MODELING UPDATE

Justin Crow, MPA

UNIVERSITY of VIRGINIA
BIOCOMPLEXITY INSTITUTE

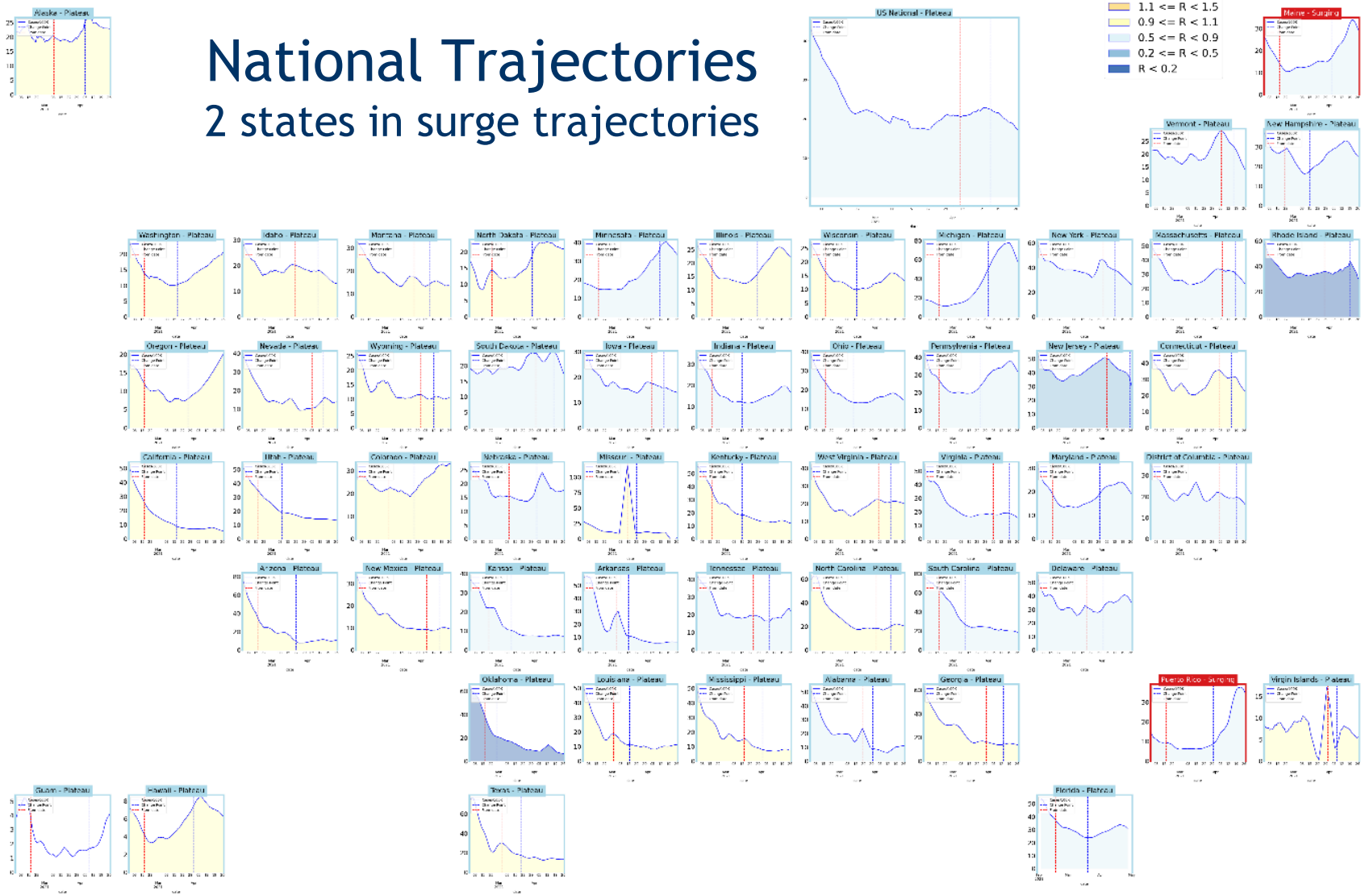
VDH VIRGINIA DEPARTMENT OF HEALTH
To protect the health and promote the well-being of all people in Virginia.

UVA COVID-19 Model-Background

- Model is developed by the UVA Biocomplexity Institute
- Model has evolved
  - Current methodology: “Adaptive Fitting”
  - Based on observed cases in each health district
  - Responsive to current trends → week-to-week volatility
- Models thrive on more & better data, and the model improves every week.
- Behavioral and policy responses drive changes in current trends
- RAND provides additional analysis

National Trajectories

2 states in surge trajectories



UNIVERSITY of VIRGINIA

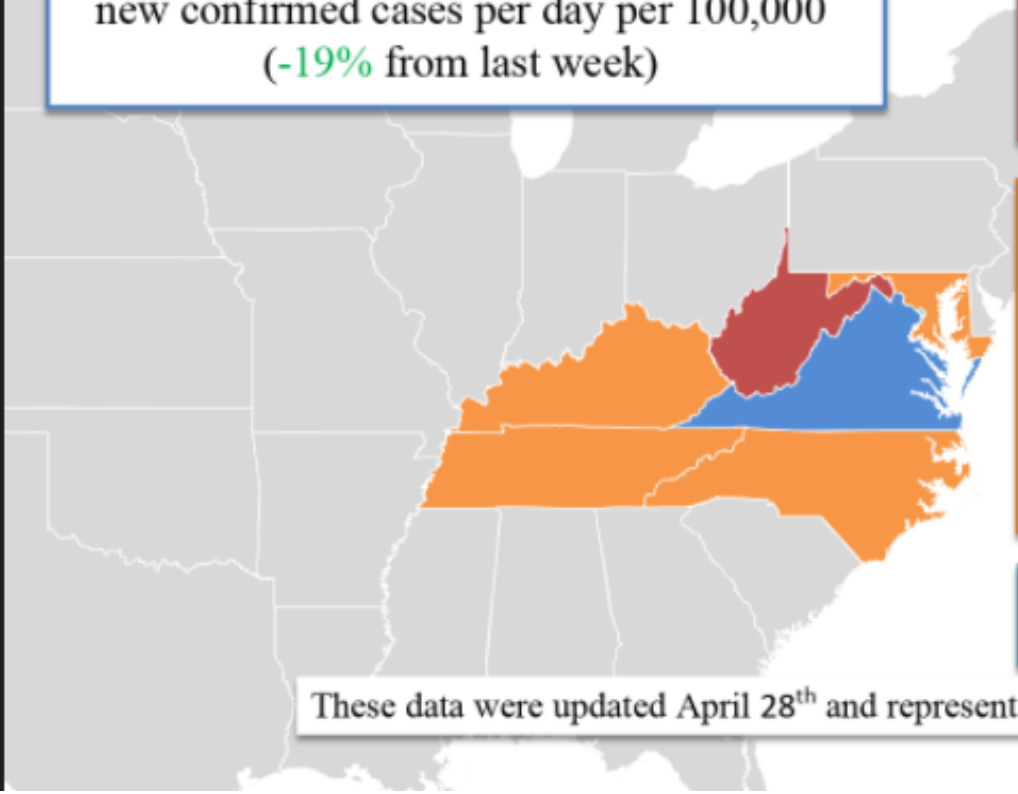
BIOCOMPLEXITY INSTITUTE

VDH VIRGINIA DEPARTMENT OF HEALTH

To protect the health and promote the well-being of all people in Virginia.

Neighboring states' case levels declined to varying degrees over the last week

Over the last 7 days, Virginia had 12.9 new confirmed cases per day per 100,000 (-19% from last week)



Very high case loads (>20):

- West Virginia (20.1 new cases per 100k, -6% from last week)

High case loads (10-20):

- North Carolina (18.1, -7%)
- Maryland (16.3, -21%)
- Tennessee (15.1, -34%)
- District of Columbia (12.9, -24%)
- Kentucky (11.6, -14%)

Lower case loads (<10): None

These data were updated April 28th and represent a seven-day average of the previous week

Case generally declined but remain high in a few counties

CASE COUNT

Source: VDH

Yellow indicates at least 25 cases per 100,000

Case levels have declined across the Commonwealth

- 85 percent of counties have fewer than 20 cases per 100,000 (80 percent last week)
- 41 percent of counties have fewer than 10 cases per 100,000 (32 percent last week)

These data were updated April 28th and represent a seven-day average of the previous week

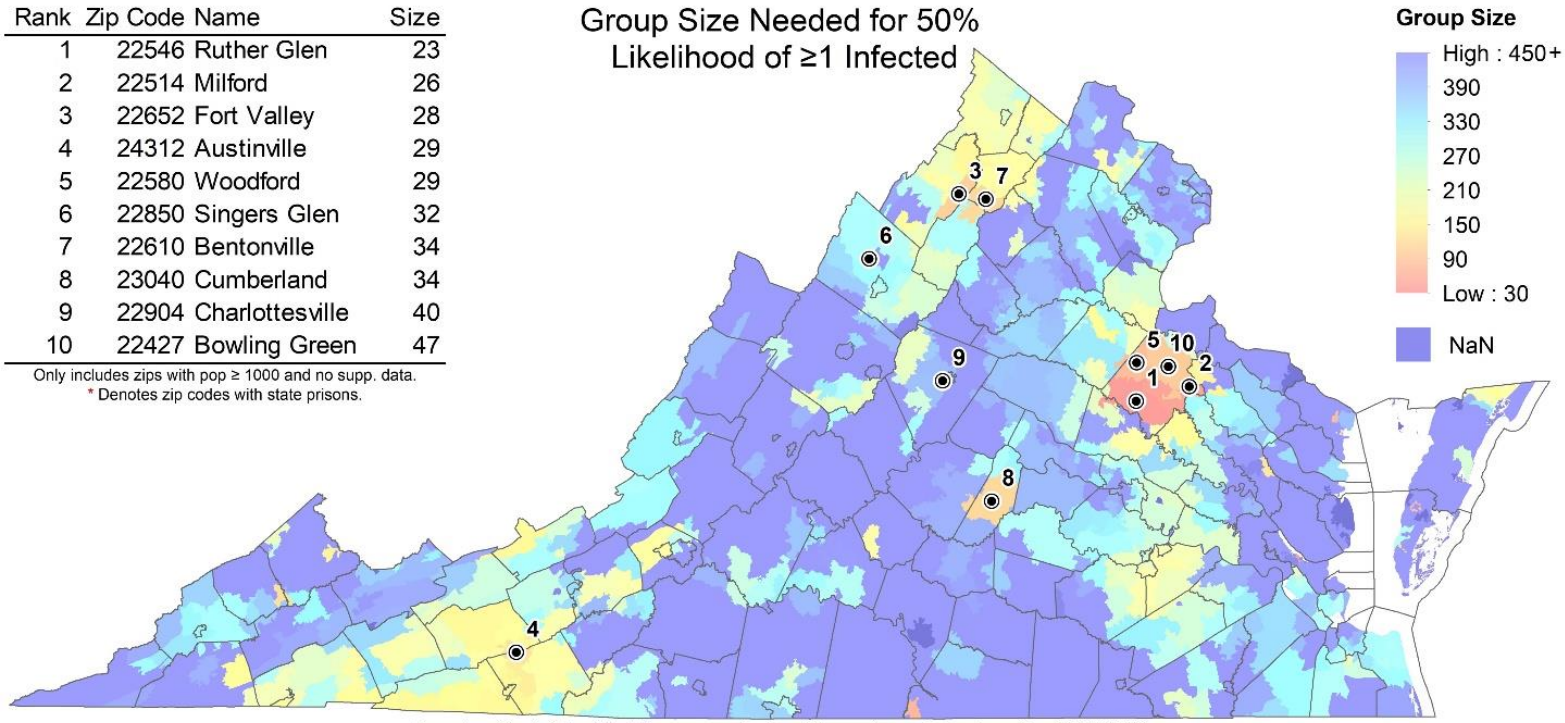
Risk of Exposure by Group Size

Case Prevalence in the last week by zip code used to calculate risk of encountering someone infected in a gathering of randomly selected people (group size 25)

- Assumes 2 undetected infections per confirmed case (ascertainment rate from recent seroprevalence survey)

Rank	Zip Code	Name	Size
1	22546	Ruther Glen	23
2	22514	Milford	26
3	22652	Fort Valley	28
4	24312	Austinville	29
5	22580	Woodford	29
6	22850	Singers Glen	32
7	22610	Bentonville	34
8	23040	Cumberland	34
9	22904	Charlottesville	40
10	22427	Bowling Green	47

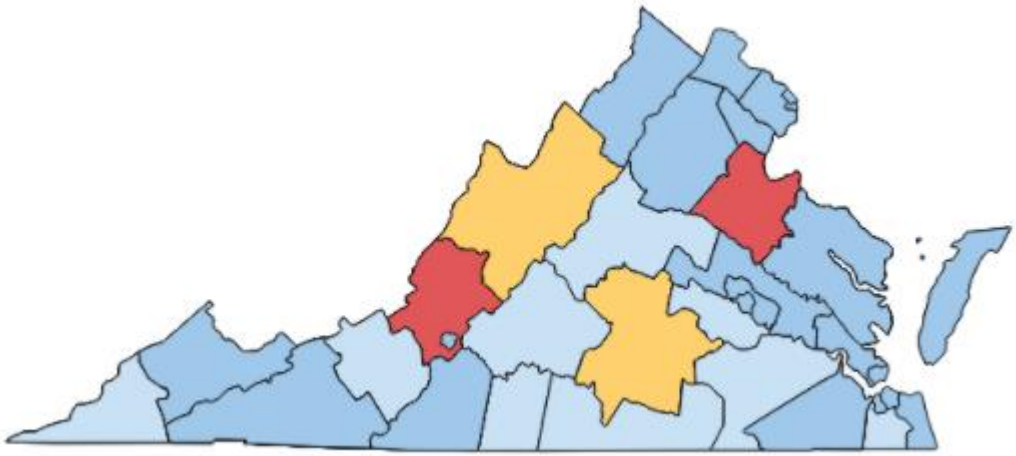
Only includes zips with pop ≥ 1000 and no supp. data.
* Denotes zip codes with state prisons.

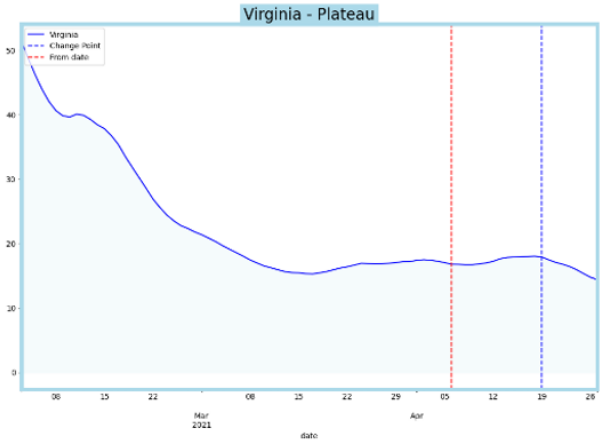


Based on Spatial Empirical Bayes smoothed point prevalence for week ending 2021-04-24.
Note: New color ramp scale and new ascertainment ratio of 2:1.

Health Districts in Surge

Status	# Districts (prev week)
Declining	22 (9)
Plateau	9 (18)
Slow Growth	2 (7)
In Surge	2 (1)





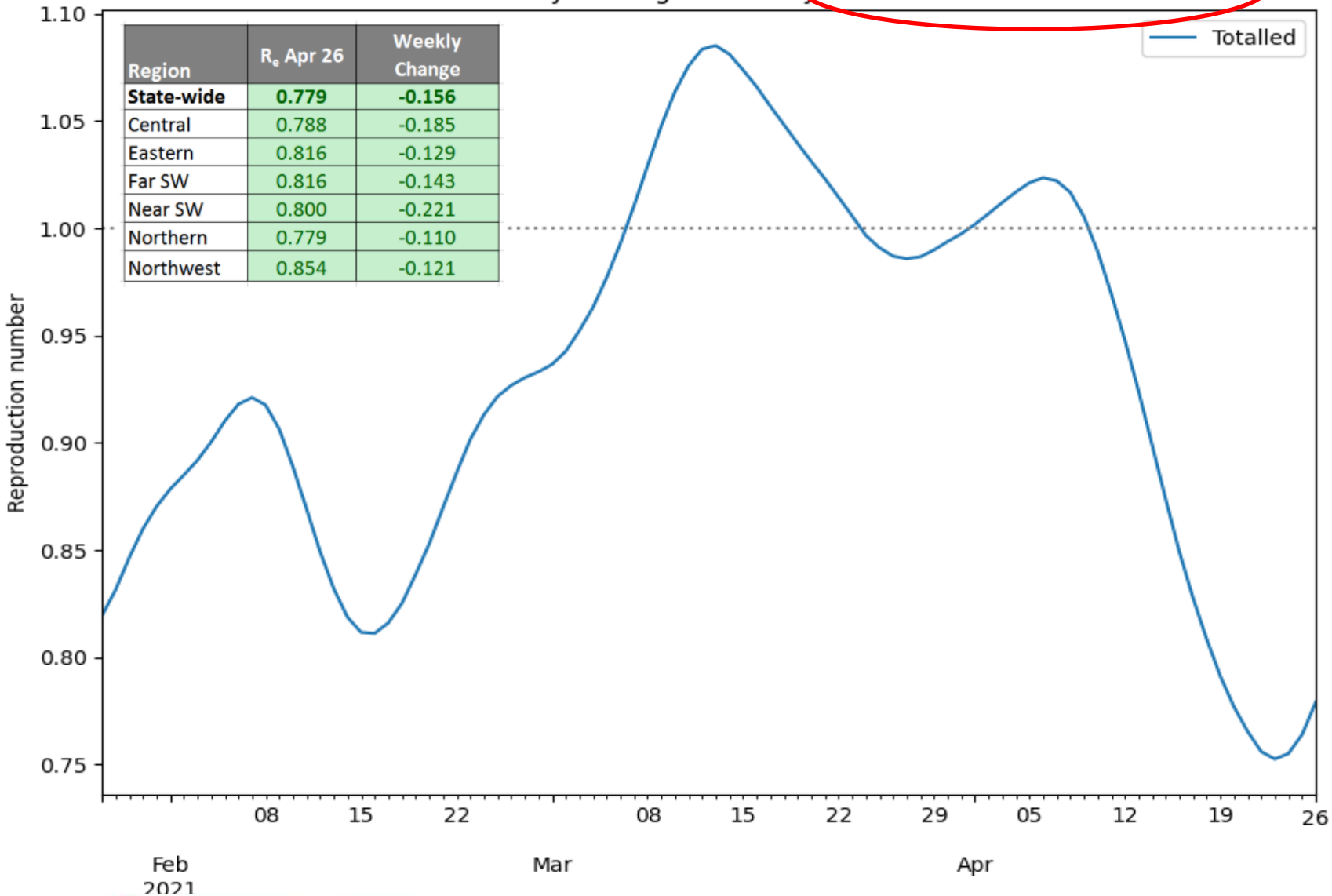
Trajectory	Description	Weekly Case Rate (per 100K) bounds
Declining	Sustained decreases following a recent peak	below -0.9
Plateau	Steady level with minimal trend up or down	above -0.9 and below 0.5
Slow Growth	Sustained growth not rapid enough to be considered a Surge	above 0.5 and below 2.5
In Surge	Currently experiencing sustained rapid and significant growth	2.5 or greater

UNIVERSITY of VIRGINIA
BIOCOMPLEXITY INSTITUTE

VDH VIRGINIA DEPARTMENT OF HEALTH
To protect the health and promote the well-being of all people in Virginia.

VA state-wide RE with 7 day moving window by confirmation date 2021-04-26

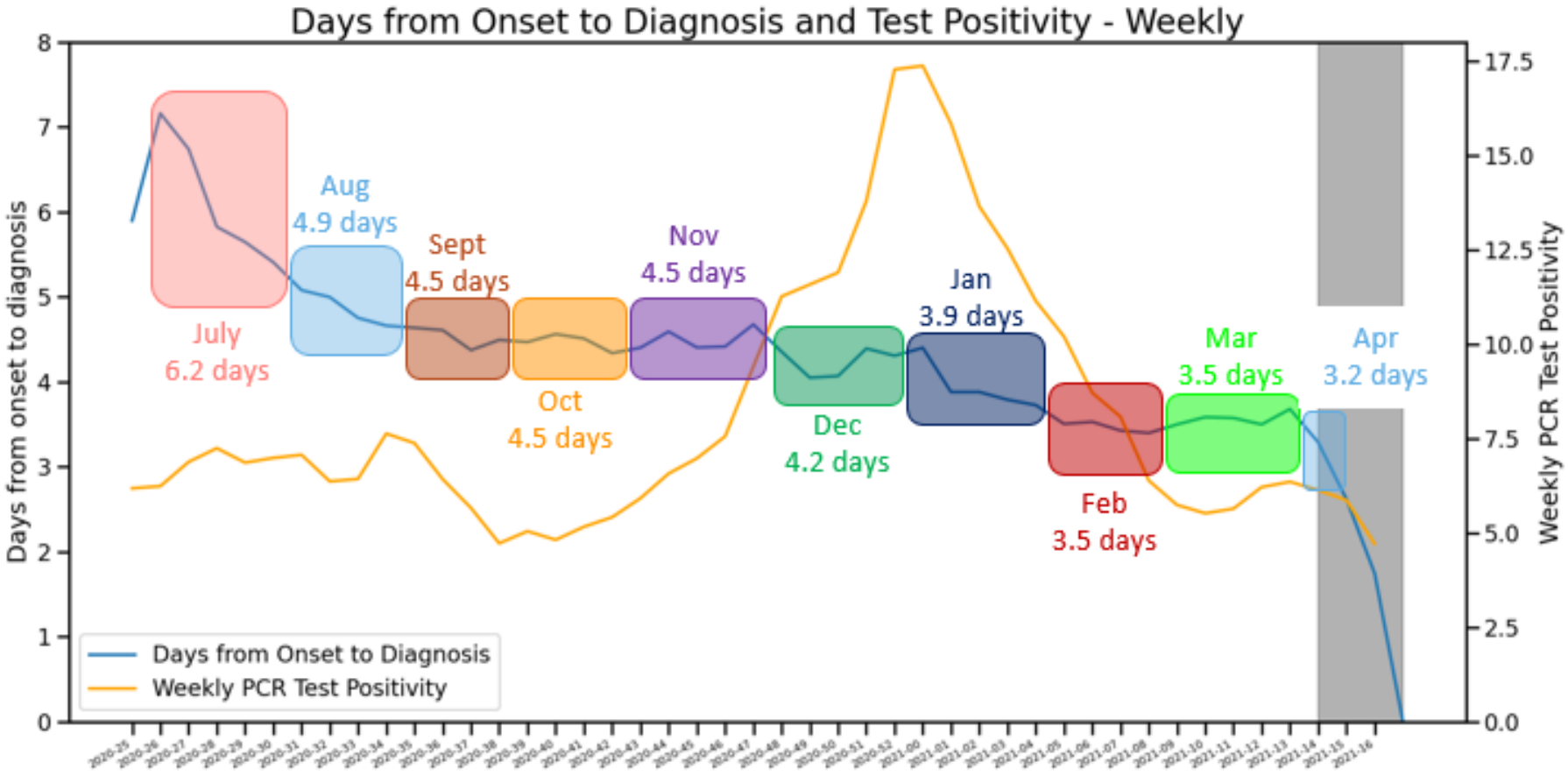
Region	R_e Apr 26	Weekly Change
State-wide	**0.779**	**-0.156**
Central	0.788	-0.185
Eastern	0.816	-0.129
Far SW	0.816	-0.143
Near SW	0.800	-0.221
Northern	0.779	-0.110
Northwest	0.854	-0.121



UNIVERSITY of VIRGINIA
BIOCOMPLEXITY INSTITUTE

VDH VIRGINIA DEPARTMENT OF HEALTH
To protect the health and promote the well-being of all people in Virginia.

Changes in Case Detection – Symptom Onset to Diagnosis



UNIVERSITY of VIRGINIA
BIOCOMPLEXITY INSTITUTE

VDH VIRGINIA DEPARTMENT OF HEALTH
To protect the health and promote the well-being of all people in Virginia.

29 percent of Virginians are fully vaccinated, and an additional fourteen percent are partially vaccinated

Age	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80+	Total
Fully Vaccinated	0	36,713	210,900	291,331	334,098	422,694	527,830	416,770	200,858	2,441,194
% Full	0.0%	3.3%	18.3%	24.8%	31.0%	37.5%	54.0%	67.9%	64.5%	28.6%
Partially Vaccinated	0	81,858	187,833	197,992	199,619	221,130	163,649	73,291	39,047	1,164,419
% with Partial	0.0%	7.4%	16.3%	16.9%	18.5%	19.6%	16.8%	11.9%	12.5%	13.6%
Confirmed Cases	30,329	70,295	125,100	105,551	95,089	93,303	63,601	34,177	24,519	641,964
% Confirmed Cases	28th 3.0%	6.4%	10.8%	9.0%	8.8%	8.3%	6.5%	5.6%	7.9%	7.5%

Vaccinations are being rolled out in Virginia very rapidly

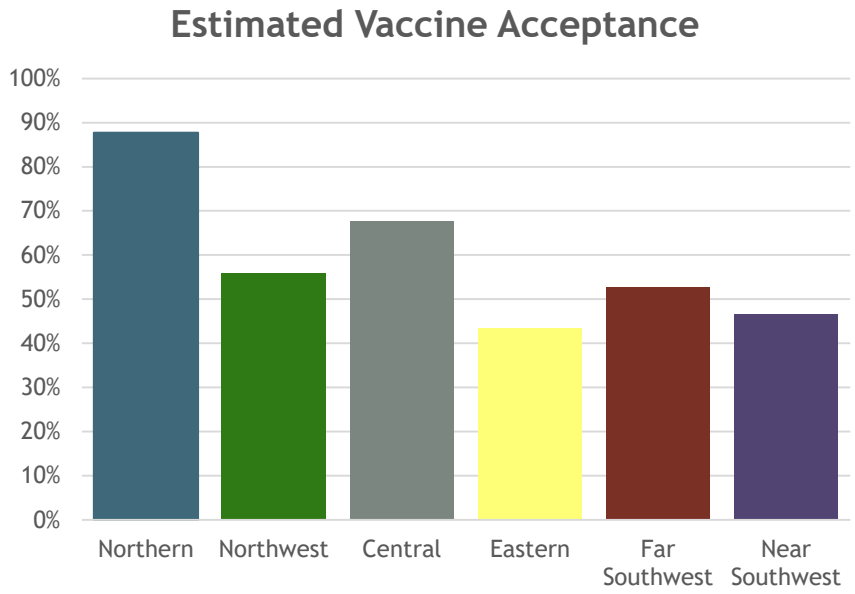
- As of April 28th, 7,504,885 doses have been distributed and 6,018,570 doses have been administered
- Over the last seven days, Virginia has averaged 73,264 doses per day

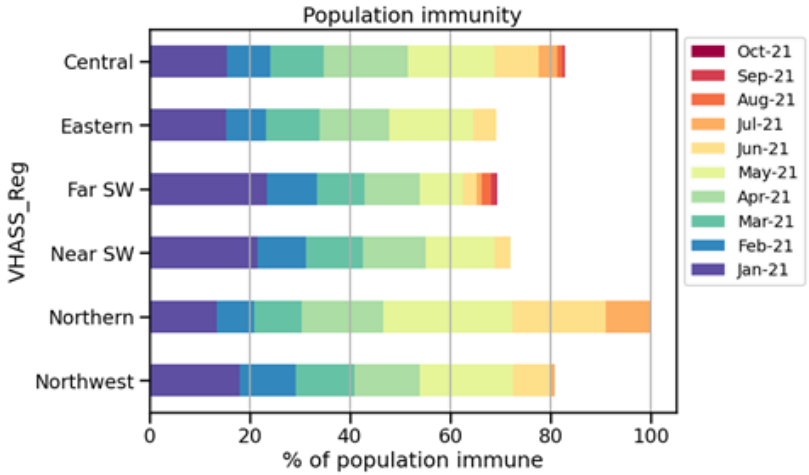
We may be seeing the effects of the vaccinations already

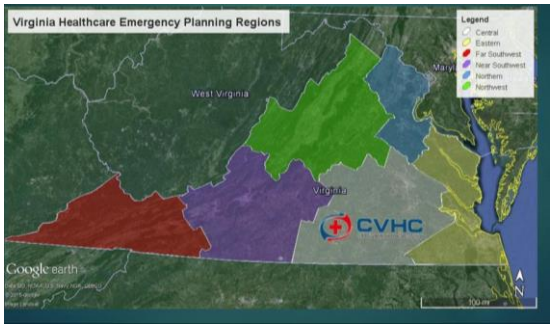
- More than 78 percent of people over the age of 70 are at least partially vaccinated
- That population only had 411 confirmed cases in the last week compared to 2,624 cases early February when only 30 percent had received at least one dose
- At the beginning of February, ten percent of the cumulative cases had been among those over the age of 70, but less than five percent of last week's cases were among the elderly

Efforts to improve demand may be required to reach the necessary levels of protection to end community spread

Vaccine Acceptance







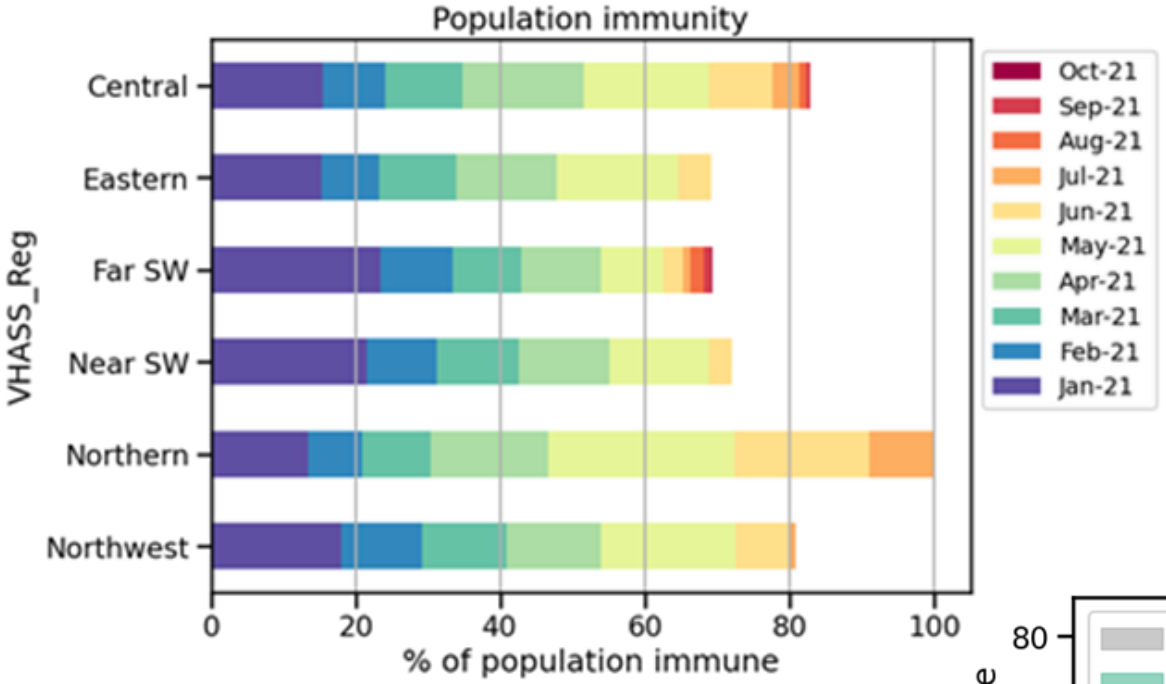
UNIVERSITY of VIRGINIA

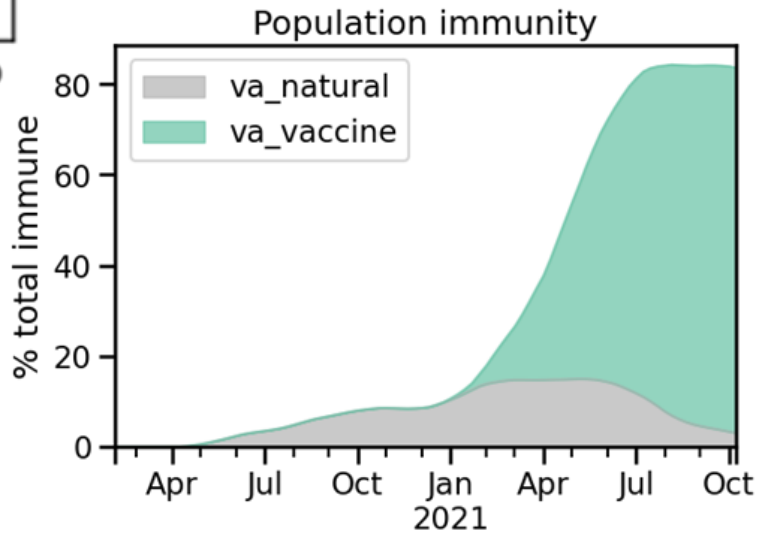
BIOCOMPLEXITY INSTITUTE

VDH VIRGINIA DEPARTMENT OF HEALTH

To protect the health and promote the well-being of all people in Virginia.

Population Immunity





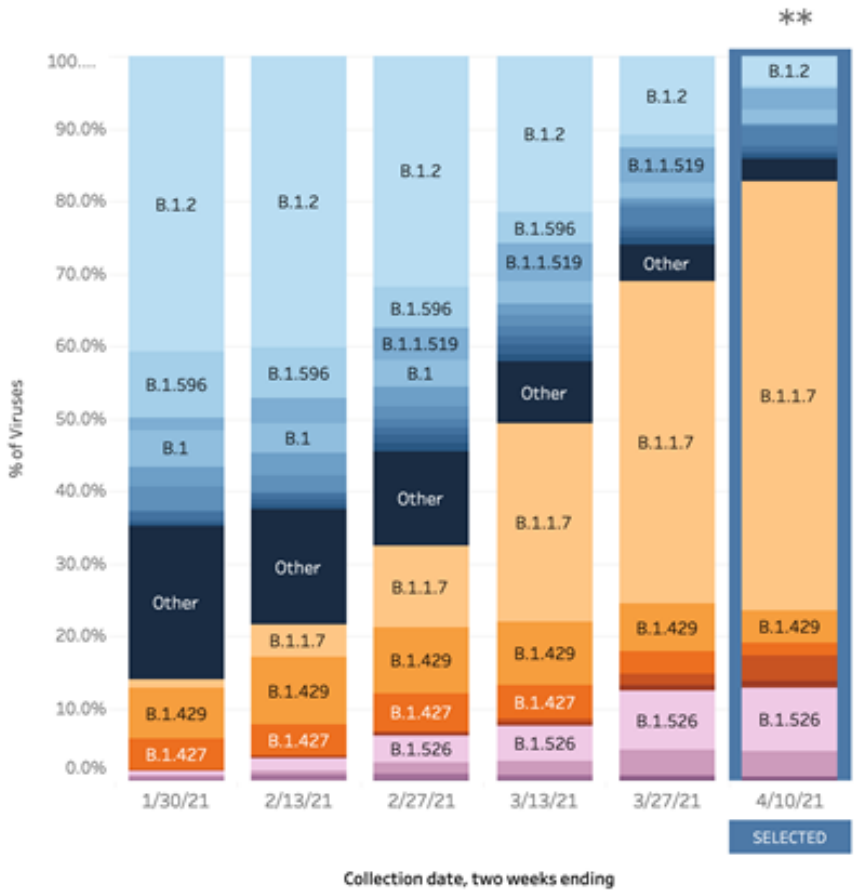
UNIVERSITY of VIRGINIA
BIOCOMPLEXITY INSTITUTE

VDH VIRGINIA DEPARTMENT OF HEALTH
To protect the health and promote the well-being of all people in Virginia.

Variants

Weighted Estimates of Proportions of SARS-CoV-2 Lineages

United States: 1/17/2021 – 4/10/2021



United States: 3/28/2021 – 4/10/2021

USA

	Lineage	Type	%Total	95%CI
Most common lineages	B.1.1.7	VOC	59.2%	56.1-62.2%
	B.1.526	VOI	8.7%	6.7-11.4%
	B.1.429	VOC	4.5%	3.5-5.8%
	B.1.2		4.0%	3.4-4.6%
	B.1.526.1	VOI	3.5%	3.0-4.2%
	P.1	VOC	3.5%	2.9-4.2%
	B.1.1.519		2.9%	2.4-3.6%
	B.1.526.2		2.8%	2.1-3.7%
	B.1		1.9%	1.6-2.2%
	B.1.427	VOC	1.8%	1.3-2.4%
	B.1.1		0.7%	0.4-1.0%
	B.1.596		0.5%	0.4-0.7%
	R.1		0.5%	0.4-0.7%
	B.1.575		0.5%	0.3-0.7%
	B.1.243		0.2%	0.1-0.3%
	B.1.234		0.2%	0.1-0.3%
Additional VOI/VOC lineages	B.1.351	VOC	0.9%	0.7-1.2%
	B.1.525	VOI	0.4%	0.3-0.6%
	P.2	VOI	0.2%	0.1-0.3%
Other*	Other		3.2%	2.8-3.8%

* Other represents >200 additional lineages, which are each circulating at <1% of viruses

** Most recent data are subject to change as samples from that period are still being processed

† Fewer than 10 observations of this variant during the selected time/location context

Scenarios

Three scenarios combine these seasonal effects and use the accelerated vaccine schedule:

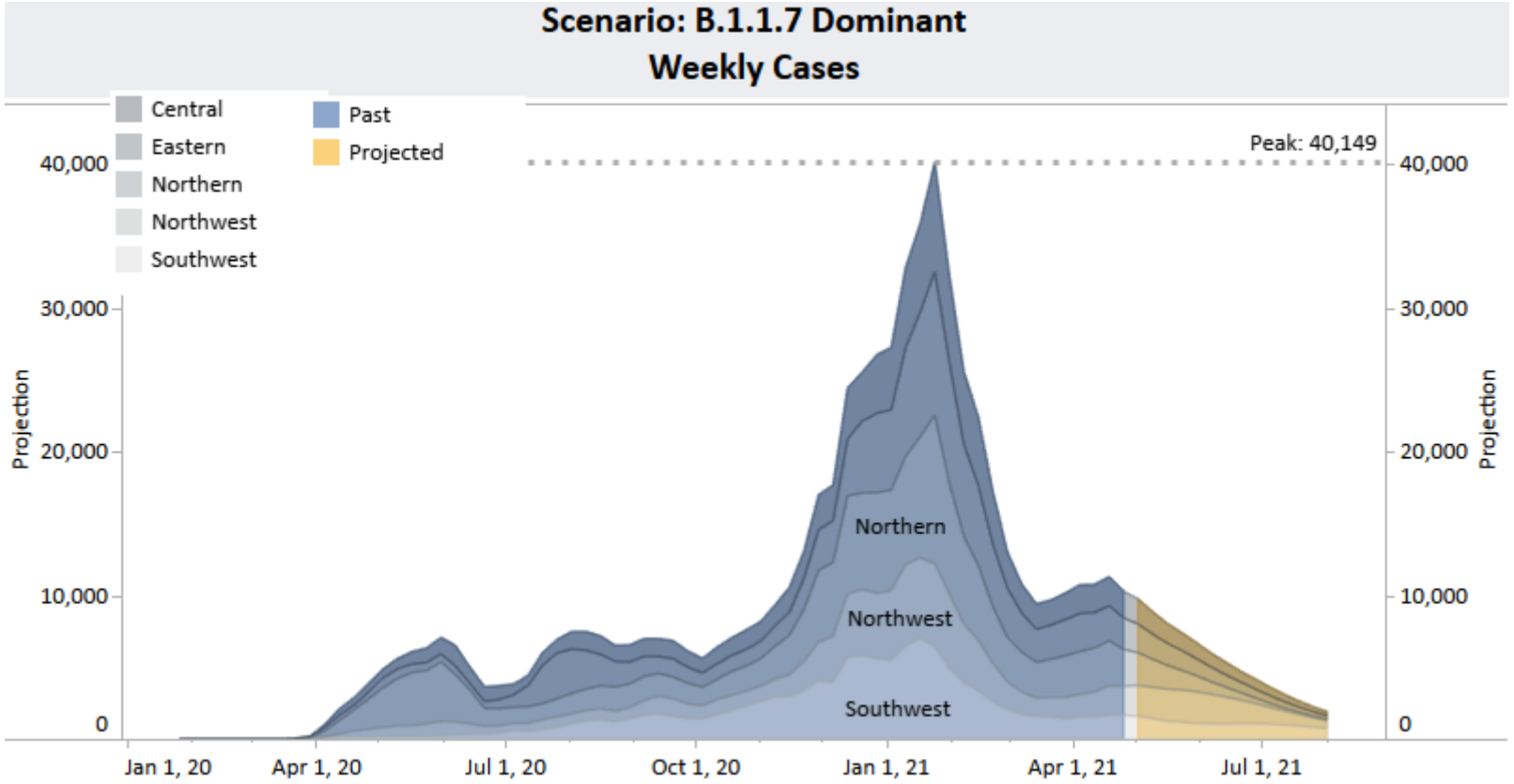
- **Adaptive-DominantB117**: Boosting of transmissibility from the emergence and likely dominance of B.1.1.7

- **Adaptive-BestPast-DominantB117:** Best Past controls with transmission boost from B.1.1.7

- **Adaptive-FatigueControl-DominantB117:** Fatigued controls and transmission boost from B.1.1.7

Counterfactuals with no vaccine ("NoVax") are provided for comparison purposes

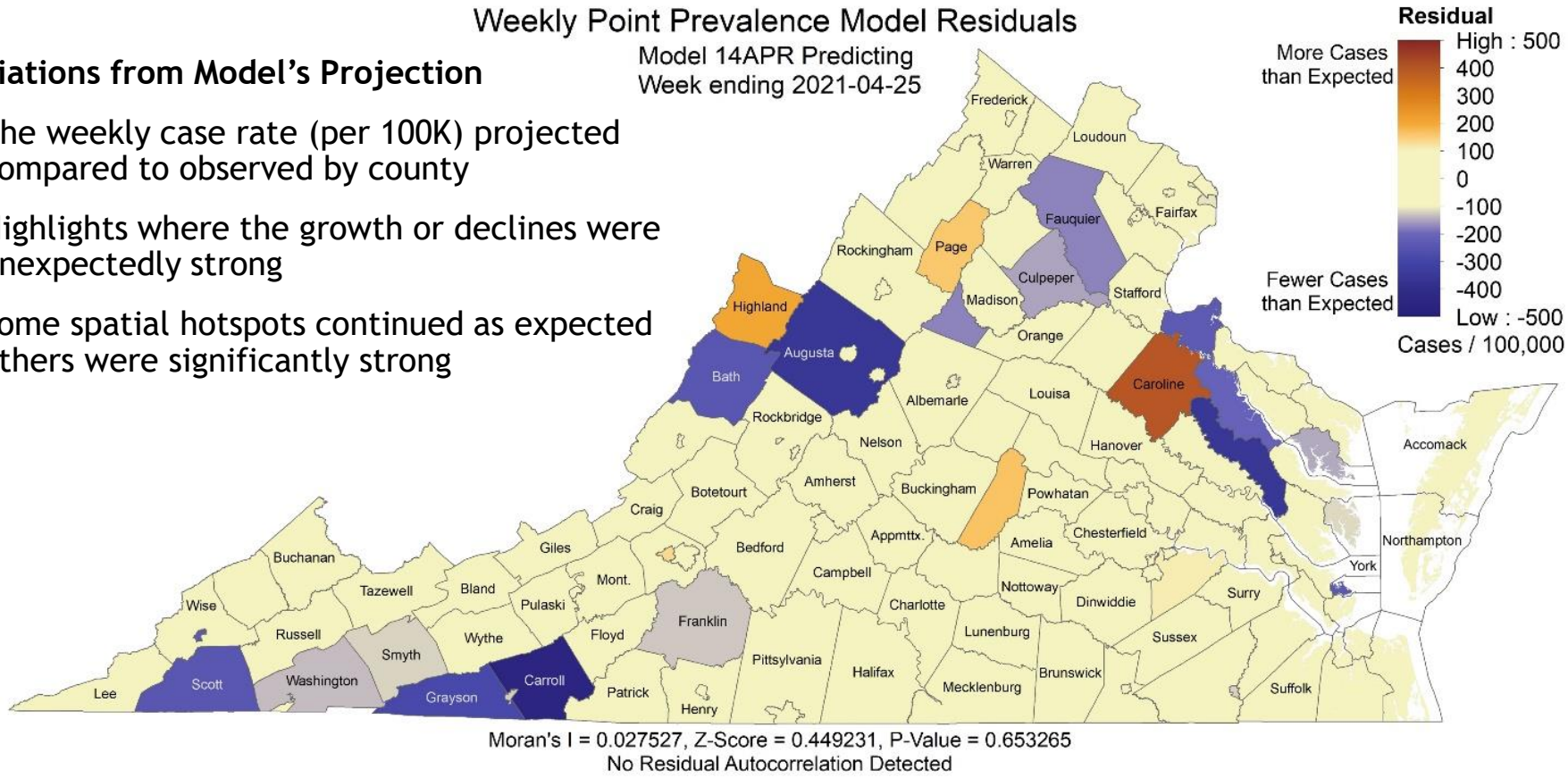
Scale of Projections: B.1.1.7 Dominant



Deviations from Model's Expectations

Deviations from Model's Projection

- The weekly case rate (per 100K) projected compared to observed by county
- Highlights where the growth or declines were unexpectedly strong
- Some spatial hotspots continued as expected others were significantly strong

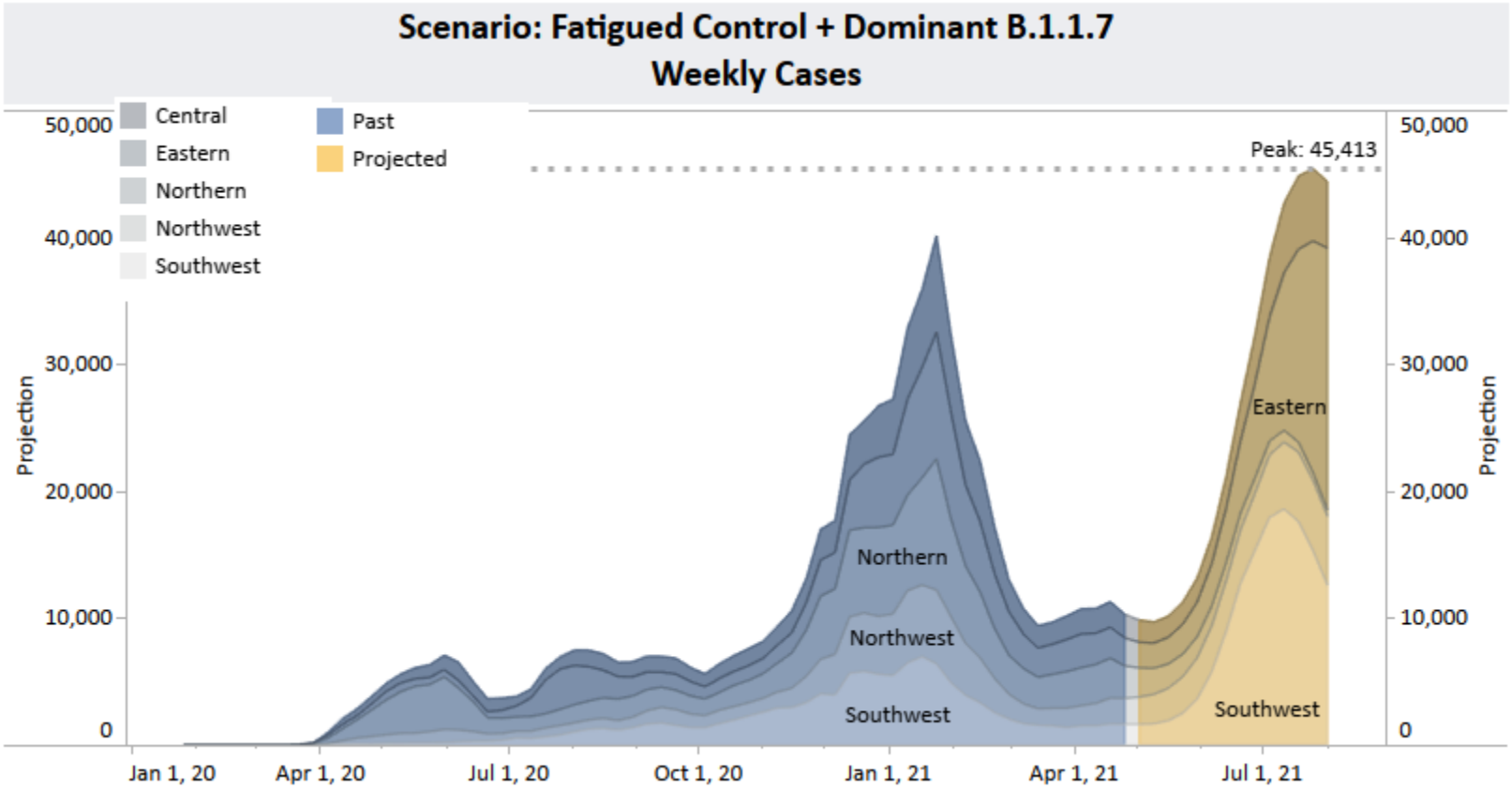


Moran's I = 0.027527, Z-Score = 0.449231, P-Value = 0.653265
No Residual Autocorrelation Detected

UNIVERSITY of VIRGINIA
BIOCOMPLEXITY INSTITUTE

VDH VIRGINIA DEPARTMENT OF HEALTH
To protect the health and promote the well-being of all people in Virginia.

Adaptive: Fatigued Control + Dominant B.1.1.7



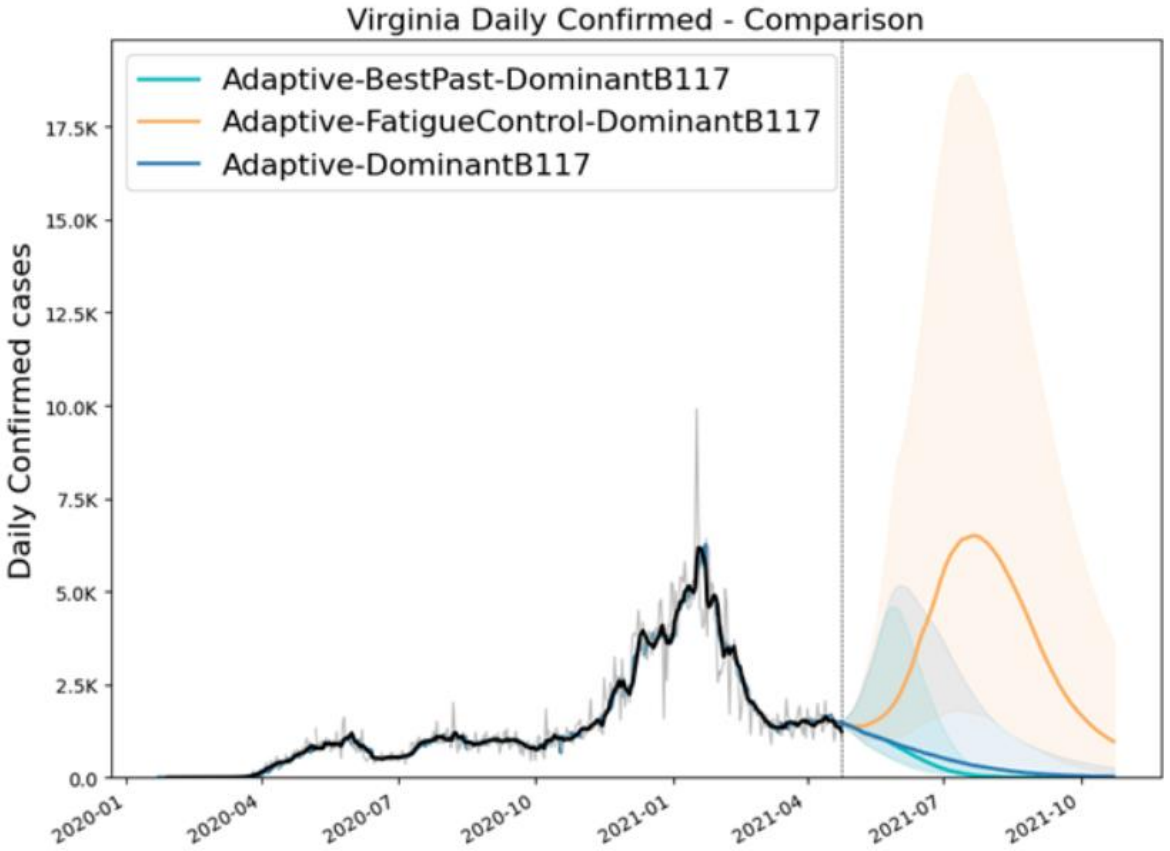
Projections

17 per 100k
Average Daily Cases
Week Ending April 25, 2021

77 per 100k
Potential Peak Average Daily Cases, Week Ending July 25, 2021 with B.1.1.7 Variant & Pandemic Fatigue

13 per 100k
2020 Summer Peak
Week Ending Aug 2, 2020

68 per 100k
Highest Peak Average Daily Cases
Week Ending Jan 24, 2021



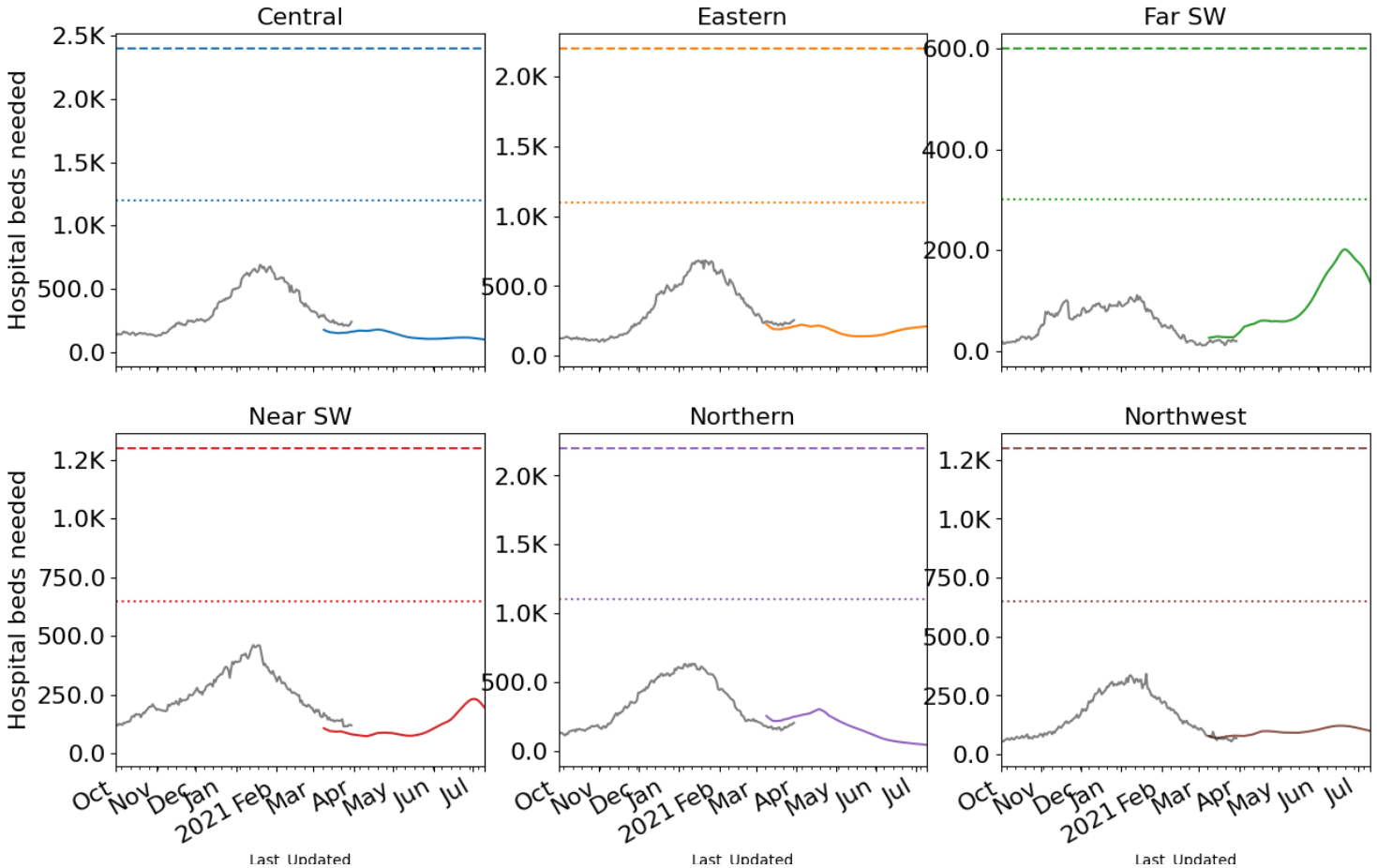
UNIVERSITY of VIRGINIA
BIOCOMPLEXITY INSTITUTE

VDH VIRGINIA DEPARTMENT OF HEALTH
To protect the health and promote the well-being of all people in Virginia.

Hospital Demand and Capacity by Region

Capacities by Region – Fatigued Control + B.1.1.7

COVID-19 capacity ranges from 80% (dots) to 120% (dash) of total beds



UNIVERSITY of VIRGINIA
BIOCOMPLEXITY INSTITUTE

* Assumes average length of stay of 8 days

VDH VIRGINIA DEPARTMENT OF HEALTH
To protect the health and promote the well-being of all people in Virginia.

The Modeling Unit, including staff from RAND and the UVA Biocomplexity Institute, hosts a weekly update every Thursday at noon.

Please contact:

Emily Sheffield
emily.sheffield@vdh.virginia.gov

to be added to that invite.

Where to find modeling results

- **VDH COVID-19 Data Insights**
  https://www.vdh.virginia.gov/coronavirus/covid-19-data-insights/
  - **Model Explorer (Thur)**
  - **UVA Biocomplexity Institute Slides (Fri)**
  - **RAND Slides (Fri)**
  - **Weekly Update (Fri)**

- COVID-19 Medical Resource Demand Dashboard
  https://covid19.biocomplexity.virginia.edu/dashboards
  - Hospital Capacity Scenarios