UNIVERSITY of VIRGINIA
BIOCOMPLEXITY INSTITUTE

UVA COVID-19 MODEL WEEKLY UPDATE

VDH VIRGINIA DEPARTMENT OF HEALTH

September 25, 2020

KEY TAKEAWAYS

- Models are designed to project what **could** happen based on current trends but do not forecast what **will** happen. Behavioral responses drive changes in current trends.
- Weekly cases declined in Virginia during a time when case rates increased nationwide. The case rate in Virginia (11.6/100K) is now below the national average (14/100K).
- 13 health districts are following a declining case trajectory, 6 have plateaued, and 13 show a slow growth. Three health districts are now in surge (New River, Western Tidewater, and Three Rivers)
- The reproduction number remains below 1.0 in all six health planning regions for the second week in a row.

205,931
Cases Expected by Thanksgiving

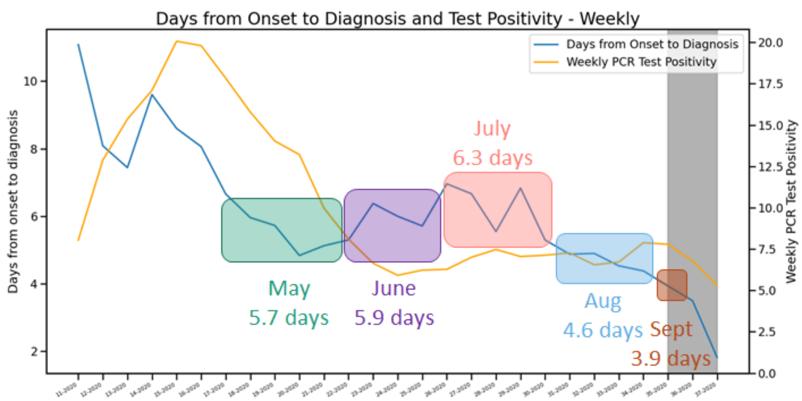
0.883
Reproduction Rate
Based on onset date
7 days ending Sept 12

KEY FIGURES

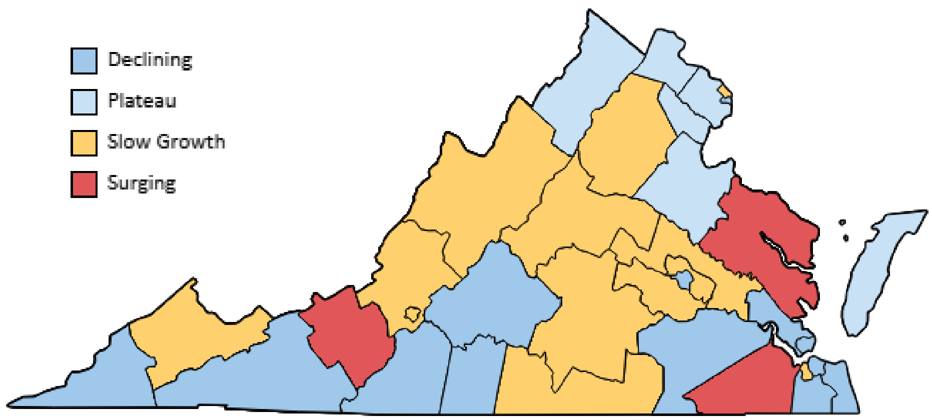
Reproduction Rate

Region	R_e Sep 12	Weekly Change
State-wide	**0.883**	**-0.011**
Central	0.898	-0.067
Eastern	0.921	0.130
Far SW	0.769	-0.045
Near SW	0.764	-0.224
Northern	0.929	0.096
Northwest	0.948	-0.035

Case Detection



In Surge: 3 Health Districts



THE MODEL

The UVA COVID-19 Model and the 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 (S)usceptible, (E)xposed, (I)nfected, (R)ecovered epidemiologic model designed to evaluate policy options and provide projections of future cases based on the current course of the pandemic.

COVID-19 is a novel virus causing an unprecedented global pandemic and response. The model improves as we learn more about it.

THE PROJECTIONS

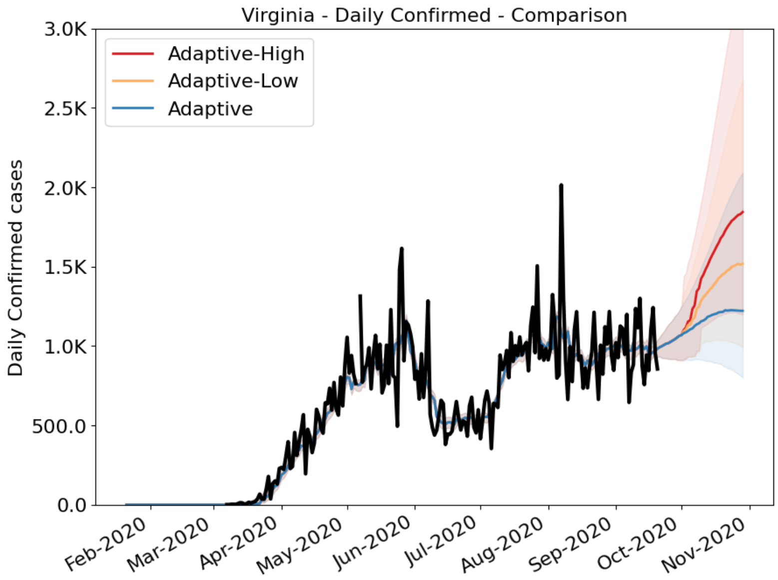
The UVA team continues to improve the model weekly. The UVA model now uses an "adaptive fitting" methodology, where the model precisely traces past and current trends and uses that information to predict future cases. These new projections are based on recent trends the model learns through its precise fitting of each individual county's cases.

The new model also includes two "what-if" scenarios to predict what we might see if cases increase in response to seasonal effects, such as schools re-opening and changing weather patterns. These "what-if" scenarios assume a 10-20% increase in transmissibility beginning with the onset of flu season. The model will be updated regularly to incorporate new information.

Low impact of seasonal effects: 10% increase in transmission starting October 1, 2020
High impact of seasonal effects: 20% increase in transmission starting October 1, 2020

MODEL RESULTS

With the adaptive modeling approach, the current course predicts that confirmed cases will peak during the week ending **November 1st** with **8,558 weekly cases**. If cases continue on this trajectory, we would expect **205,931** total confirmed cases by Thanksgiving. With a 10% increase in transmissibility at the onset of flu season, we would expect weekly cases to peak at 10,582 the week of ending November 1st. A 20% increase in transmissibility would lead to a higher peak during the week ending November 8th with 12,984 weekly cases. These two "what if" scenarios result in 10,000 and 25,000 more confirmed cases by Thanksgiving, respectively.



Increases in case counts related to students returning to campuses are creating large, short-term spikes in model projections, particularly in communities where the student population is large in comparison to the resident population. While the increases are concerning, colleges and university administrations, working with Local Health Departments, are working to ensure these are contained. In campuses that opened early in August these efforts have been successful.

A MODELING OVERVIEW

Models use past information to predict what might happen in the future. The building blocks of a model are called **parameters**. For the COVID-19 model, parameters include measurable disease characteristics like transmission rate (R0), incubation period, and days from onset to diagnosis. Researchers estimate values for parameters using published literature and observed data. As with any rapidly changing situation, the models adapt with new information. With UVA's adaptive fitting methodology, projections rely heavily on **recent trends in observed data**.

Models are useful for comparing scenarios. For example, the current UVA models shows what we might expect to see under the "adaptive fit" scenario and compares this with what we'd expect to see with slightly increased transmission. All scenarios are based on the same historical data. Therefore, direct comparisons are possible.

What models can and can't do

Models cannot predict future cases with complete accuracy. They can provide timely warnings of worrisome trends that are hidden in data. Without such warnings, people may be lulled into a false sense of security. Properly warned, they can take action to change the future.

Recall this past spring when modeling projections were first published. Early projections were based on very little evidence. Out of necessity, modelers created projections using what they knew at the time. In some cases early projections were not only far from the truth, but also quite startling. However, it's important to remember that **future outcomes change based on human behavior**.

Avid followers of the UVA model may recall that an early version of the model showed a Full Rebound scenario, describing what we'd expect to see if case transmission returned to its earliest pre-response levels. While a useful comparison, this "what if" scenario was unlikely to occur. In reality, people observe trends in their environment and adapt accordingly. As cases begin to increase, new public health measures are put in place and the projected situation changes. This is why the models are updated regularly.

Why do projections change?

"All models are wrong, but some are useful." This famous quote attributed to statistician George E. P. Box captures the essence of modeling. In a very real sense, the goal of models is to be wrong. By alerting people to the likely consequences of the status quo, they change the future. By definition, modeling infectious disease transmission requires **predicting human behavior**. This is always difficult but presents particular challenges for a novel virus. Human behavior can be predictable (to an extent), which is how models can exist in the first place. However, the current pandemic is unprecedented and the community response is subject to great uncertainty. An example is with recent surges in university settings. With schools reopening, transmission increased. In some cases this led to a projected surge trajectory. Swift action by universities and health districts can prevent the projected surge from becoming a reality. Conversely, taking no action would likely result in a surge.

Key takeaways from model results

Pay attention to week-by-week changes. Likely, a district in surge one week will begin to decline in following weeks. Projected peak cases may never be reached if the community adapts appropriately to higher transmission and the public health response is effective. However, if inadequate changes occur, then cases in the region could continue to rise and the projected peak could be achieved or even exceeded. Week-to-week changes occur because situations change, new information becomes available, and the forecast adapts.

RESEARCH HIGHLIGHTS FROM RAND CORPORATION

- Each additional case per 100,000 results in **1 to 3 additional deaths** statewide
- Severe cases have been shown to have **longer term negative health consequences**
- **Crowded housing**, rather than population density, likely played a major role in the spread among Black and Latino populations, essential workers, and those with low incomes
- **Verbal symptom screen** appears to have some efficacy in reducing workplace spread. **Temperature checks** only provide limited improvement but may provide reassurance.