Vanderbilt COVID-19 Modeling Report for Tennessee

This report updates our descriptive and modeling results
with data received through April 23, 2020.

Last week we reported that the COVID-19 transmission number in Tennessee was approximately 1.0 across the state. This metric is tracked by our team and by epidemiologists worldwide and quantifies the average number of additional people infected by one infected person. To successfully suppress an epidemic, a transmission number less than 1.0 must be sustained. If the number is above 1.0 it means the epidemic is growing.

Today, Tennessee's transmission number remains around 1.0 in both metro and non-metro areas. This indicates that social distancing has reduced transmission of the virus by limiting the number of contacts among Tennesseans.

This week we focus on the question of how to maximize the amount of time the Tennessee economy is "open" in 2020. Another way to state that same goal is that we want to minimize the amount of time spent under restrictive social distancing protocols. Achieving these goals means avoiding a possible second round of business restrictions triggered by escalating hospitalizations that threaten to overburden the health care system.
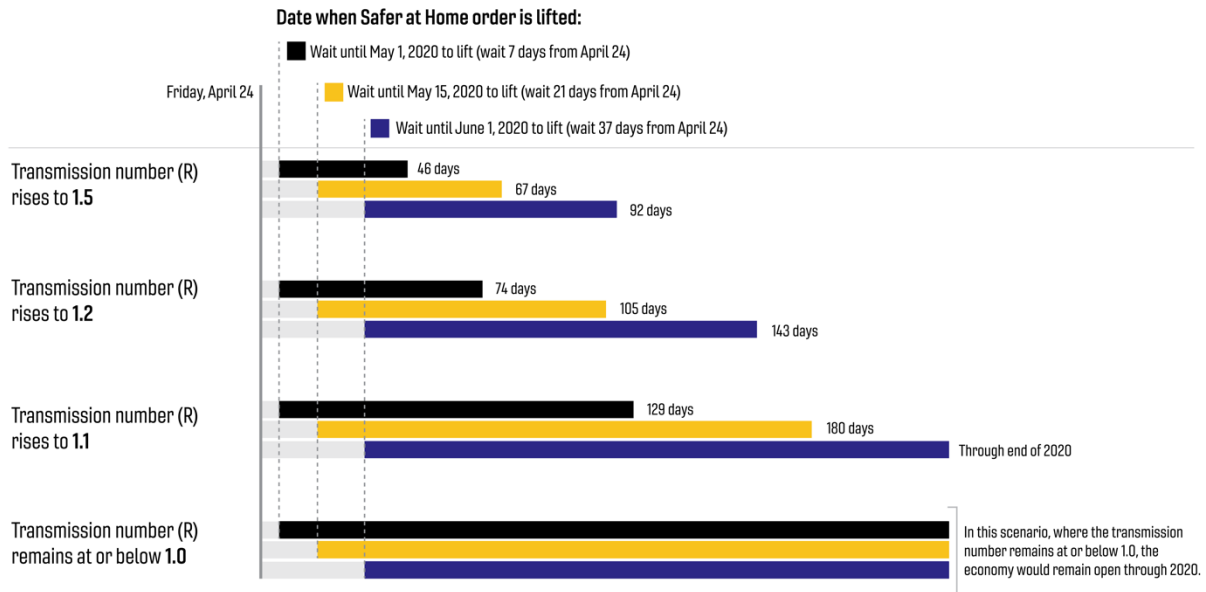
Modeling results can demonstrate what Tennessee's path forward could look like and for how long regular business could continue before our state's health care resources might be overburdened. These results draw on the model described in detail in our report of April 16 and "tuned" using Tennessee case data as of April 23 from the Tennessee Department of Health.

Our first modeling report included a scenario that assumed social distancing was lifted, the transmission number gradually increased, and a second Safer at Home order was never re-imposed. This scenario was included to demonstrate how highly infectious the virus is and how quickly progress achieved through social distancing could unravel.

In **Chart 1**, we present the results when we model "lift" scenarios that begin at several possible dates (May 1, May 15, and June 1). The model assumes that the transmission number will continue to trend downward as it has to date, and that current social distancing protocols will be maintained until the transmission number reaches 0.9. We then measure the amount of time between when the Safer at Home order and associated rules are lifted and when more restrictive social distancing protocols may need to be re-imposed because a "circuit breaker" threshold tied to hospital capacity is triggered. We show four different scenarios for how much virus transmission increases after social distancing orders are lifted. These scenarios assume the transmission number gradually increases up to a specified maximum. We assume the transmission number never increases beyond this maximum, and we stress that social distancing should not be lifted without strong public health measures – widespread testing and contact tracing – in place.

Chart 1

Estimated time until an assumed trigger of 1,000 concurrent statewide COVID-19 hospitalizations. It is assumed the statewide transmission number continues to decline to 0.9 in the next 7 days and remains there until the Safer at Home order is lifted. A transmission number below 1.0 for a sustained period is necessary to slow an epidemic.

Date when Safer at Home order is lifted:

■ Wait until May 1, 2020 to lift (wait 7 days from April 24)

■ Wait until May 15, 2020 to lift (wait 21 days from April 24)

■ Wait until June 1, 2020 to lift (wait 37 days from April 24)

Friday, April 24

Transmission number (R) rises to 1.5
- 46 days
- 67 days
- 92 days

Transmission number (R) rises to 1.2
- 74 days
- 105 days
- 143 days

Transmission number (R) rises to 1.1
- 129 days
- 180 days
- Through end of 2020

Transmission number (R) remains at or below 1.0

In this scenario, where the transmission number remains at or below 1.0, the economy would remain open through 2020.

Notes: The model assumes the transmission number returns to the specified level in the same amount of time it took to reduce it from that level to approximately 1.0, and that Tennessee reduces the transmission number to 0.9 before the time of reopening indicated above.

Data current as of April 23, 2020 and presented on April 24.

The chart shows that the longer social distancing is continued, and the more transmission of the virus is reduced, the longer the economy could stay open before overburdening the state's hospitals and risking the health of all Tennesseans who might need care, not just those suffering from COVID-19. The only scenario in which this does not occur is the one in which the transmission number stays at or below 1.0 after the Safer at Home order is lifted. While it is currently unknown exactly how much the transmission number will change as "Safer at Home" protocols are eased, we do know that the number of social contacts among Tennesseans will increase—even if certain aspects of physical distancing at businesses, mask-wearing and hygiene practices continue.

On April 20, Gov. Bill Lee announced his plan to lift the statewide Safer at Home order that went into effect April 1. While the Governor's plan is that parts of Tennessee will begin to navigate out of more restrictive business operation protocols beginning as early as April 27, more restrictive social distancing policies may remain in effect in larger metro areas beyond May 1.

We chose to model a trigger of 1,000 concurrent statewide hospitalizations for considering re-instating safer at home protocols, but this could be set at a different level with input from policymakers or health systems. Through April 22, there has been a total of 793 people who were <u>ever</u> hospitalized with COVID-19 in Tennessee,

so 1,000 <u>concurrent</u> hospitalizations would be a dramatic increase. We also note that a metric other than statewide hospitalizations, such as percent of ICU capacity used in a region for COVID-19 patients, could be a better metric to track and to trigger policy change. However, data to set such a trigger are not currently available.

It is also important to emphasize that, if a Safer at Home order was reinstated after this circuit-breaker threshold was crossed, a reduction in hospitalizations would not be immediate. Hospitalizations would continue to increase for a period of time because people already infected may need to be hospitalized over the next few weeks. Additional infections and possible hospitalizations would also continue to mount until the effects of additional social distancing are realized several weeks later. These increased numbers of hospitalizations would tax the health system further. Thus, our 1,000 hospitalization trigger should be considered a warning sign, as it is not the highest number of hospitalizations that would be reached.

Finally, we continue to stress the success of Tennesseans in reducing the transmission of COVID-19 to its current level, though we also underscore how fragile this success can be and how a transmission number below 1.0 must be sustained for the epidemic to diminish. Strong public health measures, including widespread testing and contact tracing, are essential to maintaining this trajectory as we ease social distancing practices.