Infectious period (days)	7	6	8
Proportion severe - students	0.0224	0.0133	0.0456
Proportion severe - staff/faculty	0.055	0.0327	0.1122
Proportion fatal - students	0.0006	0.0003	0.0014
Proportion fatal - staff/faculty	0.0052	0.0029	0.0105
Proportion symptomatic - students	0.35	0.27	0.43
Proportion symptomatic - staff/faculty	0.51	0.41	0.59
Testing and quarantine			
Time from onset of infectiousness to testing (1/days)	2	7	1
Screening frequency (1/days)	7	7	7
Duration of quarantine (days)	14		
Number of contacts per case	2	1	14
Proportion of contacts reached	0.75	0.5	0.9
Proportion experiencing ILI symptoms per day	0.00333	0.003	0.003667
PCR Sensitivity			
Day 2 of infectiousness	0.75	0.6	0.83
Day 4 of infectiousness	0.8	0.7	0.85
Day 7 of infectiousness	0.75	0.65	0.8
Transmission			
Students <-> Students	2	0.7	2.5
On campus students <-> On campus students	1	0.3	1.4
All students <-> staff/faculty	0.5	0.15	0.7
Staff/faculty <-> staff/faculty	0.5	0.15	0.7
Daily new cases in community (proportion)	0.000517857	0.000310714	0.001035714
Efficacy of NPIs	0.000001	0.000001	0.000001
VE	0.9		
Proportion immune from previous infection	0.2		