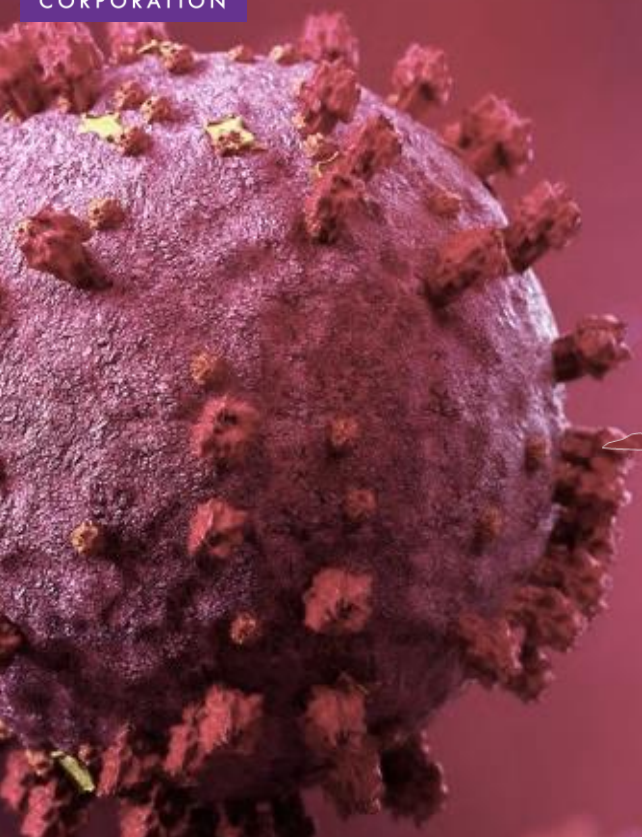
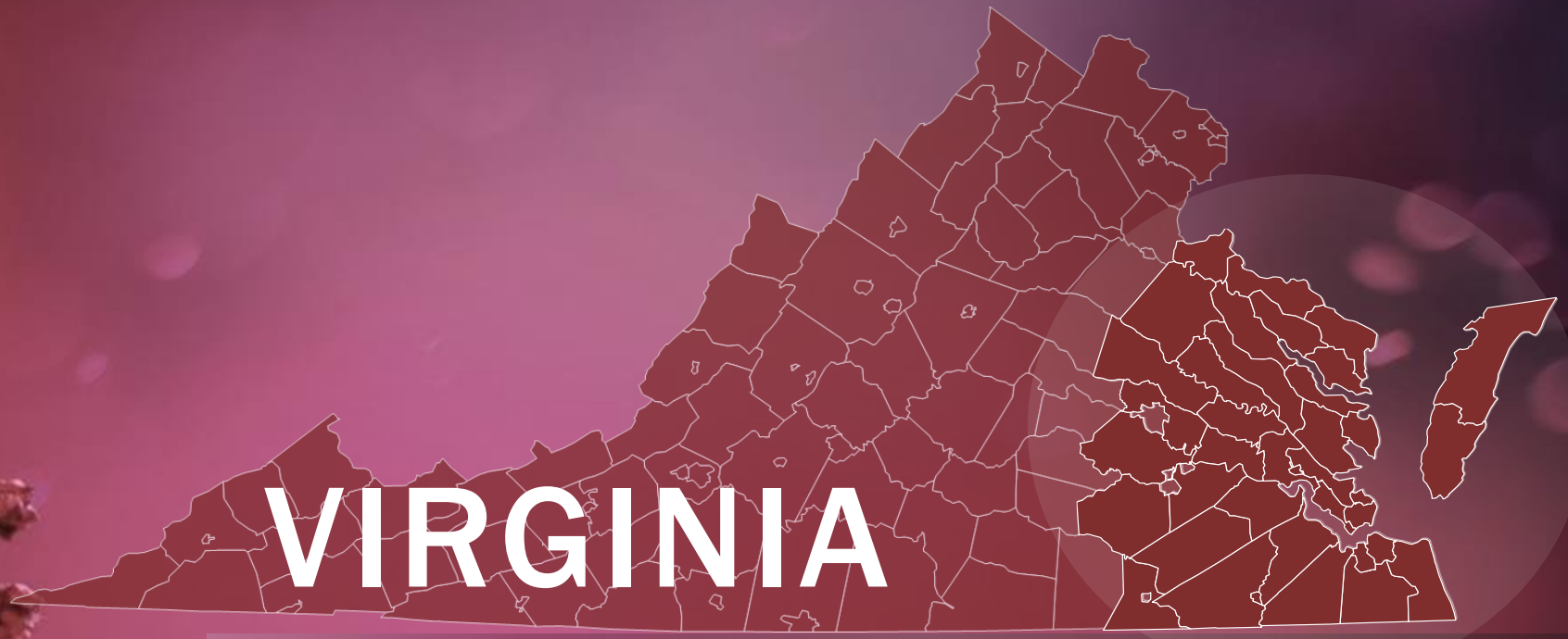




VIRGINIA

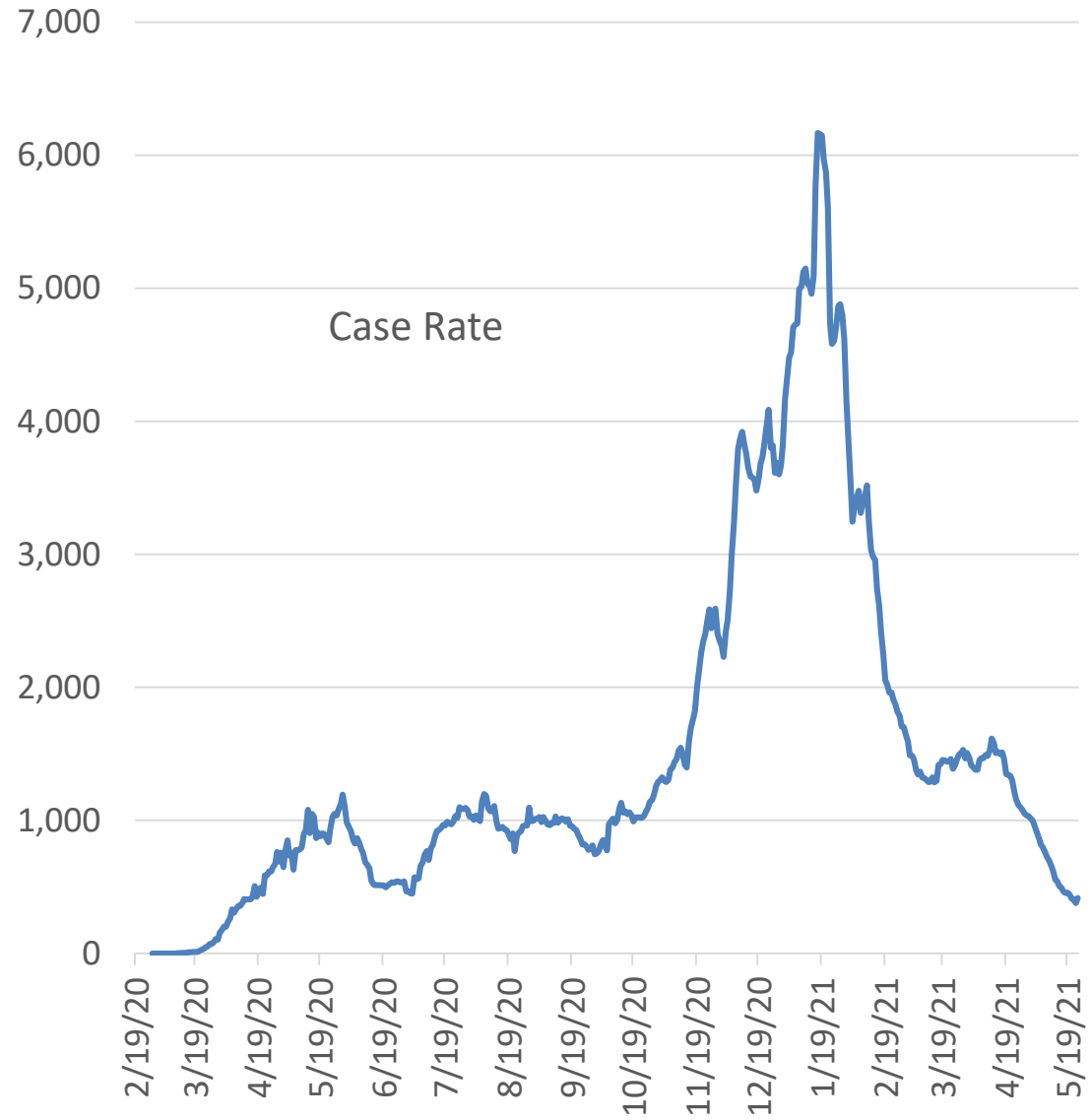
COVID-19 Update May 27th, 2021

Carter C. Price, Ph.D.

A team of RAND researchers was asked by the Commonwealth of Virginia to review available information on COVID-19 models of the Commonwealth to determine the strengths and weaknesses of each model and their relevance to decisionmaking. The information in this presentation is intended to keep policymakers abreast of the latest findings of the research team.

This research was sponsored by the Commonwealth of Virginia and conducted by the RAND Corporation. RAND is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest. For more information, visit www.rand.org.

Bottom Line Up Front



Confirmed cases have declined from last week to 418 per day (-10%)

- This is 68 percent lower than the previous low of 2021 and 7 percent below the summer lows of 2020

COVID hospitalizations have decreased to 527 (-14%)

Vaccination is continuing to increase with at least 41 percent of the population fully vaccinated

- With the current trend, community immunity will not be reached before the fall

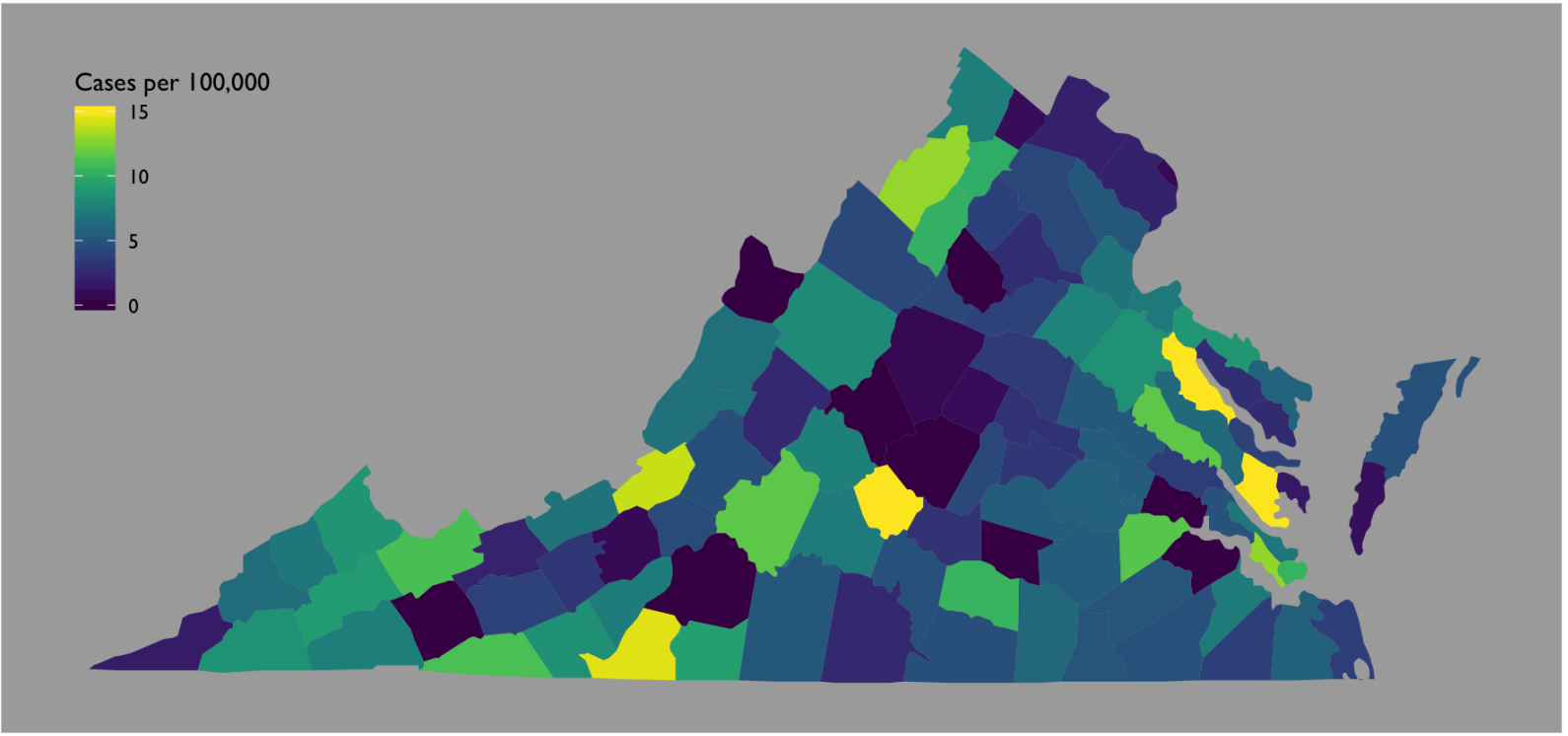
Case rates are approaching the lows of 2020, and the decline over the last few weeks may indicate that the vaccines are slowing the spread

- Virginia has been trending toward a sustained decline
- However, this trend may be fragile because the variants of concern and higher movement could still increase the case numbers among the unvaccinated

Cases are relatively low across the Commonwealth

CASE COUNT

Source: VDH



Yellow indicates at least 15 cases per 100,000

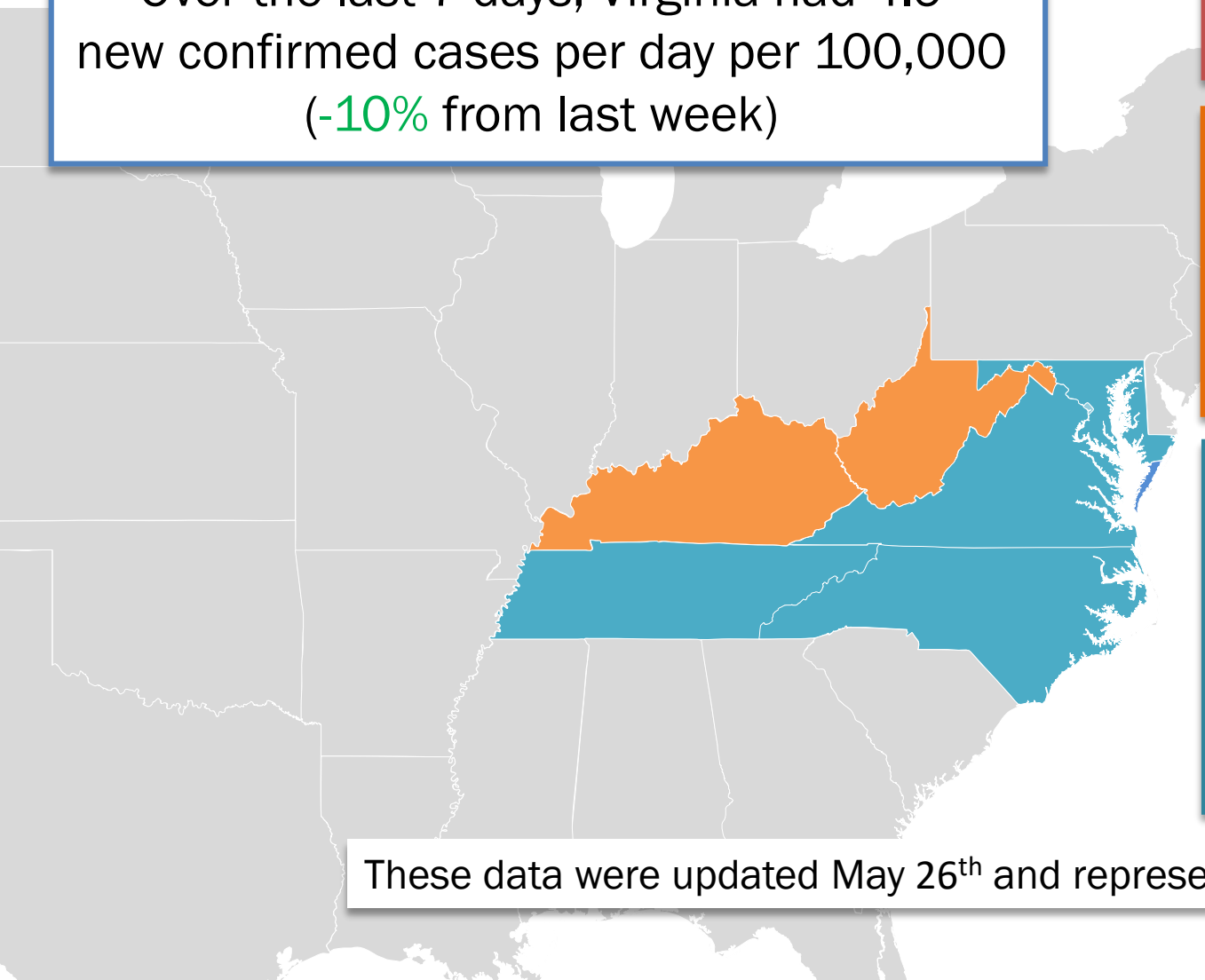
Case levels have drifted lower across the Commonwealth

- 98 percent of counties have fewer than 20 cases per 100,000 (98 percent last week)
- 83 percent of counties have fewer than 10 cases per 100,000 (78 percent last week)

These data were updated May 26th and represent a seven-day average of the previous week

Case level trends for neighboring states were down last week

Over the last 7 days, Virginia had 4.9 new confirmed cases per day per 100,000 (-10% from last week)



Very high case loads (>20):

High case loads (10-20):

- West Virginia (13.6 new cases per 100k, -16% from last week)
- Kentucky (10.3, -13%)

Lower case loads (<10): None

- North Carolina (9.2, -8%)
- Tennessee (5.7, -34%)
- Maryland (5.3, -14%)
- District of Columbia (3.5, -56%)

These data were updated May 26th and represent a seven-day average of the previous week

Variants could increase the rate of spread

The CDC has Identified five variants of concern that spread more rapidly than the baseline variant and may lead to more reinfection

- All five variants of concern have been detected in Virginia

The CDC has projections of the current prevalence for HHS Region 3 (DE, DC, MD, PA, VA, and WV) based on genomic testing from April 25th to May 8th

- B.1.1.7 (“U.K. variant”) is estimated to be 75.5 percent of cases in the region
- P.1 (“Brazilian variant”) is estimated to be 3.7 percent of cases
- B.1.351 (“South African variant”) is estimated to be 1.1 percent of cases
- B.1.427/B.1.429 (“California variants”) are estimated to be 0.4 percent taken together

Additionally, there are several variants of interest that have been detected in the region

- B.1.526/B.1.526.1 /B.1.526.2 (“New York variants”) are estimated to total 15.6 percent
- B.1.617.1-3 (”Indian variants”) are estimated to be 1.8 percent of the cases in the region

41 percent of Virginians are fully vaccinated, and an additional 10 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	125,438	399,795	478,669	517,796	621,643	658,484	461,613	219,523	3,482,961
% Full	0.0%	11.4%	34.6%	40.8%	48.1%	55.2%	67.4%	75.2%	70.5%	40.8%
Partially Vaccinated	0	152,653	131,327	134,106	126,986	133,571	108,683	59,600	33,313	880,239
% with Partial	0.0%	13.9%	11.4%	11.4%	11.8%	11.9%	11.1%	9.7%	10.7%	10.3%
Confirmed Cases	32,109	73,386	129,194	108,999	97,875	95,873	95,179	34,959	24,859	692,433
% Confirmed Cases	3.2%	6.7%	11.2%	9.3%	9.1%	8.5%	9.7%	5.7%	8.0%	8.1%

Source: VDH, May 26th

Vaccinations are slowing

- As of May 26th, 9,011,475 doses have been distributed and 7,979,477 doses have been administered
- Over the last seven days, Virginia has averaged 48,502 doses per day (+16% from last week and -37% from last month)
- At this pace, the vaccination levels needed for community immunity will not be reached before September of 2021

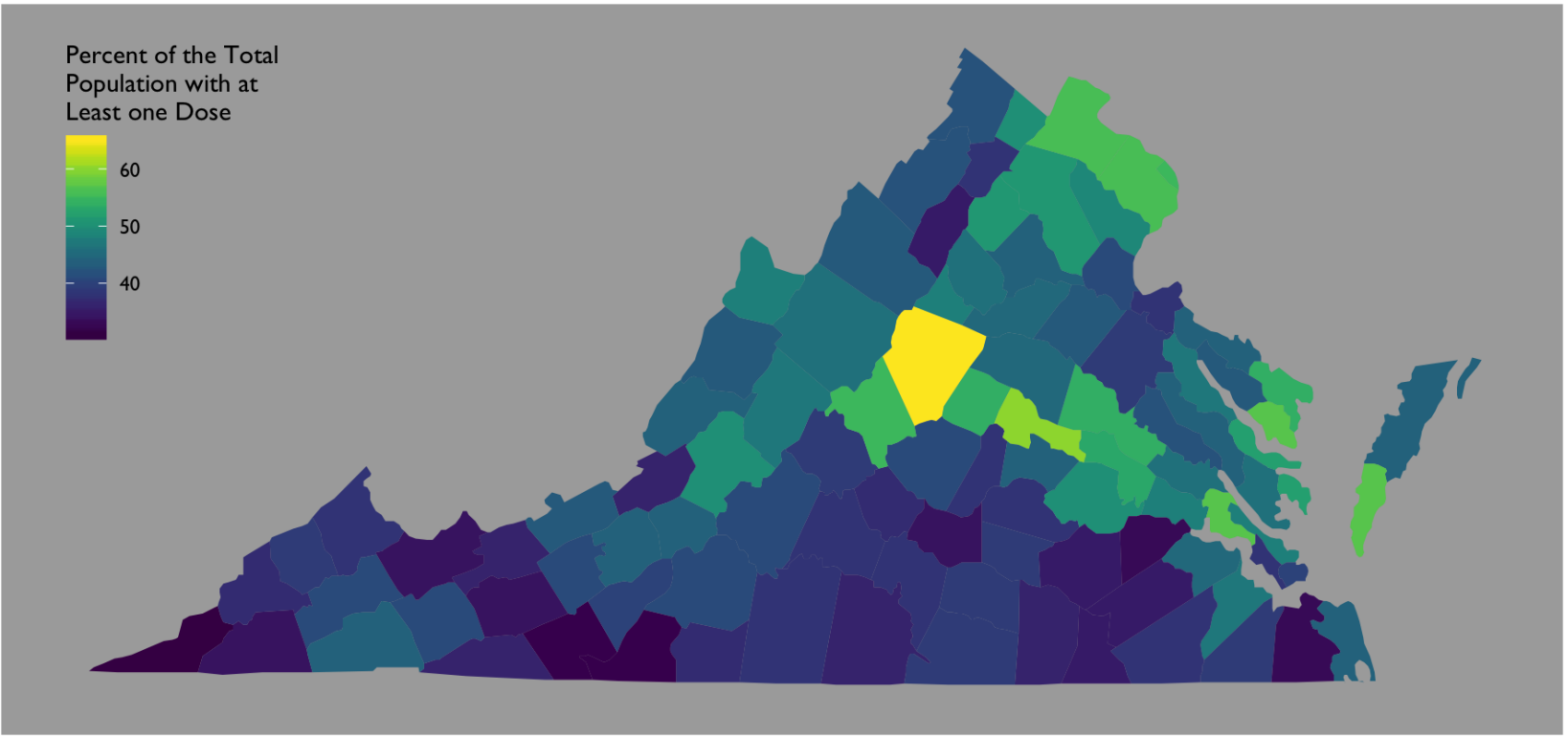
A Kaiser Family Foundation poll from April indicated hesitancy has declined

- There is a small but consistent portion of the population resistant to receiving a vaccine (roughly 19 percent)
- The gaps in vaccination rates and hesitancy have closed between white, Black, and Hispanic populations
- If access to vaccinations is a barrier, targeted vaccination sites with extended hours and no requirement for an appointment may be more useful than mass vaccination sites

Vaccination rates are uneven across the Commonwealth

Vaccination Rate

Source: VDH



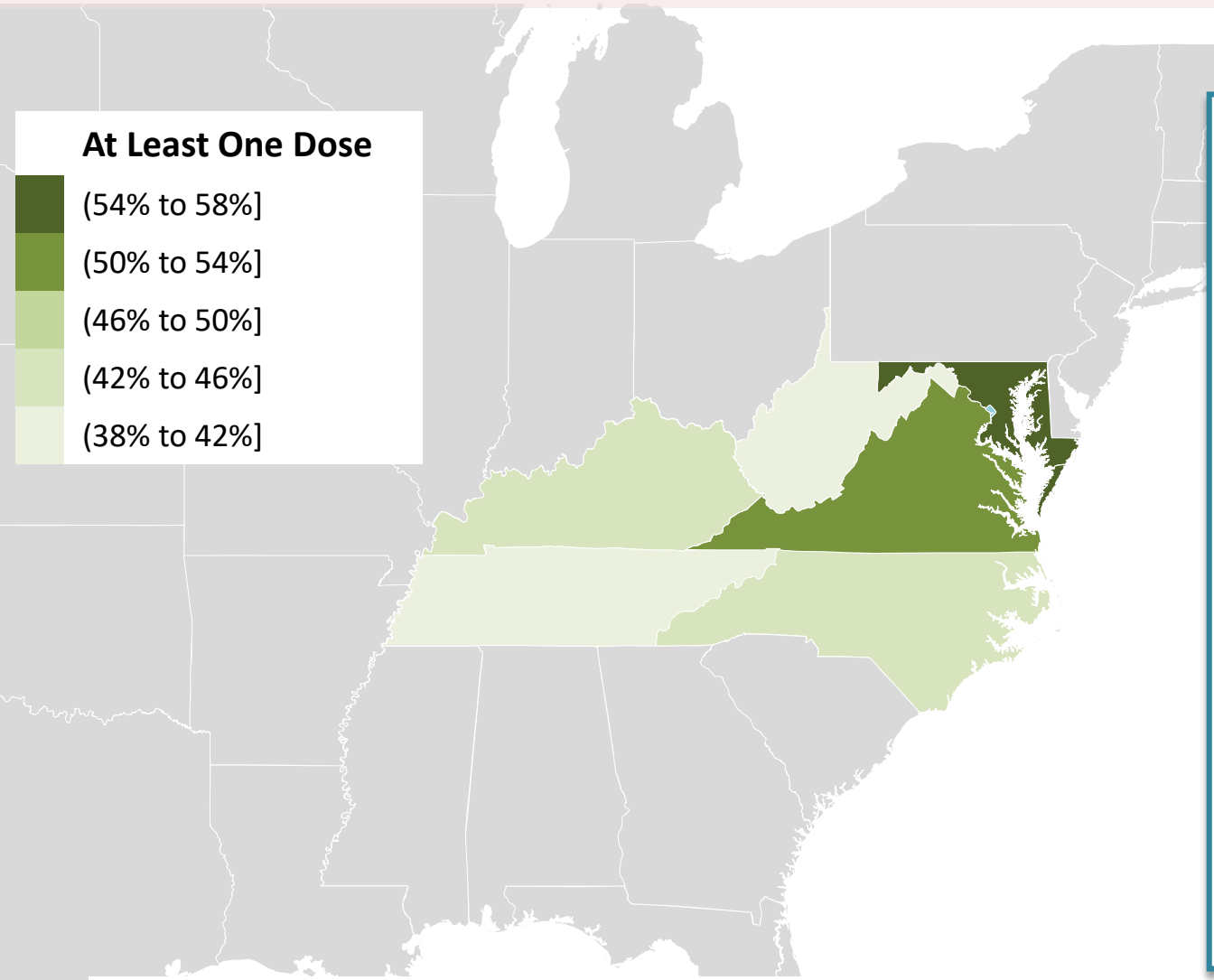
The vaccination rate varies by county

- 26 counties (3.0 million Virginians) have more than 50 percent of their total population vaccinated
- 49 counties (1.9 million Virginians) have less than 40 percent of their total population vaccinated

Community immunity is estimated to require a vaccination rate around 70 to 80 percent for the total population

These data were updated May 26th

Vaccination rates among neighboring states vary substantially



	Partially Vaccinated*	Fully Vaccinated*
Nationwide	**10.0%**	**39.5%**
D.C.	11.5%	44.5%
Kentucky	7.8%	37.6%
Maryland	10.1%	45.5%
North Carolina	7.3%	35.4%
Tennessee	7.4%	31.1%
Virginia**	**10.4%**	**43.5%**
West Virginia	6.2%	33.6%

* Total population, includes out-of-state vaccinations
**Differs from previous slide because all vaccination sources (e.g., federal) are included

Source: https://covid.cdc.gov/covid-data-tracker/#vaccinations
These data were updated May 26th

We've been monitoring recent, relevant literature

Aboelsaad et al. performed a meta-analysis on COVID-19 vaccine hesitancy studies to identify the associated factors

- They identified 39 studies from a pool of 12,246 articles on vaccine hesitancy that met their criteria
- From these studies, they found strong relationships between vaccine take-up rates and factors such as case fatality rates and recent COVID-19 cases

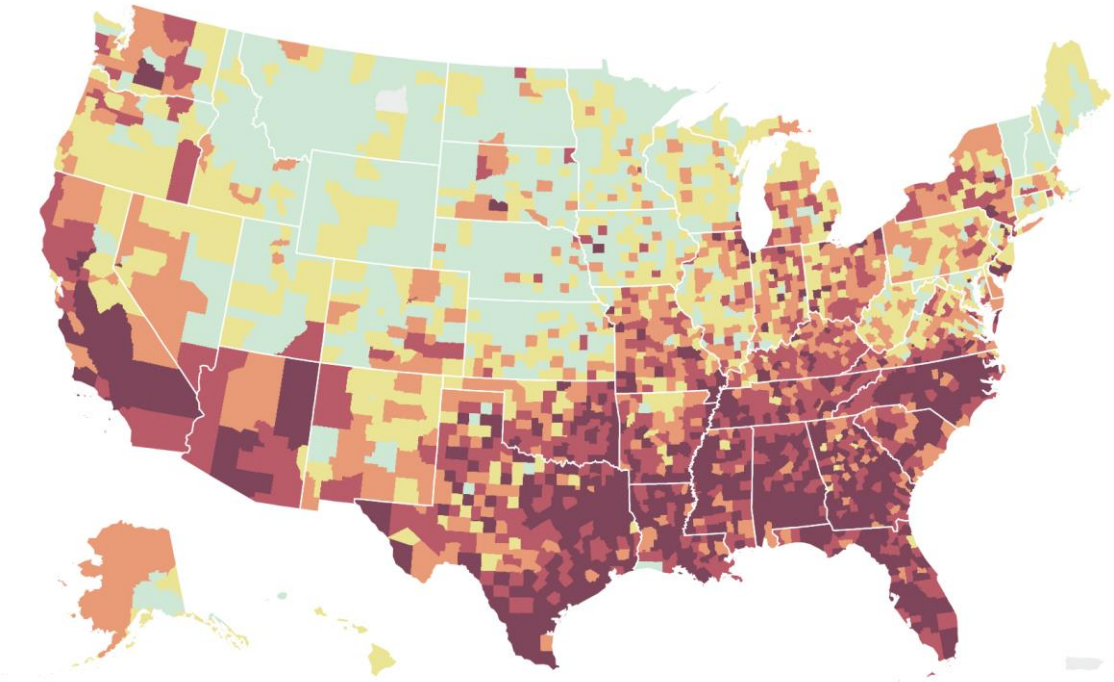
Bard et al. studied the implication of variants of concern for those under the age of 19 years

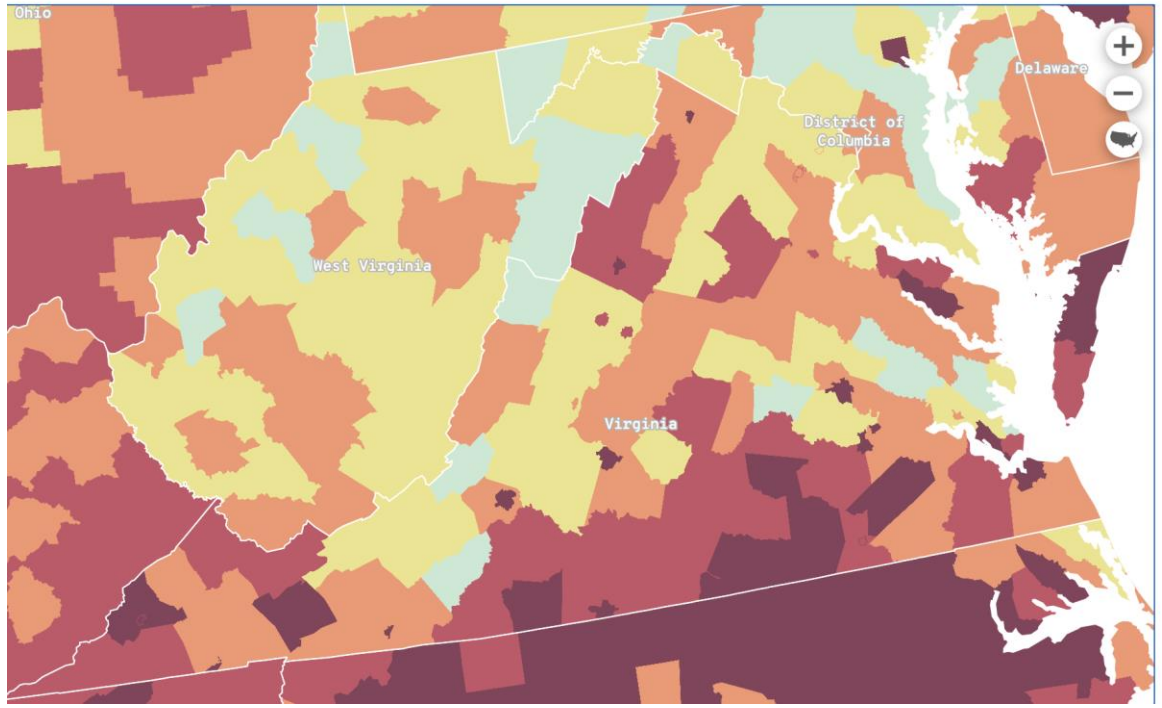
- They studied viral genomic data from 2,119 cases of those aged 18 or younger from March of 2020 to April of 2021
- They found that the B.1.1.7 variant was substantially more prevalent in those under 12 years of age than other variants COVID
- This study provides evidence that young children may be more susceptible to the B.1.1.7 variant, but, given the sample size, further study is required

Smittenaar et al. have updated their measure of COVID-19 community vulnerability (CCVI) to better capture the evolution of the pandemic

- The vulnerability measure produced by the research team includes factors related to socioeconomic status, minority status and language, household and transportation, epidemiology, health care systems, high-risk environments, and population density
- The updated measure captures how testing resources were deployed and updates the socioeconomic data to November of 2020

The COVID-19 Community Vulnerability Index varies substantially across the Commonwealth



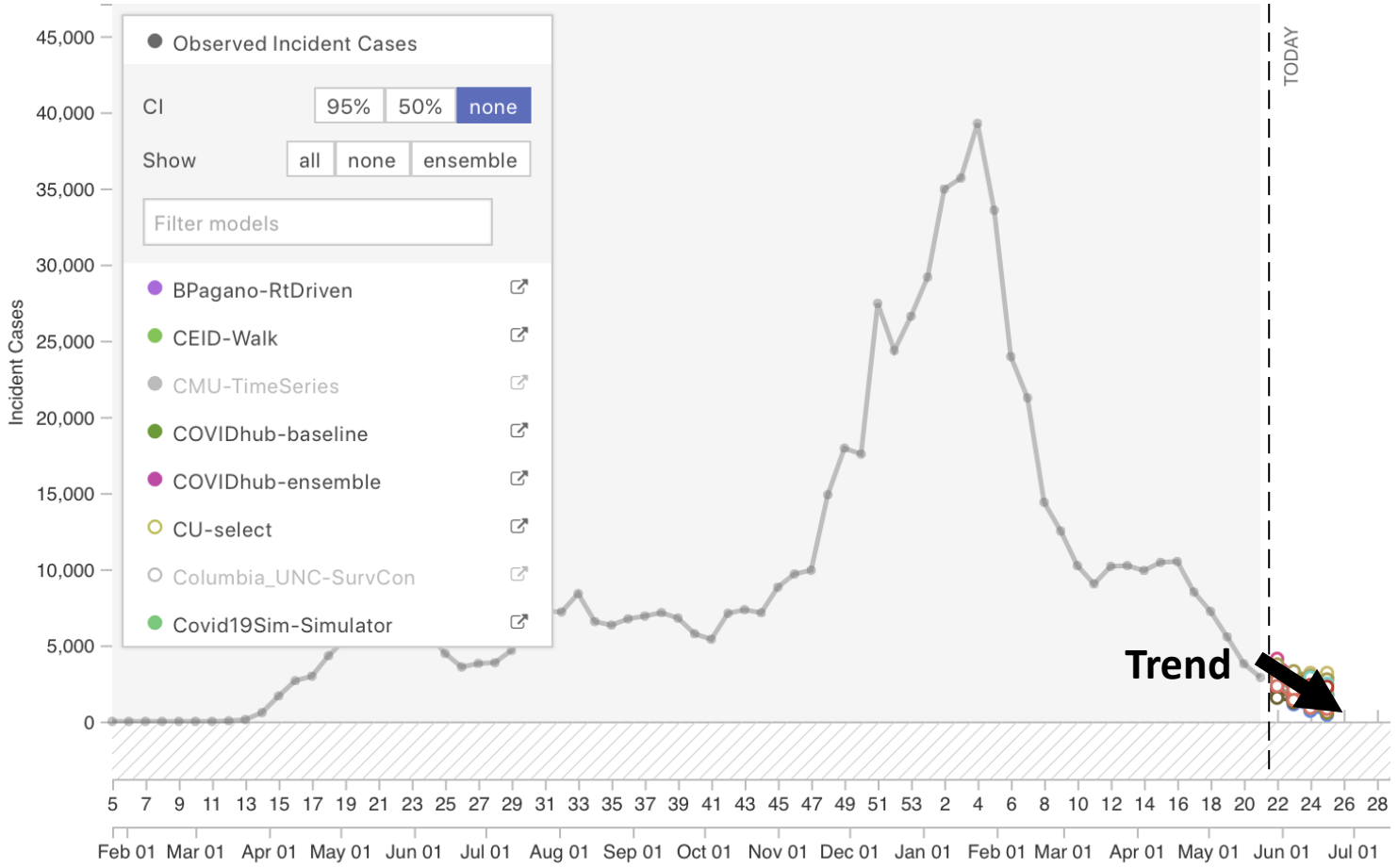


The Surgo Foundation's CCVI indicates that the southern counties in Virginia are the most vulnerable to COVID

- These counties may need additional resources to respond to and recover from the pandemic

These data were updated May 26th

The model forecasts broadly agree on a sustained decline in cases



The model estimates forecast a substantial decline in cases over the coming weeks, with a few exceptions

Many of the model predictions lag the data

- This means that they match the trends in retrospect but not as forecasts

Modeling will be less useful for forecasts with the current decline in cases

- Surveillance efforts will be key to the early identification of potential outbreaks
- Contact tracing efforts have proven effective in containing low levels of spread
- Modeling can support both surveillance and test-and-trace

Source: COVID-19 Forecast Hub, https://viz.covid19forecasthub.org/
Accessed May 26th

The pandemic characteristics will change over the summer and fall

The state of the pandemic in Virginia this summer and fall will depend on vaccination take up

- The number of hospitalizations and deaths will likely not surpass last year's levels because the elderly, the most vulnerable population, have a vaccination rate near 80 percent
- The rate of take up among the 18-to-65-year-old population is not currently on track for community immunity targets to be reached by the summer
- Virginia's counties with the lowest vaccination rates generally border states with low vaccination rates
- Thus, there will continue to be a risk of community spread in the Far Southwest and among those under 30 years of age

Previous infection offers some protection, but it does not appear to be as effective as vaccination

- Several studies (e.g., Hansen, 2021 and Letizia, 2021) indicate that prior infection is about 80 percent effective in preventing future infection versus 94 percent or higher for Pfizer and Moderna (Tenforde, 2021)
- The durability of naturally acquired antibodies is not yet known, but they may wane (Hansen, 2021)
- Further, the efficacy of naturally acquired antibodies may be lower against the new variants

In this environment, there will be occasional waves of COVID cases, potentially tied to super-spreader events and seasonal changes/events (e.g., holidays or school calendars), but deaths and hospitalizations are not likely to spike

- Activities that increase vaccination take up (Bogart, 2021) make community immunity more attainable
- Decisionmakers should monitor variants that might break out of the immune protection in case a new strategy is needed
- If the durability of naturally acquired antibodies is only a few months, long-run cases could be reduced by encouraging those who have recovered from COVID to get vaccinated

There will be long-term consequences from COVID

As of May 26th, 674,439 Virginians had been diagnosed with COVID, and 55,922 had been hospitalized for it

- Based on the Mishra et al. study, we would expect 200,000 Virginians to have had neurological issues associated with their case and more than 1,100 strokes to have occurred due to COVID
- Many of these people will have lingering physical and mental health consequences from their infections
- As many as one third of cases (225,000) result in “long COVID” with a range of physical effects

Beyond those who survived COVID infections, there will be long-term repercussions from the pandemic

- Patients with chronic conditions may suffer long-term consequences due to delayed care
- Stress among health care providers has substantially lowered morale and may lead to additional attrition
- Further, distress and mental illness have risen substantially in the broader public and may require additional capacity to treat appropriately

Efforts to ensure adequate capacity for timely care could mitigate the effects of these consequences

- Access to telemedicine could be improved by additional training for providers and family members and broadband access in rural areas (Cantor, 2021)
- Increased investment in mental health care and substance abuse programs may be necessary to meet demand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