VIRGINIA

COVID-19 Update April 22nd, 2021

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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.

Bottom Line Up Front

7-Day Confirmed Case Average

Confirmed cases have declined from last week to 1,342 per day (-15%)
- This is up 4 percent from the March 2021 low and 12 percent from the summer highs of 2020

COVID hospitalizations have have increased slightly to 1,120 (+5%)

COVID tests have stabilized but at a lower level than in the winter
- The test positivity rate is down slightly from 8.2 percent last week to 7.4 percent

Vaccination is continuing to increase rapidly (+3.5 percentage points fully vaccinated) and a quarter of the population is fully vaccinated

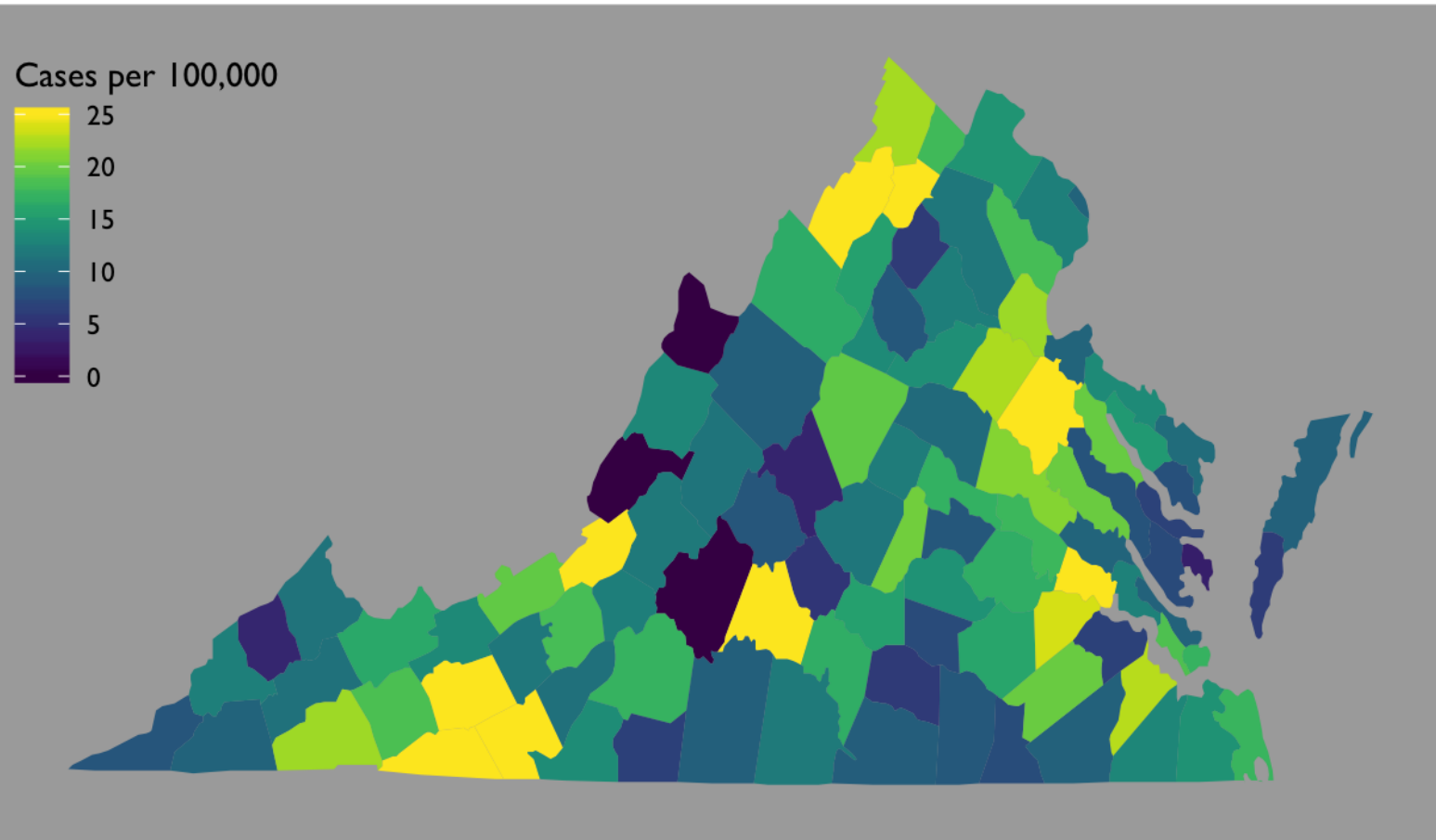**Despite growth in the share of the population vaccinated, case rates remain high**
- The variants of concern and higher movement may be increasing the case numbers among the unvaccinated

Cases declined in many counties, but remain relatively high

CASE COUNT
Source: VDH

Cases per 100,000

Yellow indicates at least 25 cases per 100,000
- This has been rescaled from last week's cap of 20 per 100,000

Case levels have drifted lower across the Commonwealth
- 80 percent of counties have fewer than 20 cases per 100,000 (65 percent last week)
- 32 percent of counties have fewer than 10 cases per 100,000 (24 percent last week)

These data were updated April 21st and represent a seven-day average of the previous week

Most neighboring states' case levels had little change from last week

Over the last 7 days, Virginia had 15.7 new confirmed cases per day per 100,000 (-15% from last week)

Very high case loads (>20):
- Tennessee (21.3 new cases per 100k, +22% from last week)
- West Virginia (21.3, -4%)
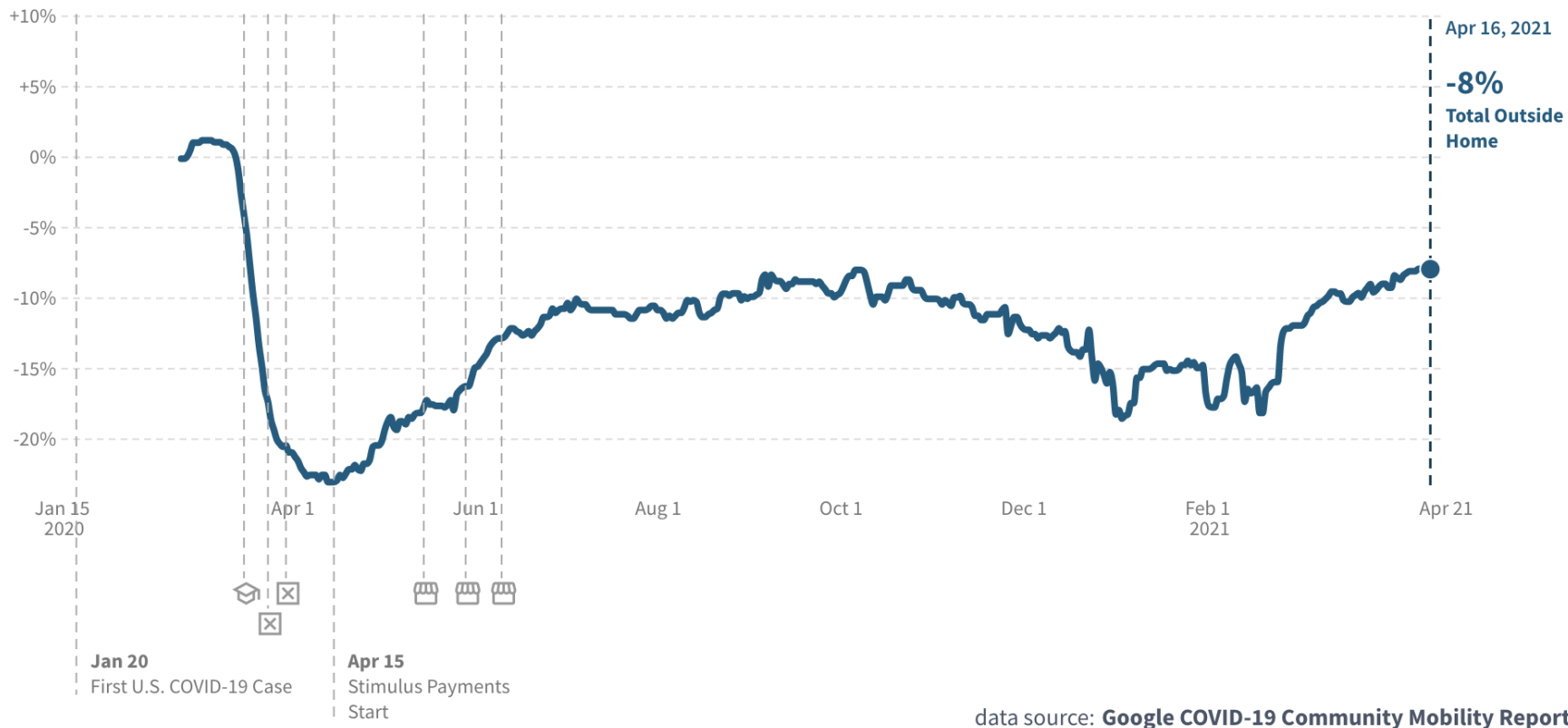
High case loads (10-20):
- Maryland (19.9, -25%)
- North Carolina (19.5, +8%)
- District of Columbia (17.3, +9%)
- Kentucky (12.8, -7%)

Lower case loads (<10): None

These data were updated April 21st and represent a seven-day average of the previous week

Mobility data estimate that time away from home is back to the levels from the summer and fall

Apr 16, 2021

-8%
Total Outside Home

Jan 15 2020 · Apr 1 · Jun 1 · Aug 1 · Oct 1 · Dec 1 · Feb 1 2021 · Apr 21

Jan 20
First U.S. COVID-19 Case

Apr 15
Stimulus Payments Start

data source: **Google COVID-19 Community Mobility Reports**

Google mobility is down 8 percent from pre-pandemic levels

- This is up around eight percentage points from the range in January and February of 2021
- The current level is roughly the same as the highs from July through October of 2020

Similarly, U.S. DoT reports Virginia's vehicle miles traveled were down 17 percent year-on-year for February

These types of data have been useful in estimating the case growth rate in the past

- The recent growth may have been partially driven by higher mobility

Source: Google COVID-19 Community Mobility Reports via
https://tracktherecovery.org/
Accessed April 21st

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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 also bypass immune protection from vaccines or previous infection

- B.1.1.7 is also known as the U.K. variant and has been found in all neighboring states
- B.1.351 ("South African variant") has been found in most neighboring states
- P.1 ("Brazilian variant") has been found in D.C., Maryland, and Tennessee
- B.1.427/B.1.429 ("California variants") have been reported in neighboring states
- **<u>All five of the current variants of concern have been detected in Virginia</u>**

Additionally, there are three variants of interest

- B.1.525/B.1.526 ("New York variants") are estimated to spread more quickly than the baseline
- P.2 is another Brazilian variant that is estimated to be similar to P.1

Genomic testing will be key to tracking the variants

- PCR tests can also help identify some of the variants

Contact tracing could be particularly useful in containing outbreaks of these variants when paired with better surveillance

25 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	25,819	171,375	242,503	279,177	354,411	477,312	399,039	193,743	2,143,379
% Full	0.0%	2.3%	14.8%	20.7%	25.9%	31.5%	48.9%	65.0%	62.2%	25.1%
Partially Vaccinated	0	66,057	183,929	204,163	213,310	246,728	188,097	82,774	42,812	1,227,870
% with Partial	0.0%	6.0%	15.9%	17.4%	19.8%	21.9%	19.3%	13.5%	13.8%	14.4%
Confirmed Cases	29,527	68,885	123,339	104,124	93,852	92,248	62,990	33,890	24,395	633,250
% Confirmed Cases	2.9%	6.3%	10.7%	8.9%	8.7%	8.2%	6.4%	5.5%	7.8%	7.4%

Source: VDH, April 21st

Vaccinations are being rolled out in Virginia very rapidly
- As of April 21st, 5,500,915 doses have been distributed and 5,470,861 doses have been administered
- Over the last seven days, Virginia has averaged 77,220 doses per day

We may be seeing the effects of the vaccinations already
- More than 77 percent of people over the age of 70 are at least partially vaccinated
- That population only had 552 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 only five percent of last week's cases were among the elderly

Vaccine supply is currently the constraint, but efforts to improve demand are needed to reach needed levels of protection

Vaccination rates among neighboring states vary substantially

At Least One Dose

- 42 to 46% Vaccinated
- 38 to 42% Vaccinated
- 34 to 38% Vaccinated
- 30 to 34% Vaccinated

	Partially Vaccinated*	Fully Vaccinated*
Nationwide	**14.1%**	**26.4%**
D.C.	18.1%	24.7%
Kentucky	10.9%	28.3%
Maryland	14.9%	29.2%
North Carolina	11.5%	25.5%
Tennessee	11.4%	21.1%
Virginia	**15.5%**	**27.7%**
West Virginia	7.6%	27.2%

* Includes out-of-state vaccinations

Source: https://covid.cdc.gov/covid-data-tracker/#vaccinations
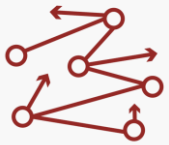These data were updated April 21st

We've been monitoring recent, relevant literature (1/2)

Kidman et al. estimate the amount of parental death from COVID in the U.S.
- Using a simulation of kinship networks and mortality data, the authors identify likely familial structures for COVID deaths and then estimate the number of children in those households
- The authors estimate that approximately 40,000 children aged 0 to 17 have lost a parent due to COVID, which is roughly 20 percent of the number in a typical year
- These children are disproportionately Black and Hispanic and in low-income households

Dai et al. assessed the efficacy of two nudge designs intended to increase vaccination rates
- Using a randomized control trial of text-based nudges to about 100,000 UCLA Health patients, the authors found that messages highlighting the importance of vaccinations and the ease of scheduling increased the number of appointments scheduled within six days by five percentage points
- Information designed to reduce vaccine hesitancy did not significantly affect outcomes

Letizia et al. enrolled about 3,000 Marine recruits aged 18 to 20 years old from May to November of 2020 to understand reinfection risks
- About eight percent of the recruits were found to be seropositive during the intake
- The seropositive recruits had a case rate about 80 percent lower after six weeks (10 percent for seropositive versus 48 percent for the seronegative)
- Further, those seropositive recruits who were reinfected tended to have viral loads about one-tenth that of the recruits who were seronegative during intake
- These values are very similar to studies of reinfection risks for other populations (i.e., Hansen, 2021)

We've been monitoring recent, relevant literature (2/2)
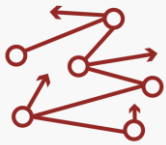
Sakya et al. examined the relationship of Facebook news consumption and knowledge of COVID

- Using a survey of 5,948 people from central Pennsylvania, the authors asked questions about news consumption habits and factual questions about COVID
- Those who listed Facebook as a source of news averaged 7 percent fewer correct answers about COVID
- Efforts may be needed to target Facebook users with accurate information about COVID

Taquet et al. used medical records to estimate the prevalence of neurological and psychiatric outcomes among 236,379 COVID survivors six months after infection

- They found that 34 percent had at least one negative neurological or psychiatric outcome with mood, anxiety, or psychotic disorders being the most common (24 percent)
- In a similar study, Harerall et al. tracked 2,149 Swedish health care workers who had tested positive for COVID and found that, of those seropositive eight months after their infection, 15 percent had lingering symptoms, most commonly the loss of smell

McLaughlin et al. studied the early and ongoing introduction of COVID into Canada from international sources

- Using case data and analysis of the virus's characteristics, the authors estimate that 54 percent of Canadian sub-lineages are likely to have originated in the United States
- By their estimation, earlier and stricter travel restrictions would have substantially reduced the extent of the pandemic in Canada, but it would not have prevented eventual community transmission
- Understanding the dynamics of viral introductions may be more relevant as vaccinations reduce community spread, variants of concern account for a larger share of global cases, and travel increases

What is next for modeling and analysis?

Pandemic modeling has greatly evolved over the last year
- Initially, there was a dearth of high-quality data and the models were typically either SEIR-based or statistical
- As behaviors and policies changed, the models grew in complexity and hybrid/ensemble models are also used now
- Growing immunity, behavioral changes, and other factors will make modeling for the purpose of producing accurate forecasts particularly challenging in the coming months

At this stage of the pandemic, modeling and data analysis will be useful for addressing specific types of questions:
- How might the spread change as new variants enter Virginia?
- Which segments of the population remain the most vulnerable?
- As vaccinations increase and case levels decline, which NPIs can be relaxed and when?
- Are there early warnings or triggers that should be monitored to help inform policy?

For other questions, surveillance is likely to be more useful:
- How widespread are the variants in Virginia?
- How many cases should we expect in the next few weeks?

Robust, integrated testing programs are necessary to conduct effective surveillance
- Data on the sampling approaches are useful to understand which areas and populations are well-covered versus under-covered
- Improving external access to data sources like wastewater testing or genomic sequencing could improve analysis

The models diverge somewhat over the next few weeks
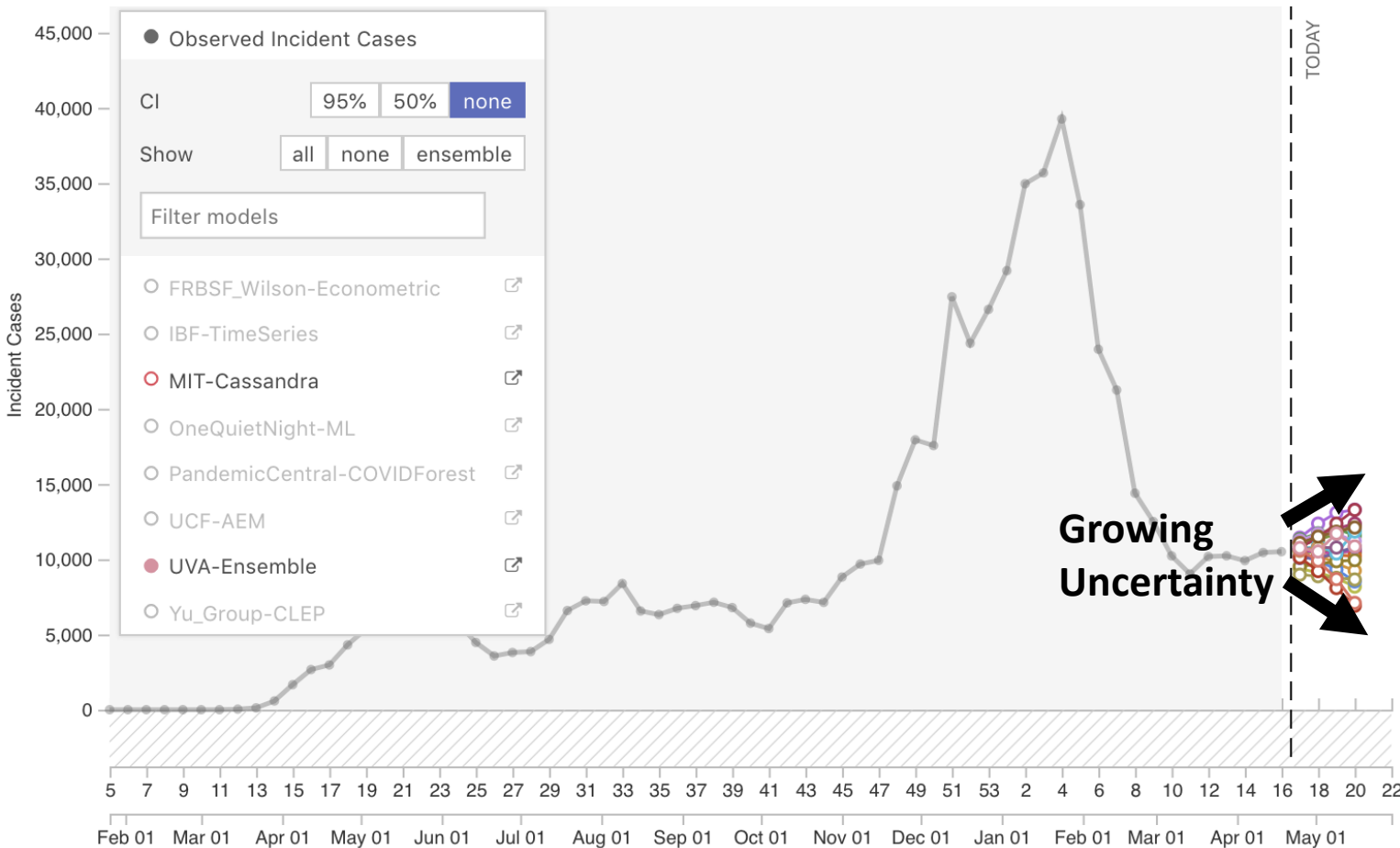
The models have a narrow range for the case level next week, but they increasingly diverge as time passes

- Some models, like the SEIR-type, are structurally incapable of producing a plateau at a relatively high level of cases
- It is not clear how the trade-off between the variants and vaccines is made in each model, and this will be particularly challenging for statistical models
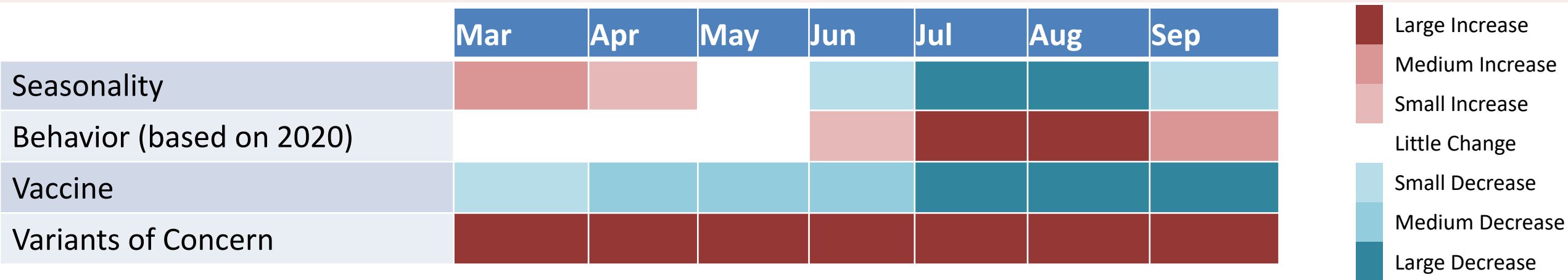
Many of the model predictions lag the data

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

Source: COVID-19 Forecast Hub, https://viz.covid19forecasthub.org/
Accessed April 21st

Future spread will be a race of vaccines versus variants

	Mar	Apr	May	Jun	Jul	Aug	Sep
Seasonality	Medium Increase	Small Increase		Small Decrease	Large Decrease	Large Decrease	Small Decrease
Behavior (based on 2020)				Small Increase	Large Increase	Large Increase	Medium Increase
Vaccine	Small Decrease	Medium Decrease	Medium Decrease	Medium Decrease	Large Decrease	Large Decrease	Large Decrease
Variants of Concern	Large Increase	Large Increase	Large Increase	Large Increase	Large Increase	Large Increase	Large Increase

Legend:
- Large Increase
- Medium Increase
- Small Increase
- Little Change
- Small Decrease
- Medium Decrease
- Large Decrease

There are several factors that will continue to drive the spread for the next few months

- Seasonal effects for COVID-19 appear to increase/decrease spread with cooler/hotter weather
- Behavioral changes appear to have increased the rate of spread during the summer of 2020 and may have a similar effect this summer
- The vaccines have begun to meaningfully slow the spread for certain populations, but maintaining the rate of vaccine administration will require a continuation of the high acceptance rate
- The Variants of Concern may be increasing the rate of spread in Virginia, and future variants could also change the severity or the efficacy of vaccines

There are some key unknowns about the current spread

- How long does the immune protection from a prior infection last? From the vaccines? Against which variants?
- What portion of the population will eventually want to take a vaccine?

What might a "new normal" look like and how might we influence it?

Some of the factors that will affect the "new normal" can be influenced by policy, but others cannot
- Efforts to maximize the vaccination rate will determine whether community immunity is feasible in Virginia
- Additionally, the spread of the variants and their nature will determine whether community immunity is feasible in any circumstance
- Even if community immunity is reached, outbreaks may still occur and require special interventions

Regardless of the local case levels, some policies may be advisable until the global pandemic has abated
- Efforts to monitor for outbreaks, track new variants of concern, and trace contacts may be useful to continue
- Similarly, low cost NPIs, such as masking, may be prudent to retain

There will likely be substantial long-term consequences that may require additional resources
- As of April 21st, 649,608 Virginians had been diagnosed with COVID, and 53,970 had been hospitalized for it
- Many of these people will have lingering physical and mental health consequences from their infections
- 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

Discussion and Questions