

Network Systems Science &
Advanced Computing

Biocomplexity Institute &
Initiative

University of Virginia

Estimation of COVID-19 Impact in Virginia

Safe-opening and continued operations of K-12 public schools

August 17, 2021

(data current to **August 13**)



UNIVERSITY of VIRGINIA

BIOCOMPLEXITY INSTITUTE

Key takeaways

Current State of the Pandemic

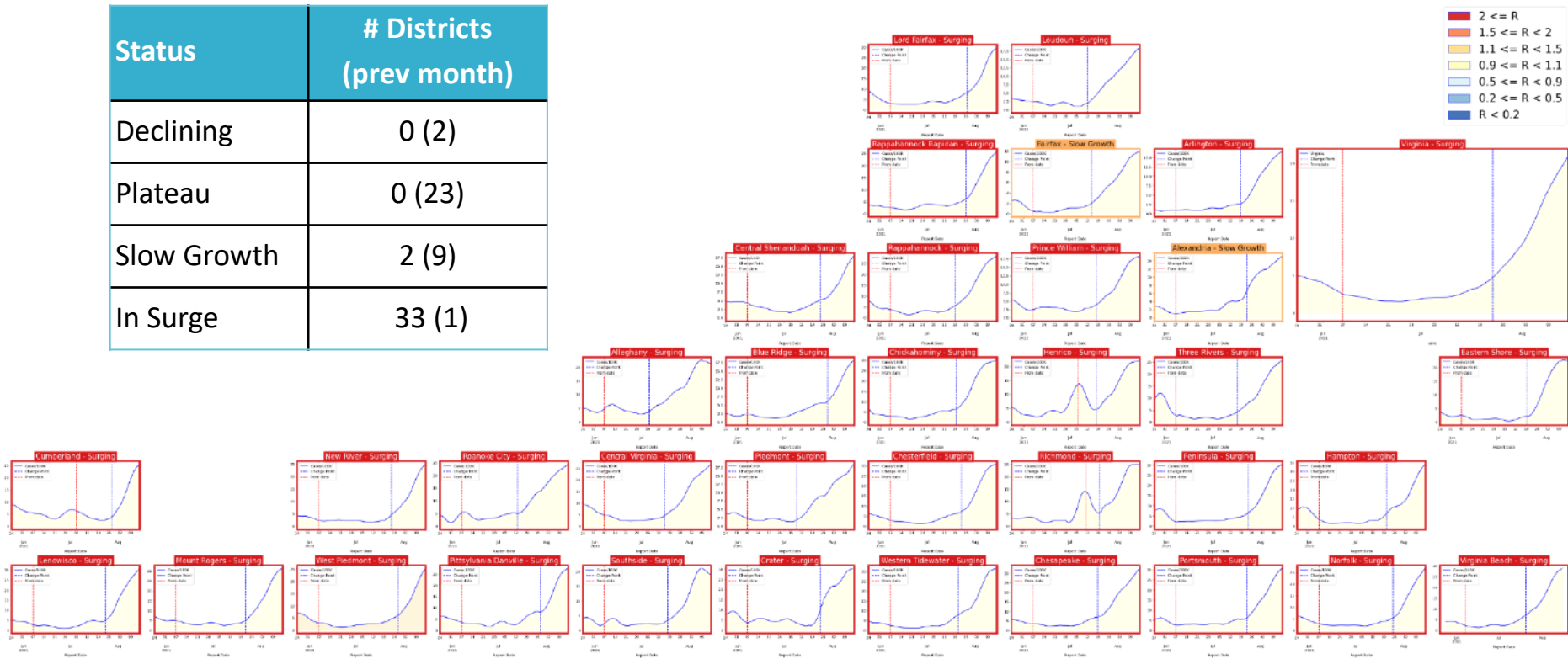
- **Case rates in Virginia continue to rise quickly amidst a background of surges across the nation**
- VA mean weekly incidence up to 22/100K from 17/100K, US up to 37/100K (from 29/100K)
- Vaccination rates continue to pick speed and acceptance among the unvaccinated persists
- Projections continue to show significant uptick in activity, with larger growth possible fueled by Delta's increasing prevalence, even areas with high vaccination coverage

Modeling for Public Schools

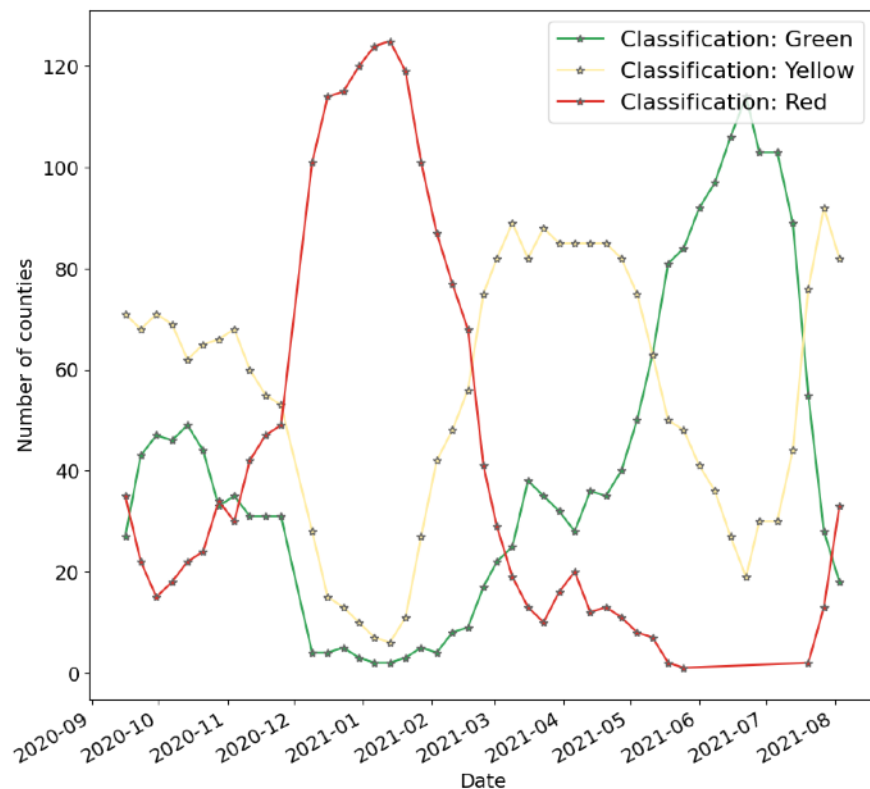
- Developed a data-driven modeling and analytics framework that encompasses all the public school districts in the state
- Ready to support VDH and VDOE to carry out analyses of intervention strategies that you deem most important

Case Rate Trajectories by Health Districts

| Status | # Districts (prev month) |
|-------------|-----------------------------|
| Declining | 0 (2) |
| Plateau | 0 (23) |
| Slow Growth | 2 (9) |
| In Surge | 33 (1) |



Test Positivity by Counties



County level RT-PCR test positivity

Green: <5.0% (or <20 tests in past 14 days)

Yellow: 5.0%-10.0% (or <500 tests and <2000 tests/100k and >10% positivity over 14 days)

Red: >10.0% (and not "Green" or "Yellow")

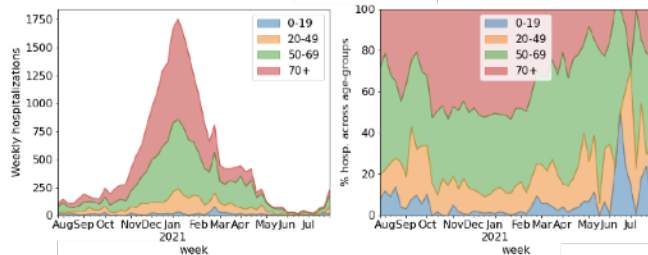
| Classification | Green | Red | Yellow |
|----------------|-------|------|--------|
| date | | | |
| 2021-07-13 | 89.0 | 0.0 | 44.0 |
| 2021-07-20 | 55.0 | 2.0 | 76.0 |
| 2021-07-27 | 28.0 | 13.0 | 92.0 |
| 2021-08-03 | 18.0 | 33.0 | 82.0 |

Hospitalizations across the US

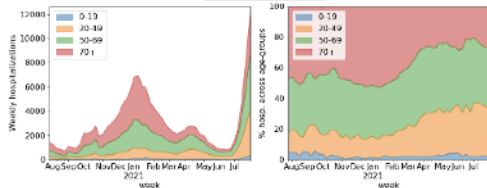
Hospitalization rates remain low in VA, but rapid change is possible as seen in other states

- Hotspot states see rapid rise in hospitalizations especially among the younger age groups
- Nationally pediatric hospitalizations are at an all time high since the pandemic began

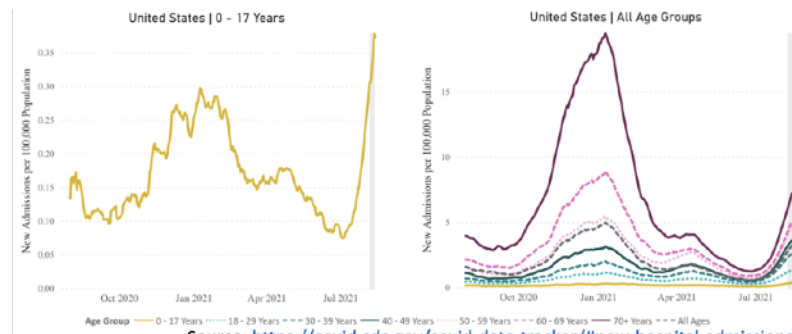
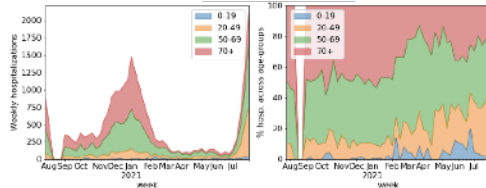
Virginia



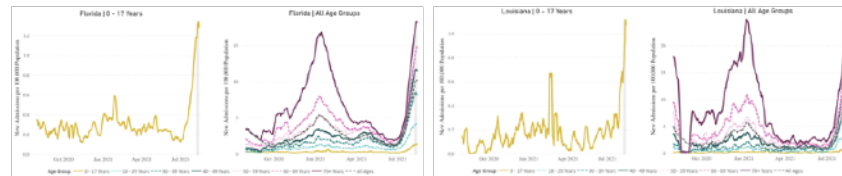
Florida



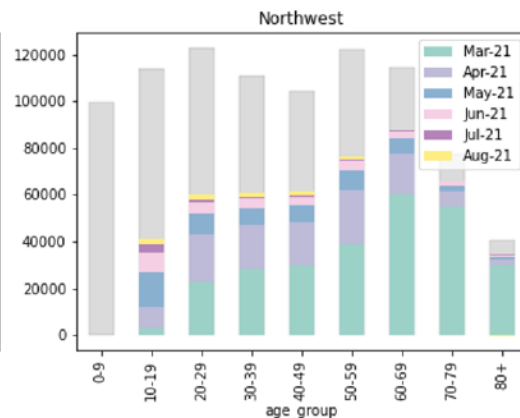
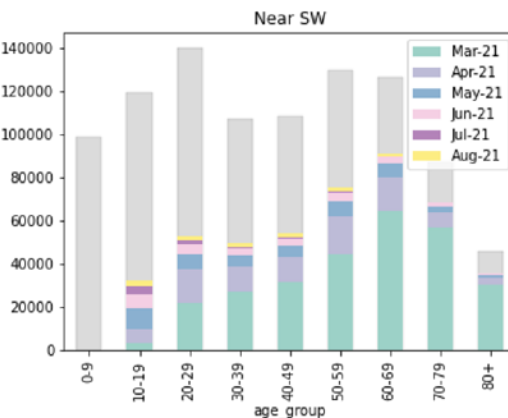
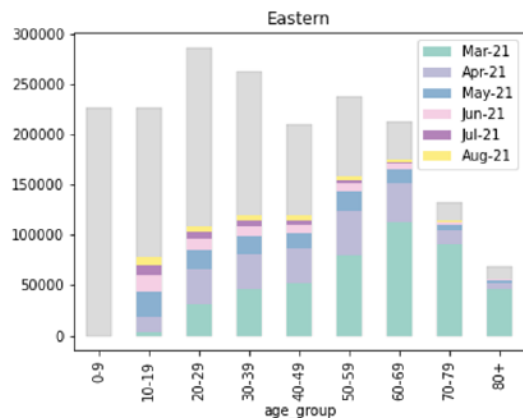
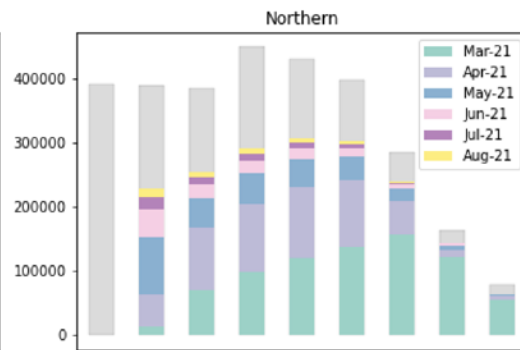
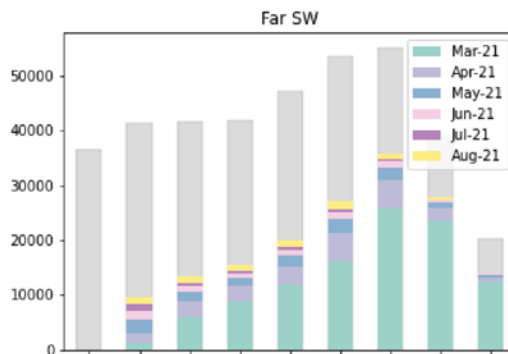
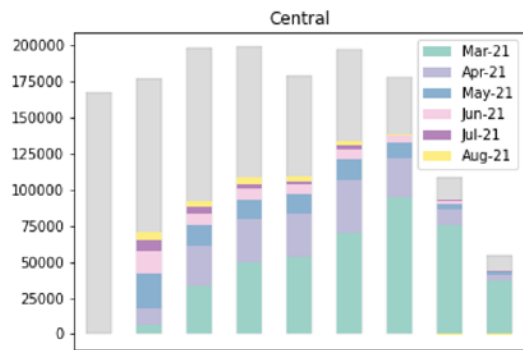
Louisiana



Source: <https://covid.cdc.gov/covid-data-tracker/#new-hospital-admissions>



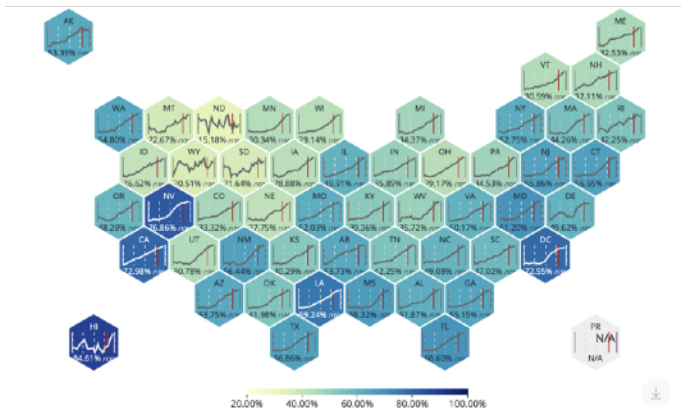
Vaccinations in Younger Populations



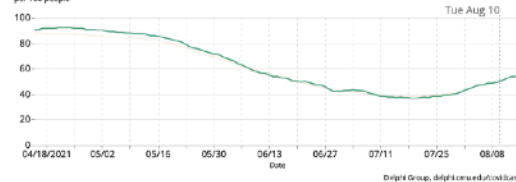
Mask Usage

Self-reported mask usage has declined for months, but rebounded

- State-wide up to 50% from 43% a couple weeks ago
- Similar to US overall, with mixed movement across VA counties



People Wearing Masks in Virginia
per 100 people



Delphi Group, delphi.com/education/index.htm

☐ Rescale Y-axis ☐ Show All Dates

- Virginia
50.17% per 100

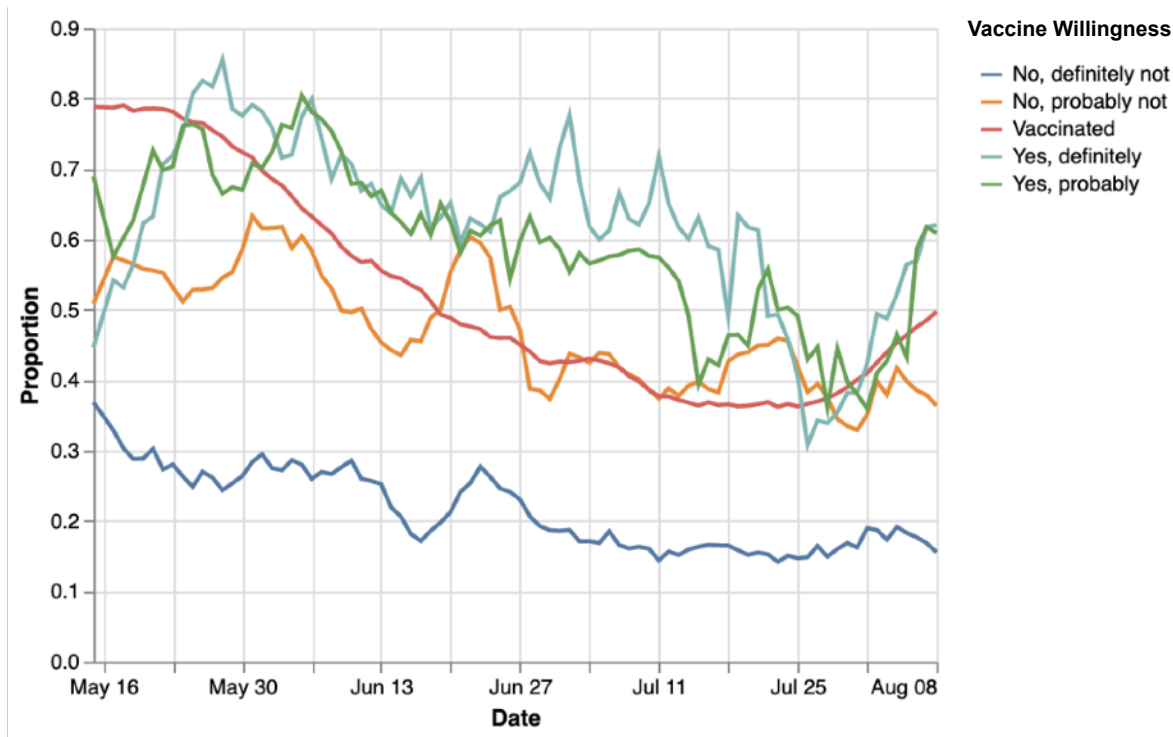
- United States
50.88% per 100



Mask Wearing by Vaccine Willingness

Among the different tiers of vaccine acceptance, mask wearing increasing

- Only those who would “definitely not” take the vaccine if offered has a low level of mask usage
- All other Vaccine willingness levels have similar mask wearing levels



Projection Scenarios

| Name | Txm Controls | Variant Boosting | Vax | Description |
|------------------------|--------------|------------------|-----|---|
| Adaptive-Delta | C | 60% | SQ | Likely trajectory based on conditions remaining similar to now, but with increasing prevalence of Delta variant |
| Adaptive-Delta-VaxOpt | C | 60% | VO | Vaccination through October reaches an optimistically high level of expanded coverage (85%), with increasing prevalence of Delta variant |
| Adaptive-SurgeControl | 25% | 60% | SQ | Transmission rates in the next month reduced through increased control from non-pharmaceutical interventions, with status quo vax and Delta |
| Adaptive-SpringControl | Spring | 60% | SQ | Transmission rates return the rates experienced in May 2021 with status quo vaccination and increasing prevalence of Delta |

Transmission Controls: C = Current levels persist into the future
 25% = Transmission rates are reduced by 25% with a gradual introduction, concluding in 4 weeks
 Spring = Transmission rates return to May 2021 levels

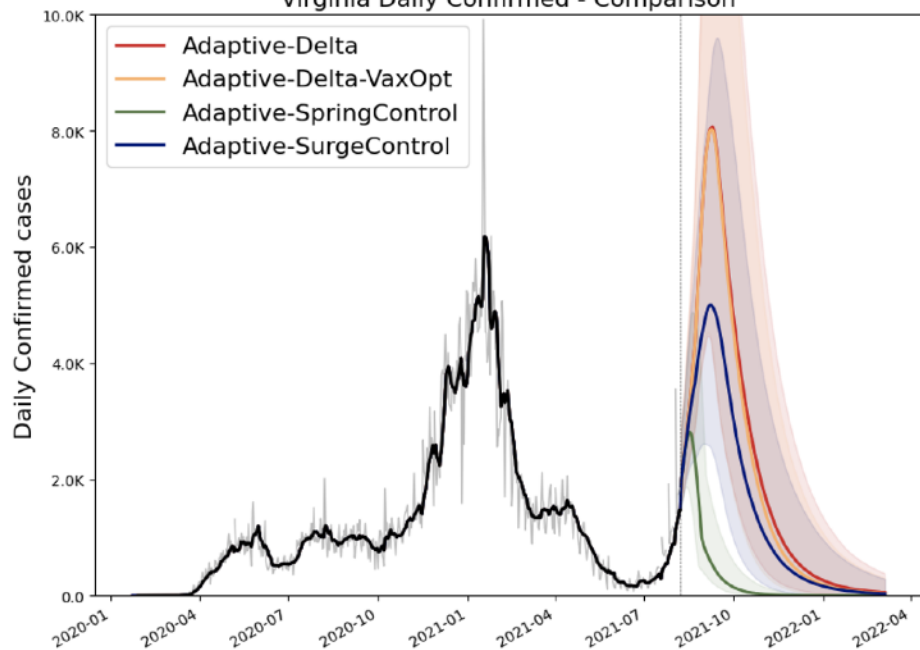
Variant Boosting: None = Variety of variants, no future txm boosting, but with severity impacts from current levels
 60% = Prevalence of Delta ramps up according to logistic growth and is 60% more transmissible

Vaccinations: SQ = Status quo acceptance leads to low rates of vaccination through the summer
 VO = Vaccination acceptance optimistically expands with increased rates through the summer

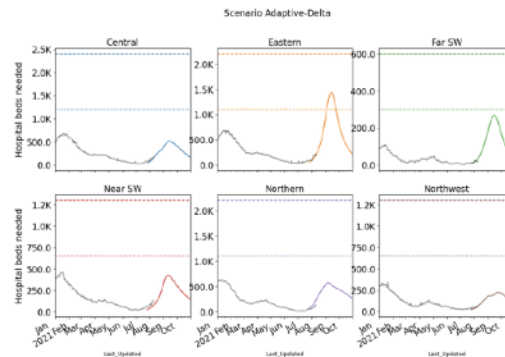
Outcome Projections

Confirmed cases

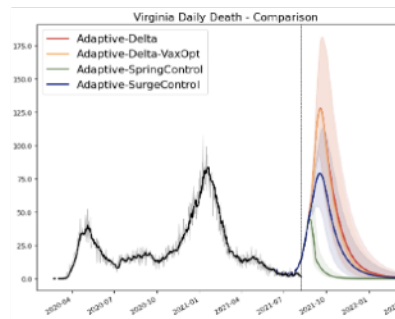
Virginia Daily Confirmed - Comparison



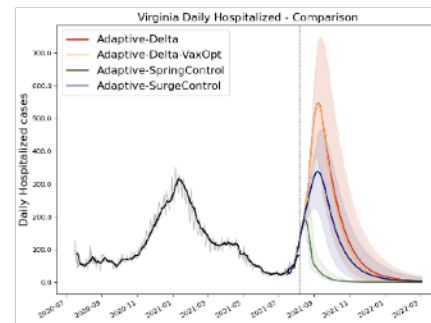
Estimated Hospital Occupancy



Daily Deaths



Daily Hospitalized



Data-driven modeling and analytics to support K-12 re-opening

Summary

- Developed a data-driven modeling and analytics framework that encompasses all the public school districts in the state
 - Framework uses latest information about schools, including location, size, classes
 - Also takes into account the current and projected cases in the surrounding counties for seeding
- Analytical framework can be used to study what-if scenarios to evaluate the impact of various school-level interventions: e.g. usage of masks, increased vaccinations, hybrid learning, test and isolate strategies and pod creation (social bubbles)
 - Illustrative hypothetical studies are presented to showcase the readiness of the tools and provide examples of how such an environment can be used.
- Ready to support VDH and VDOE to carry out analyses of intervention strategies that you deem most important.

Our proposed strategy:

Use detailed information on public schools and county case prevalence combined with epidemiological models to support VDOE and VDH planning and response efforts for safe re-opening and continued operations of K-12 public schools.

1. Use 1-2 weeks ahead forecasts to estimate the number of infected children per school
2. Calibrate school-specific epidemiological models taking into account school size and location
3. Carry out what-if scenarios of various intervention strategies

Interventions considered

1. Increased mask usage: students wear masks
2. Self Isolation when symptomatic
3. Hybrid learning: partial in-person and virtual
4. Social Pods: social groups that have pooled testing
5. Increased test and isolate
6. Increased vaccination ages 12-17 and potential impact on vaccinating kids aged 5-12

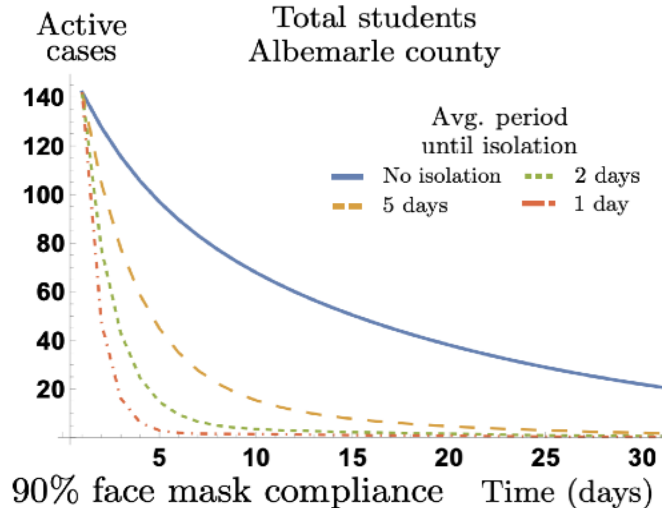
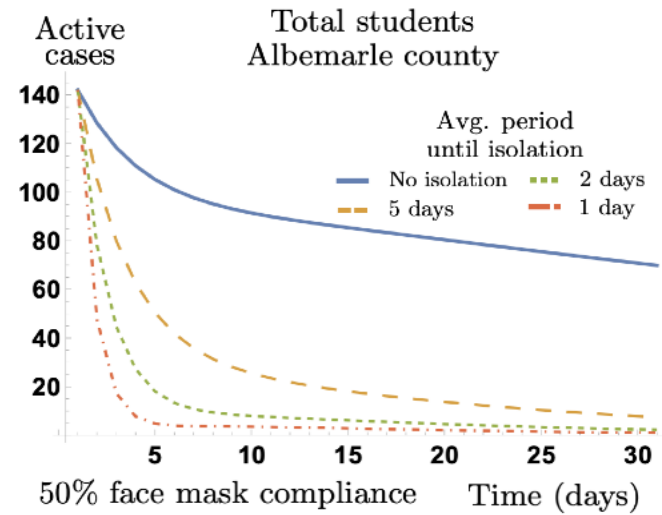
Illustrative result: Impact of mask wearing and self isolation

Question: What is the impact of mask wearing and self-isolation of symptomatic cases on the disease progression?

Scenario: Students wear surgical masks with varying compliance. Symptomatic students self-isolate with certain compliance

Key findings:

- Wearing a mask makes a difference
- Combination of masks and isolation quickly reduces active cases
- Even at 50% compliance, mask wearing can reduce cases:
 - E.g. After 15 days, Mask wearing at 50% compliance and isolation after 5 days of symptoms onset can reduce the number of active cases by 88% relative to the no mask and no isolation scenario.



Next Steps

1. Ready to support VDH and VDOE to provide analytics for exploring various interventions so that schools can be opened and operated safely
 - a. Design of what-if scenarios would be done together to maximize the usefulness to you all
 - b. Model is configured to produce results relatively quickly, allowing it to inform ongoing decision making
2. System structure enables studying targeted policies using real data (based on current prevalence, vaccine uptake, etc.)
3. Illustrative examples demonstrated one intervention at a time -- the model can analyze targeted and concurrent interventions (e.g. test + isolate combined with mask wearing)