

Tennessee COVID-19 Death Trends Are Lower in Areas with Virus Mitigation Strategies in Place

November 10, 2020

Since early October, Tennessee has seen a substantial increase in reported cases, hospitalizations, and deaths resulting from COVID-19. As of November 6th, over 3500 Tennesseans have died of COVID-19. Figure 1, below, shows the 7-day moving average of deaths per day through October 1.

The data presented are arranged by date of death, which is typically earlier than the state reporting date. COVID-19 deaths reported by the state on any given day can lag the actual date of death for a variety of reasons. Among Tennesseans who have died, there were, on average, about 14 days between their test date and their date of death. As described in Box 1 below, additional time passes before the death is reported publicly due to data processing and, in some cases, further review.

As of this writing, we have a reasonably complete picture of deaths in Tennessee that occurred through the first week of October 2020. These deaths are tied to infections that likely occurred in mid- to late-September, before the recent rise in cases.

Figure 1

COVID-19 Deaths in Tennessee, 7-day moving average

The following chart shows a 7-day moving average of COVID-19 deaths in Tennessee by date of death.



As discussed in our [October 27 report](#), there has been considerable COVID-19 policy activity at the local and state level. As of this writing, just under two-thirds (63%) of Tennesseans are subject to a mask requirement in their county, while the remaining 37% either never faced a masking requirement (31%) or were only subject to a requirement during the summer months (July-September; 6%).¹ In addition, as of September 30, all restrictions on group gatherings and on business capacity and operations were lifted in at least 89 counties where, collectively, 60% of the state population resides.²

In light of these trends, this report expands on our previous analyses of masking policies. We do so by considering the association between counties that were early- and late-adopters of mandatory masking policies, versus those not adopting masking policies, and deaths of residents of those counties. As in our previous reports, we stress that masking policies—especially those adopted earlier in the summer—are best considered as a proxy for a broader bundle of complementary behaviors and policies, including mask requirements, intended to mitigate the spread of COVID-19.

Box 1: How are Deaths Reported and Counted in Tennessee?

Death certificates are completed by physicians and medical examiners who are legally obligated to accurately report certain information regarding cause of death. Death certificates pass through several administrative layers and are examined for accuracy at each level before being finalized.

The cause of death is reported in two parts on the certificate: Part I includes the immediate, intermediate, and underlying causes of death, and Part II includes other conditions that may have significantly contributed to but were not directly a part of the events leading to the death. In simplified terms, the underlying cause starts the events that lead to the death. It then progresses through the intermediate causes and the individual passes away from the immediate cause. Other health conditions may contribute by putting the person at higher risk of death despite not being a direct cause of the death. For a death to be classified as a COVID-19 death, it must be included in Part I.

In Tennessee, COVID deaths may be reported by county medical examiners, nursing home and hospital staff via email or phone to be entered into the state surveillance system. In some cases, they are also identified when a death certificate for an individual who has previously tested positive for COVID and is in the state surveillance system is registered in the death registration system. In Tennessee, the state searches text in death certificates and cross references with lab data to ensure that decedents with COVID are found and documented appropriately. In this way, the state medical examiner can link the case report and death certificate and review to verify that the underlying cause of death is COVID-19. In all cases, deaths are considered COVID-19 deaths only if what actually caused the person to die at the time was COVID-19. It is not the case, for example, that an individual who dies due to a motor vehicle accident or opioid overdose, and who happens to have COVID, would be called a COVID-19 death. In fact, we very rarely do postmortem COVID testing in Tennessee. On average, the decedents with a COVID-19 cause of death were diagnosed with COVID-19 fourteen days before their death.

¹ We classified the 7 counties (16% pop) that have had mask mandates expire and then be reinstated as early or late adopters, depending on when they instituted their initial mask mandate.

² These 89 counties are those with rural county public health departments that operate under the supervision of the Tennessee Department of Health. The 6 remaining counties with independent public health departments include: Davidson, Knox, Hamilton, Madison, Shelby and Sullivan.

Masking Requirements and COVID-19 Deaths

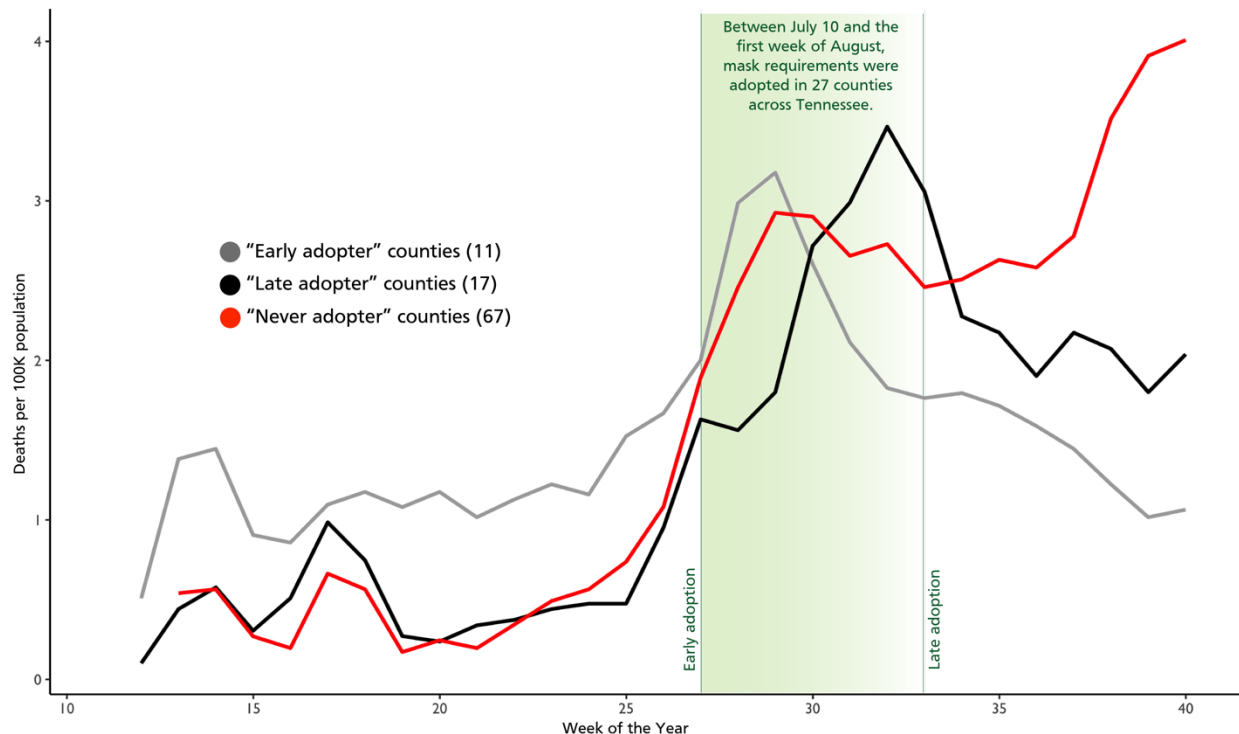
Masks are known to reduce human transmission of the SARS-CoV-2 virus^{3,4,5}. Consequently, areas with more widespread mask wearing are expected to have fewer transmission events—and thus a “flatter” case, hospitalization, and deaths curve—than areas where masking is less common. We would also expect the effects of masks to take some time to take effect: turning “on” or “off” required masking behavior as cases rise and fall would not immediately affect growth in cases or deaths.

In particular, deaths increase several weeks after cases go up. By the same token, death rates would take some time to shift downward after virus mitigation strategies are introduced. It is the total impact of masking plus other virus mitigation behaviors, such as distancing, hand hygiene, and avoiding crowds that over time reduces viral spread by severing chains of transmission.

Figure 2

COVID-19 Deaths in Tennessee and Adoption of Mask Requirements

The following chart shows deaths per 100K population in counties grouped based on date of installment of mask requirements. A total of 27 counties installed mask requirements, some of which remain in effect. Sixty-seven counties have never had a mask requirement to date.



³ Peeples, L., 2020. Face Masks: What The Data Say. [online] Nature.com. Available at: <<https://www.nature.com/articles/d41586-020-02801-8>>

⁴ Lyu, W. and Wehby, G., 2020. Community Use Of Face Masks And COVID-19: Evidence From A Natural Experiment Of State Mandates In The US | Health Affairs. [online] Healthaffairs.org. Available at: <<https://www.healthaffairs.org/doi/10.1377/hlthaff.2020.00818>>].

⁵ Wang X, Ferro EG, Zhou G, Hashimoto D, Bhatt DL. Association Between Universal Masking in a Health Care System and SARS-CoV-2 Positivity Among Health Care Workers. JAMA. 2020;324(7):703–704. doi:10.1001/jama.2020.12897

Figure 2 shows the trends in deaths per week in Tennessee, based on the date of death and the county in which the deceased lived. This analysis expands on our earlier analyses of the impact of masking policies by dividing counties into groups depending on the timing of mask policy implementation. Specifically, we categorize counties based on whether they were an early adopter (i.e., mask mandate in place as of July 10, the cutoff date used in our previous reports; these counties are shown in **GRAY**), a later adopter (i.e., mask mandate in place after July 10; shown in **BLACK**), or a never adopter (shown in **RED**).

Several patterns emerge from the data shown above. First, early adopting counties had higher death rates, on average, prior to the surge in cases in July. This is consistent with the virus initially spreading rapidly in the populous, urban areas of the state. However, among these early adopting counties—which include most of the major metro counties in Tennessee—the death rate began to fall within a couple of weeks of the masking policies’ implementation.

In the later adopting counties, we see a rapid rise in the death rate leading into July which is nearly identical to the rise observed in non-adopting counties. But a few weeks later the death rate begins to fall in late adopting counties—and continues to rise in non-adopting counties. The rise in non-adopting counties continued throughout our observation period.

Conclusions

There is a clear difference in mortality trends between the Tennessee communities that adopted masking requirements and those that did not. In both early- and late-adopting mask requirement areas, we see a pattern of rising death rates before mask requirements and then declining death rates within a few weeks of requirements (and any concurrent policies) going into effect. Early adopting areas had higher death rates early in the pandemic and were predominantly larger urban counties—making it difficult to compare to smaller, more rural areas. However, late-adopting areas and areas not adopting mask requirements had similar experiences until the summer, when late-adopting areas began to see death rates decline, while non-adopting areas continued to see increases in their death rates.

As in our recent report on hospitalizations, we stress that areas with masking requirements also have seen greater changes in other community behavior (e.g., lower mobility/travel to higher-risk points of interest), and many areas with requirements also have other virus mitigation strategies in place. Thus, masking policies are a useful proxy or indicator for these complementary behaviors but it must be underscored that the observed relationships between hospitalizations, deaths, and mask requirements is about a set of behaviors, including but not limited to masking.

The COVID-19 pandemic in Tennessee is now at its highest point to date in terms of hospitalizations and new cases, and deaths will likely continue to increase. The good news is that we have learned a great deal since the beginning of the pandemic. Nearly 80 percent of Tennesseans now report wearing masks in public all or most of the time, but the distribution of

mask wearers is likely skewed to large urban areas where masks are required (where self-reported masking behavior is well above 90%).⁶

In addition, although Tennesseans report that they are wearing masks, we know from other research that mask wearing may be inconsistent. In particular, individuals may not understand the risk of exposure to friends and family and may “let down their guard” in situations where they are meeting in small groups with close contacts. Mask ordinances demonstrate leadership by sending a clear signal that behavior must change to mitigate spread of the virus.

This report was prepared by John Graves, PhD, associate professor of Health Policy and director of the Center for Health Economic Modeling, Melissa McPheeters, PhD, research professor in the Department of Health Policy and co-director of the Center for Improving the Public’s Health Through Informatics, Melinda Buntin, PhD, Mike Curb Professor of Health Policy and Chair, Department of Health Policy. Data analysis and presentation support were provided by Khrysta Baig, Kyle Gavulic, Jake Lowary, Leonce Nshuti, and Zilu Zhou; the team received input from Vanderbilt’s Health Policy and Public Health Advisory Panel.

⁶ See <https://covidcast.cmu.edu>