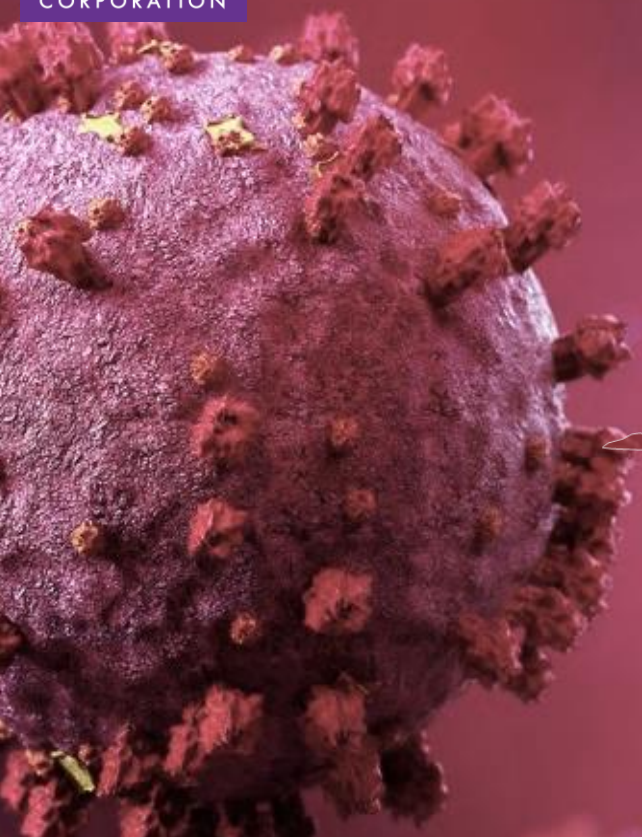
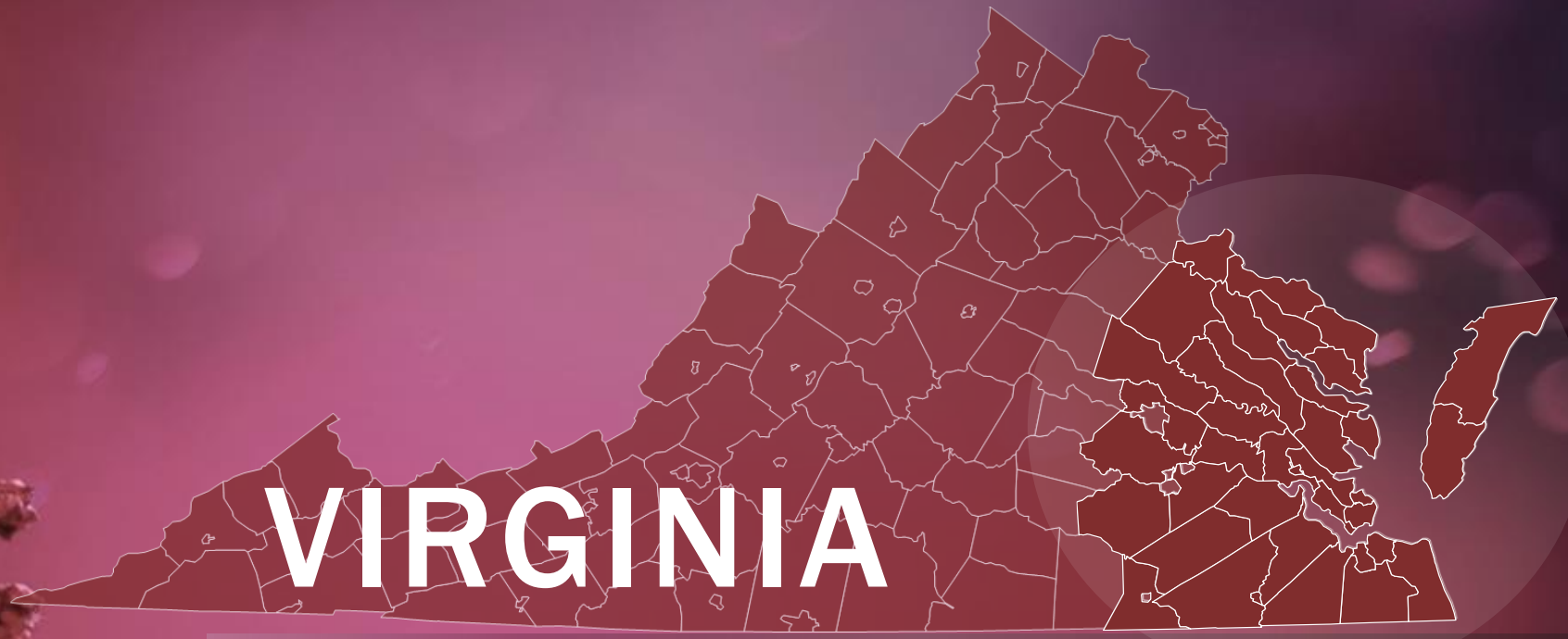




VIRGINIA

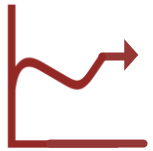
COVID-19 Update December 3rd, 2020

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 work of the research team will be documented in a forthcoming RAND research report. 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



Virginia's total case levels remain very high

- Growth in cases has paused, though this is likely due to reduced testing over Thanksgiving weekend

- Hospitalizations continue to rise rapidly

Key triggers will continue to drive a rapid rise for the coming months

- Seasonal changes
- Holiday interactions
- COVID-fatigue

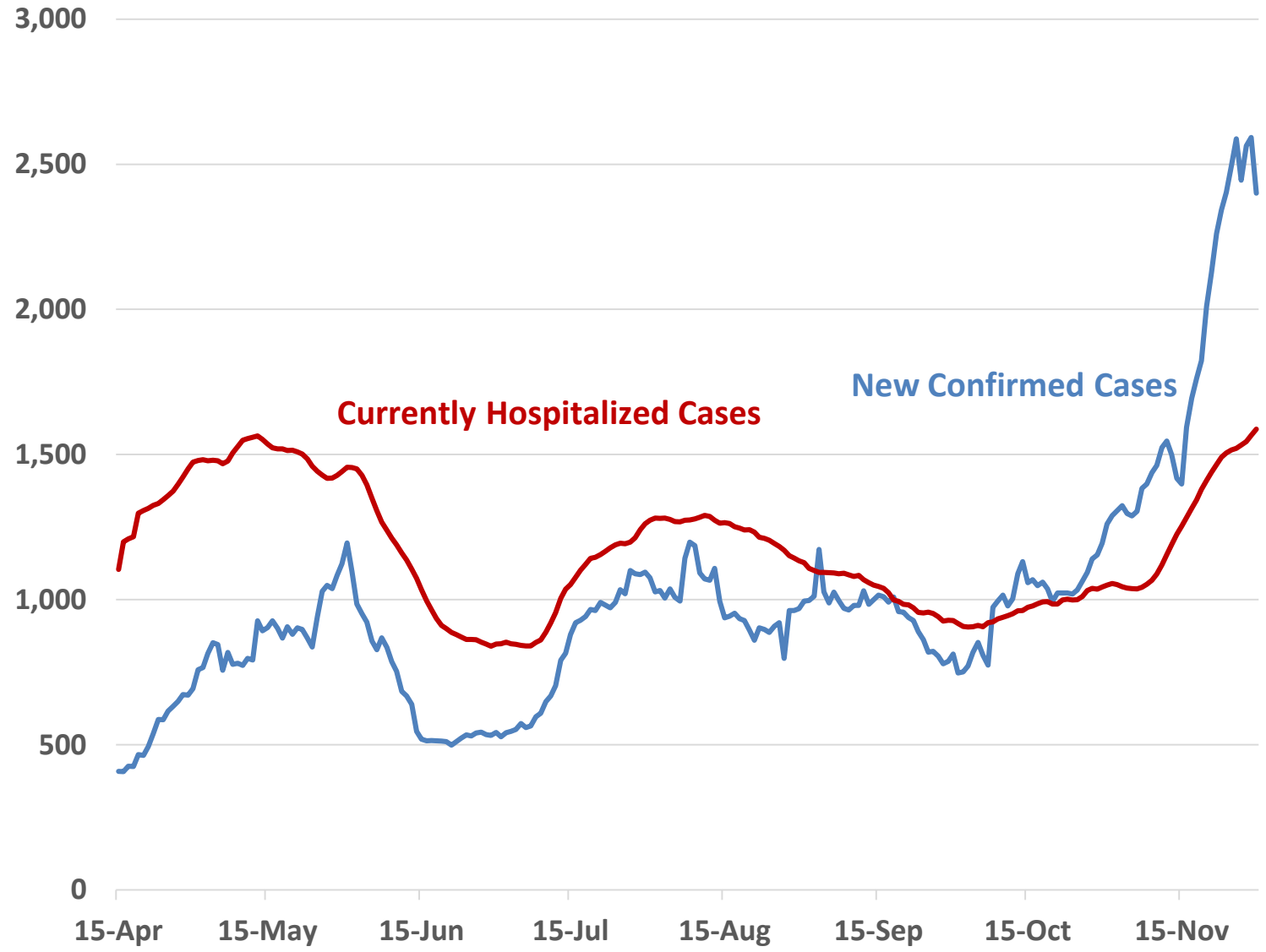
Cheaper, faster testing or a vaccine could reduce the spread if widely deployed

Model forecasts may be less accurate because behavior is driving growth

- Models will continue to be useful for comparing policies and exploring scenarios

Given the rapid change in rates, a 3-day moving average may be better than a 7-day moving average for understanding trends

Case levels remain high and hospitalization is growing



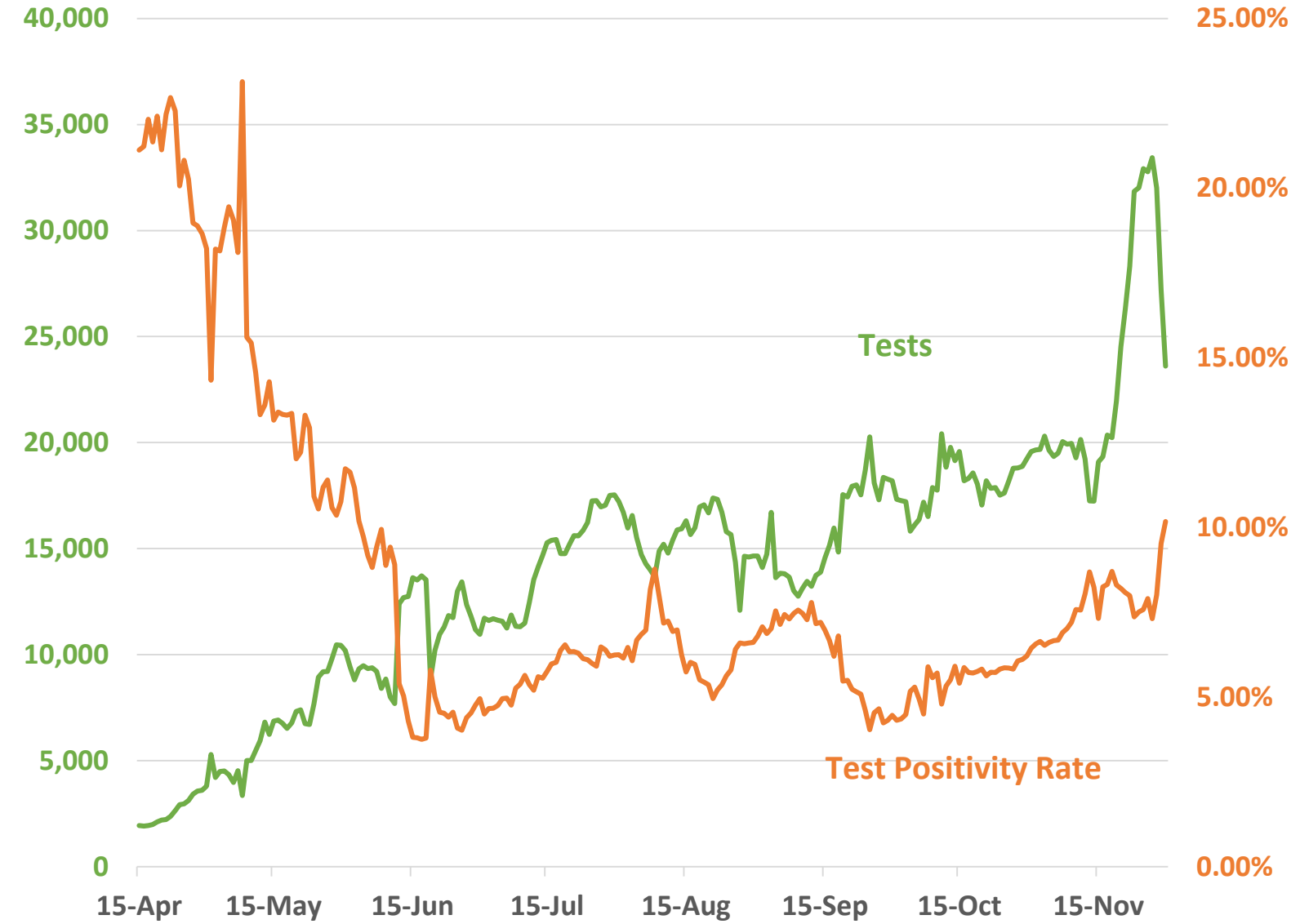
New confirmed cases are spiking and have surpassed 2,500/day on average

- The holiday likely slowed case detection and so the numbers from the last week may be unreliable
- By early next week, we should understand the extent of the spread directly related to Thanksgiving

Currently hospitalized cases have risen above 1,600

- Hospitalizations are likely to continue to increase by a similar magnitude to the case rate (more than 40%) in the next week or two

Testing was interrupted by the Thanksgiving holiday but remains high



Tests per day have dipped but remain over 20,000

- There was a surge in testing prior to Thanksgiving

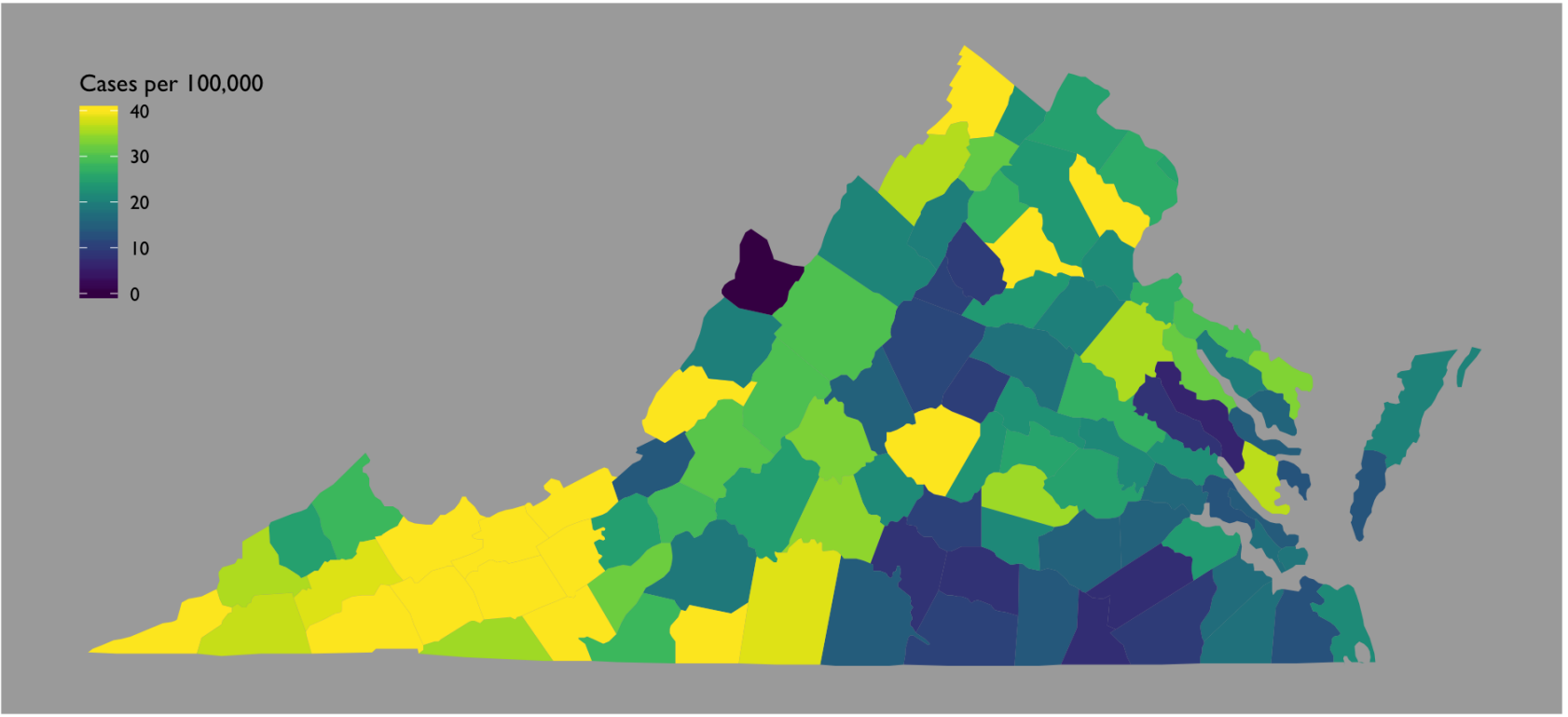
The test positivity rate spiked to just over ten percent

- Five percent is a suggested target
- This spike is more a function of changes in the testing levels than a concerning trend for now
- If this rate remains over ten percent by next week, it indicates the data are less reliable

Case levels remain high statewide

CASE COUNT

Source: VDH



Yellow indicates at least 40 cases per 100,000

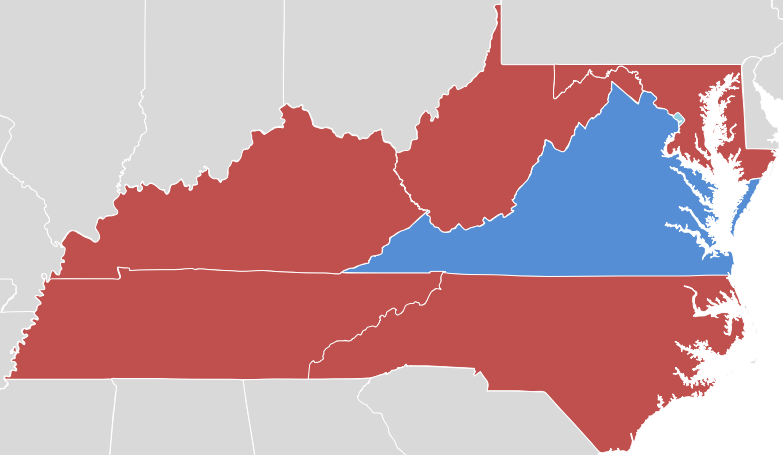
- This scale has changed from last week where the limit was 30

Counties across the Commonwealth saw increases

These data were updated December 1st and represent a seven-day average of the previous week

Case rate trends were generally flat in neighboring states, but testing was disrupted by Thanksgiving

Over the last 7 days, Virginia had 28.1 (+2% from last week) new confirmed cases per day per 100,000



Very high case loads (>20):

- Tennessee (62.6 new cases per 100k, +17% from last week)
- Kentucky (60.1, -11%)
- West Virginia (53.6, +1%)
- North Carolina (34.5, +1%)
- Maryland (34.4, +4%)
- District of Columbia (25.5, +3%)

High case loads (10-20): None

Lower case loads (<10): None

These data were updated December 1st and represent a seven-day average of the previous week

We've been monitoring recent, relevant literature

Van Dyke et al. examined the efficacy of mask mandates using county level variation in Kansas

- In July, the governor of Kansas issued a mask mandate order for everyone over 2 years of age that allowed counties to opt out
- 24 counties (out of 105) kept the mandates in place and saw a six percent decline in cases
- The remaining 81 counties saw their case rates double

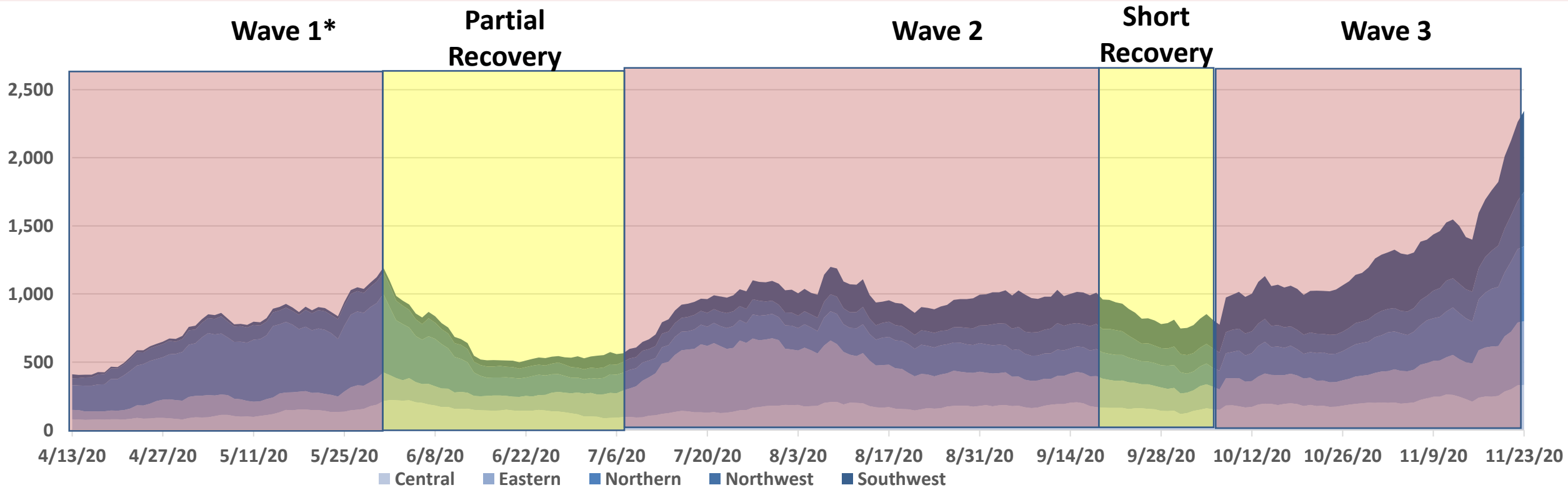
Gupta et al. conducted a literature review for policy effects on health and economic outcomes

- Individual choices drive the decline in mobility though state and local policy can further reduce movement
- State policies on distancing are effective in reducing cases
- State and local policy has minimal effect on supporting economic activity, though federal policy does increase activity

Leifheit et al. looked at the effect eviction moratorium expirations had on COVID-19 cases and deaths

- The authors used the variation in state eviction moratoriums between March 13th and September 3rd to identify the effects of a moratorium expiring
- Nationally, lifting eviction moratoriums resulted in 430,000 excess cases and 10,000 deaths
- Virginia only had three weeks without eviction protection in this timeframe and so had no statistically significant increase in spread attributable to evictions

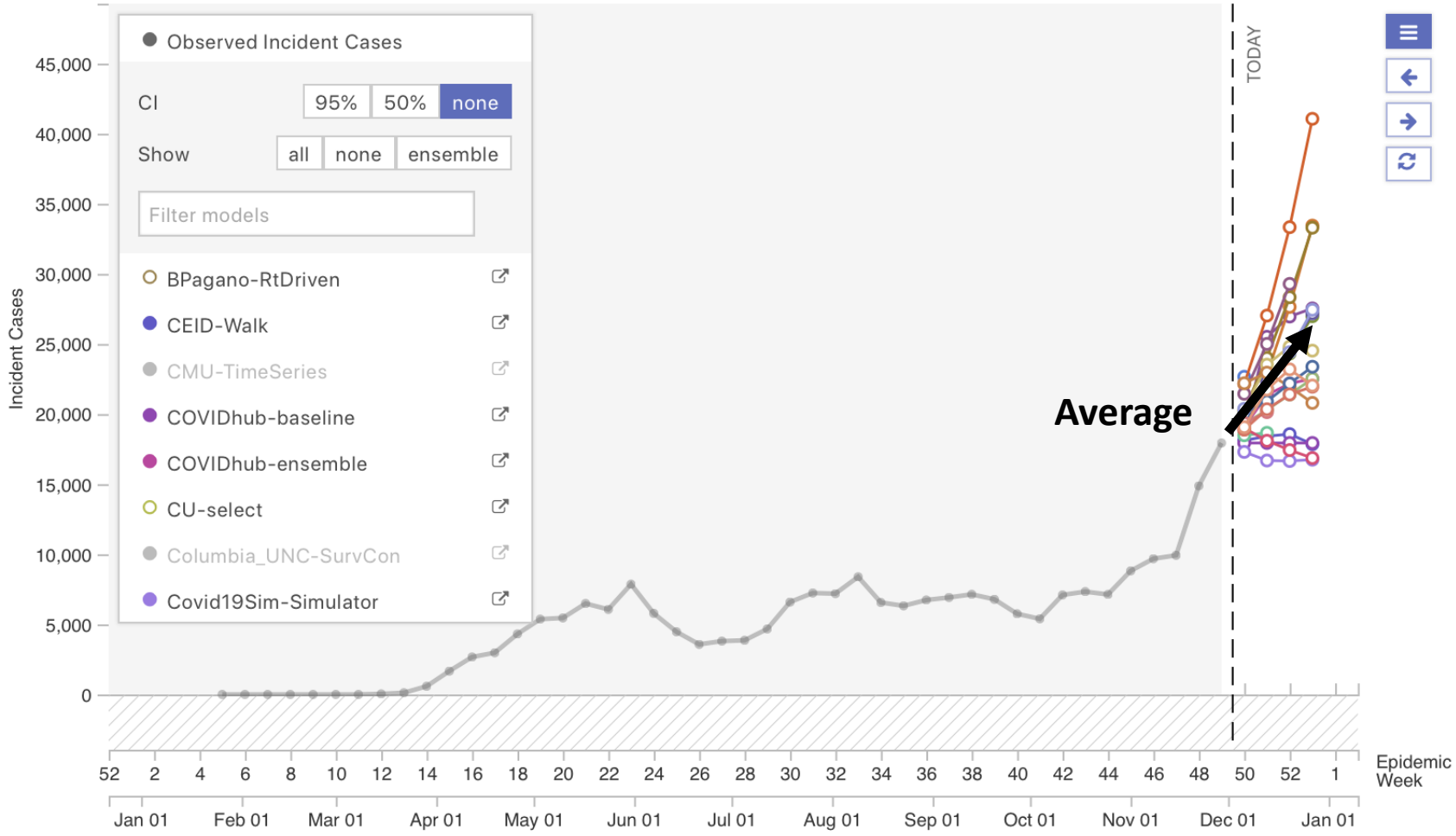
Each wave of cases has been centered in different parts of the Commonwealth



- The initial wave was concentrated in the Northern region*
- There was a partial recovery when cases in the Northern region dropped
- In mid-July, cases grew first in the Eastern region and then, beginning in August, statewide
- Statewide levels declined slightly, with a dip in the Eastern region in late September
- A new wave began in the Southwest region early in October, and previous highs have been matched or surpassed in each region

*Testing was insufficient for accurate counts during the first wave

Forecasts for cases vary, but average to a rapid rise



Note: SEIR-type models have been cut from this figure due to poor fit
Source: COVID-19 Forecast Hub, https://viz.covid19forecasthub.org/
Accessed December 1st

There is substantial variation in the case forecasts

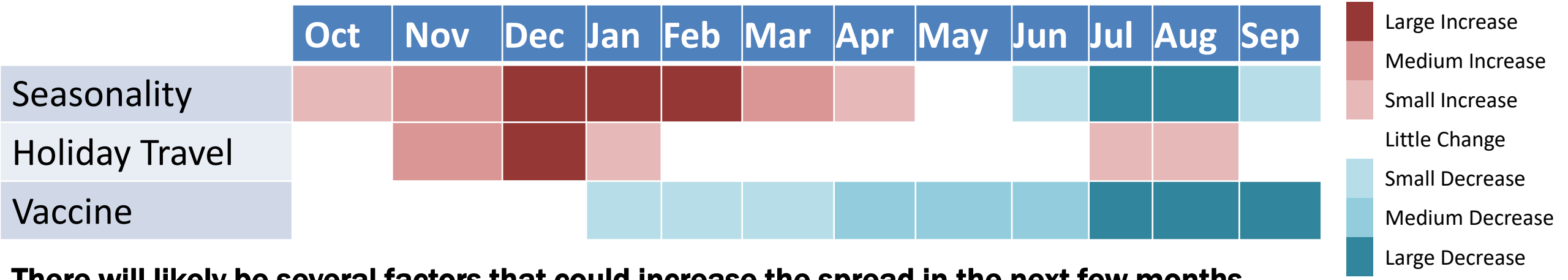
- The model "average" is for a rapid increase for the coming weeks

The mechanisms driving the spread at this stage are very different than in the early stage

- Initially, people did not change their behavior, so COVID spread exponentially
- Increased tele-work, changing weather, the return of In-person instruction, and other factors changed the pattern of spread
- These new patterns require the models to evolve

There may be a gap in testing over Thanksgiving that could cause problems for models next week

There are several triggers that could lead to increased spread



There will likely be several factors that could increase the spread in the next few months

- Seasonal effects for COVID-19 could lead to more spread during the colder months
- Holiday travel could lead to increased spread, particularly from the mixing of age cohorts

A vaccine may become available around the turn of the year

- It is unlikely that there will be sufficient supply initially to significantly reduce the spread
- People may scale back preventative behaviors (such as distancing and mask wearing) too soon

There are likely to be long-term repercussions that need planning and preparation to mitigate

- Mental health problems may persist, particularly among medical professionals and those directly affected
- Following the 1918 pandemic, there were higher rates of disability, mental illness, and other conditions

Thanksgiving is likely to be a fork in the road for COVID-19 spread in Virginia and nationally

The recent restrictions should slow the rate of spread to the extent that they are followed

- Mask mandates and business closures have been shown to be effective in the literature
- Efforts to monitor and improve compliance may increase efficacy

Thanksgiving will be a fork in the road that dictates the progression of the next few months

- Mobility data may be useful in determining, in near-real time, whether Thanksgiving is likely to become a super-spreader event
- Because testing dipped Thanksgiving weekend, a further spike in cases may not be detected until December 4th or later
- Similarly, the test positivity rate may not be a reliable gauge of testing adequacy until mid-December due to a bias towards symptomatic individuals receiving tests

If cases spike post-Thanksgiving, additional interventions may be needed

- Additional hospital capacity may be necessary and elective procedures may need to be postponed
- A shutdown of two weeks (potentially targeted) may reduce the risk from secondary infections
- Expanding testing, including the widespread use of antigen testing, may help identify problem areas and reduce the risk of spread

- Note: Options are provided by RAND Corporation. Listing on this slide does not imply endorsement or recommendation by any agency or office of the Commonwealth of Virginia.

Discussion and Questions