UNIVERSITY of VIRGINIA
BIOCOMPLEXITY INSTITUTE

UVA COVID-19 MODEL WEEKLY UPDATE

VDH VIRGINIA DEPARTMENT OF HEALTH

February 4nd, 2022

KEY TAKEAWAYS

- Case rates are continuing to decline across the Commonwealth, and all regions reported a reproductive number (R_e) of less than one.
- Most health districts are in decline, though four districts in the Southwest and Southside are still in surge.
- Models forecast a continued reduction in case rates and suggest that daily hospitalizations may have peaked as well.
- Despite the falling case rates, all counties are still reporting "High" community transmission levels. Precautions are still warranted.
- Models suggest that the new BA.2 subvariant of Omicron may become dominant in Virginia in the coming few weeks. This could greatly slow the statewide decline in case rates.
- Studies suggest that BA.2 is not more severe than Omicron, but both are still capable of causing significant illness.

114 per 100k
Average Daily Cases Week Ending Jan. 30, 2022

(187 per 100k)
Adaptive Scenario Forecast Average Daily Cases, ***Already Peaked*** *on Jan. 16, 2022*

1,843 / 2,086
Average Daily 1st / 2nd Doses Jan. 30, 2022

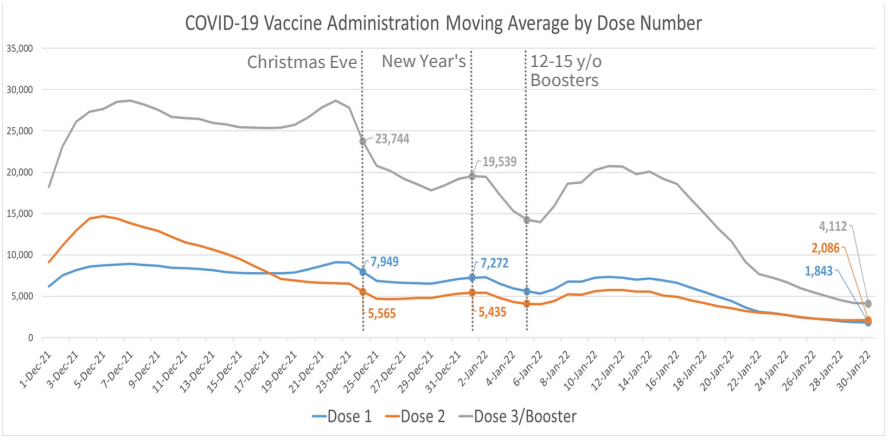
4,112
Average Daily Boosters Jan. 30, 2022

KEY FIGURES

Reproduction Rate
(Based on Confirmation Date)

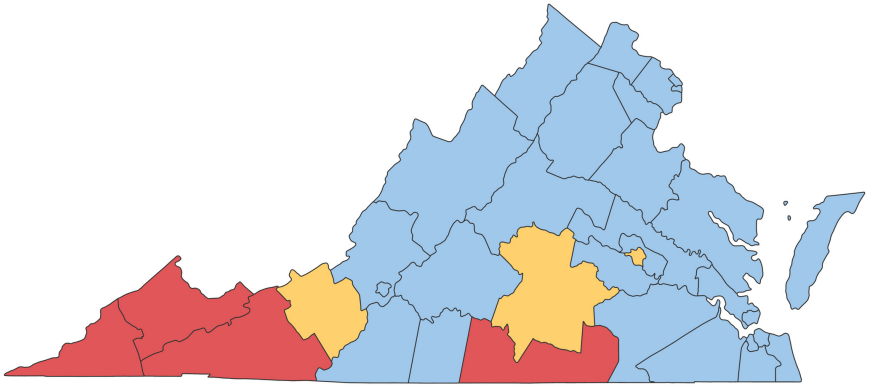
Region	R_e Jan. 31st	Weekly Change
Statewide	**0.749**	**0.002**
Central	0.876	0.048
Eastern	0.553	-0.132
Far SW	0.914	-0.121
Near SW	0.867	-0.012
Northern	0.627	0.089
Northwest	0.826	-0.085

Vaccine Administrations



Growth Trajectories: 4 Health Districts in Surge

Status	# Districts (prev week)
Declining	28 (22)
Plateau	0 (0)
Slow Growth	3 (1)
In Surge	4 (12)



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THE MODEL

The UVA COVID-19 Model and these weekly results are provided by the UVA Biocomplexity Institute, which has over 20 years of experience crafting and analyzing infectious disease models. It is a county-level **S**usceptible, **E**xposed, **I**nfected, **R**ecovered (SEIR) model designed to evaluate policy options and provide projections of future cases based on the current course of the pandemic. The Institute is also able to model alternative scenarios to estimate the impact of changing health behaviors and state policy.

COVID-19 is a novel virus, and the variant mix changes constantly. The model improves as we learn more.

THE SCENARIOS

Updated: The models use various scenarios to explore the path the pandemic is likely to take under differing conditions. As the CDC now estimates that the Omicron variant represents >99% of all new cases in Virginia, all prior Delta variant scenarios have been retired. All current scenarios are based on the immune escape and transmission profiles of the Omicron variant. As before, models use COVIDcast surveys to estimate county-level vaccine acceptance. They then assume that vaccination uptake continues steadily in each county until this value is reached and 40% of vaccinated individuals receive a booster.

The new "**Adaptive**" scenario assumes that Omicron is as transmissible as Delta but adds an immune escape of 80%. This represents the current course of the pandemic and assumes that there will be no significant changes in interventions or transmission rates in the near future. Note that this scenario was called "Adaptive-Omicron" until January 21st.

The "**Adaptive-Spring**" scenario is meant to approximate the epidemic trajectory seen in the Spring of 2021. In this scenario, transmission rates from now until mid-March are manually set to reflect the falling transmission rates from the same time last year, then boosted by Omicron's enhanced transmissibility and immune escape. The "**Adaptive-DecreaseControl**" scenario explores the effects of a hypothetical increase in transmission rates. This scenario is meant to demonstrate that continued vigilance remains important despite Omicron's milder illness. The "**Adaptive-VariantBA2**" scenario adjusts for the new Omicron BA.2 subvariant's enhanced transmissibility, and assumes it will reach 95% prevalence by April 1st.

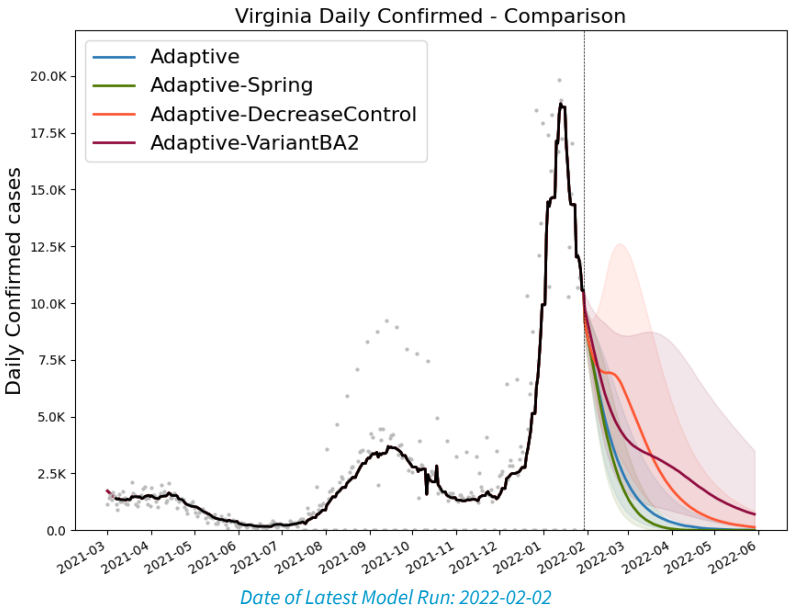
MODEL RESULTS

Updated: The current course "**Adaptive**" scenario (light blue) shows a continued rapid decline in case rates, with Virginia reaching fewer than 2,000 daily cases by March. The "**Adaptive-Spring**" scenario (green) is similar, but the quicker decline in case rates results in 30,000 fewer cases by April.

The "**Adaptive-DecreaseControl**" (shown here in orange) causes a second mild surge, and delays case declines. This results in 145,000 additional cases by April and keeps Virginia above 2,000 daily cases until mid-April.

The "**Adaptive-VariantBA2**" (maroon) projects a far slower decline but no surge. It keeps Virginia above 2,000 daily cases until late April.

Please do your part to drive down cases. Practice good prevention, including indoor masking, social distancing, self-isolating when sick, and get vaccinated and boosted as soon as possible.



Date of Latest Model Run: 2022-02-02

THE FUTURE OF COVID-19

Anyone who has tuned into their local news hoping to catch the next snow forecast is aware that models are often short-term tools. A model can tell you if we will get another snowstorm next week. But what will happen in April, that's a different story. The same is true of epidemic modeling. We can identify trends, examine counterfactuals, and generally get a good short-term picture. But the question of what will happen with COVID-19 in the long term cannot be answered yet. We can, however, begin thinking about plausible outcomes for the rest of 2022. Four of these are outlined below:

Robust / Lasting Immunity

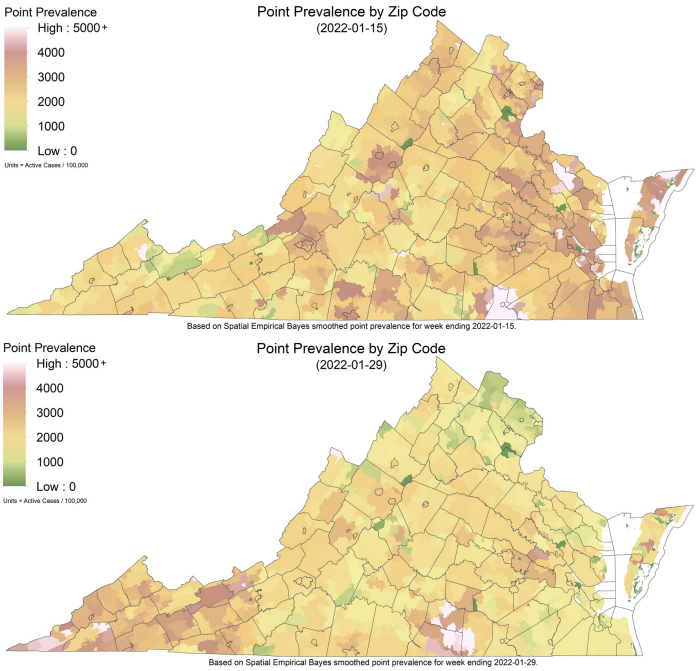
If infection by Omicron gives strong, lasting protection against reinfection, then we could see a very steep drop-off of case rates. The current decline could continue until we reach levels rivaling those of Summer 2021. Like a predator that has eaten all the prey in the area and starves, the virus could infect most currently available hosts and fade away. In the long run, we'd expect such an endemic COVID-19 to behave much like the flu. Waning immunity and seasonal forcing would probably give rise to surges in fall and winter. Summer months would likely be mild.

Moderate / Waning Immunity

If infection by Omicron gives moderate protection against reinfection by Omicron, or if immunity wanes, we may not see a continued drop-off. The major waves of COVID-19 hit different parts of Virginia at different times. This means that some parts of the Commonwealth are surging while others are in decline. It may also mean that population immunity will wane in some areas while the virus is still circulating elsewhere. This could lead to the virus "bouncing" around the state, causing localized surges, while other areas are recovering. Statewide, case rates would stop their decline and appear to oscillate at a moderate level.

Frequent Reinfections

If infection by Omicron gives only limited protection against reinfection, we could see the case rates remain at a high level. Rather than repeated surges, we'd expect more of a slow burning "smolder". Waning immunity would mean there are always newly susceptible individuals for the virus to reinfect. In the long run, this would put significant selective pressure on the virus, likely giving rise to even more subvariants. If one of those subvariants has a large advantage in immune escape, it may out-compete its relatives and cause another surge. Otherwise, statewide case-rates would remain relatively static at a high level.



This figure illustrates the difference just two weeks can have on the geographic distribution of the pandemic. In mid-January, Northern and Eastern Virginia were the most affected regions; last week it was the Far Southwest. In Scenario 2, waning immunity could allow for localized spikes as the virus reinfects pockets of newly susceptible population.

Another New Variant

The arrival of new variants of concern is difficult to predict. To survive, they must have some significant advantage over the currently circulating variants. Virginia has experienced the arrival of three major variants (Alpha, Delta, and Omicron). Each has been both faster spreading and better at immune evasion than the strain it replaced. If another major variant arises and out-competes Omicron, it will likely have similar advantages. Such a variant could cause another major surge, followed another rapid decline. Such a variant may also be even milder than Omicron, though we cannot assume that will be the case.

What about Today?

Regardless of what the future holds, vaccination is still the best protection against severe disease, hospitalization, and death. A booster dose, five months after the initial course, is proven to provide better protection against hospitalization than a two-dose course. Please continue to practice good prevention, wear masks in public indoor places, and get vaccinated/boosted when able.