COVID-19
Critical Indicators
October 16, 2020

TN Department of Health

Introduction

As Tennessee (TN) monitors reopening across the state, the Tennessee Department of Health (TDH) will maintain vigilance of critical COVID-19 indicators at the state and county levels to identify 'problem areas' across the state and provide early indication of sustained increases in community transmission.
These metrics were developed in line with the **White House proposed State Gating Criteria** and help officials monitor trends in four key areas:

- Trends in COVID-19 Cases (see on page 2)
- Trends in COVID-19 Symptoms (see on page 7)
- Trends in COVID-19 Testing Capabilities (see on page 8)
- Trends in Healthcare System Capacity (see on page 9)

Beginning June 12th, 2020, case trends (beginning on page 2) include both confirmed and probable cases.

COVID-19 in TN at a Glance

COVID-19 in TN at a Glance

223,493	666	18,791	2,871
Total Number of COVID-19 Cases	New COVID-19 Cases Today	Active COVID-19 Cases Today	Total Number of COVID-19 Deaths

Key Definitions

Below are definitions important to understanding this report. In addition to these definitions, each visuaization in this report will be explained in further detail in the technical notes (see page 11).

- In TN, a **COVID-19 case** is counted in the daily case count, demographics, and outcomes, if it classified as a confirmed or probable case. Please see the COVID-19 case definition here.
- A **confirmed case** is someone who tested positive (via PCR test) for the virus that casues COVID-19 (SARS-Cov-2).
- A **probable case** is someone who may have tested negative by PCR, tested positive by another type of test or may not have been tested at all, but has an illness consistent with COVID-19, and may have other risk factors. For example:
  - If a person is a close contact of a COVID-19 case and has a clinically-compatible illness, this person meets the criteria to be a probable case
- The **specimen collection date** is the date someone's COVID-19 lab sample was collected. Due to lab turn-around time there may be delays between when a specimen is collected and a confirmed case is reported to the public. Unless otherwise stated, visualizations in this report use specimen collection date as it more accurately indicates when a patient was sick (and not when their case was reported to the public).

Trends in COVID-19 Cases in TN

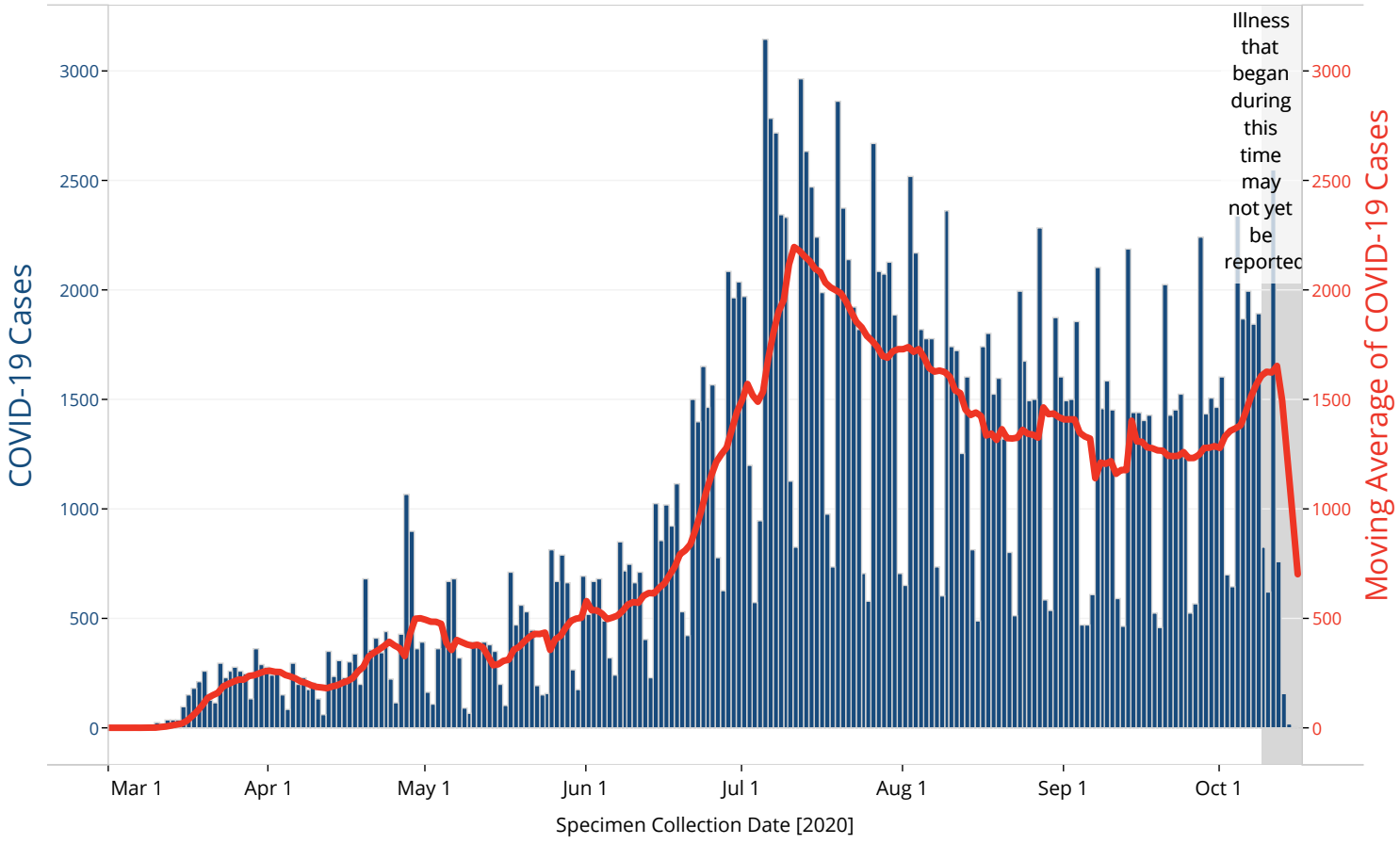
The following section will visualize the COVID-19 case trends (both confirmed and probable) in TN, including newly reported cases, the active number of cases, and the number of COVID-19 confirmed deaths.

White House State Gating Criteria: COVID-19 Cases

Downward trend of confirmed cases within a 14-day period
OR
Downward trend of positive tests as a percent of total tests within a 14-day period (flat or increasing volume of tests)

Epidemic Curve of COVID-19 Cases by Specimen Collection Date[1]

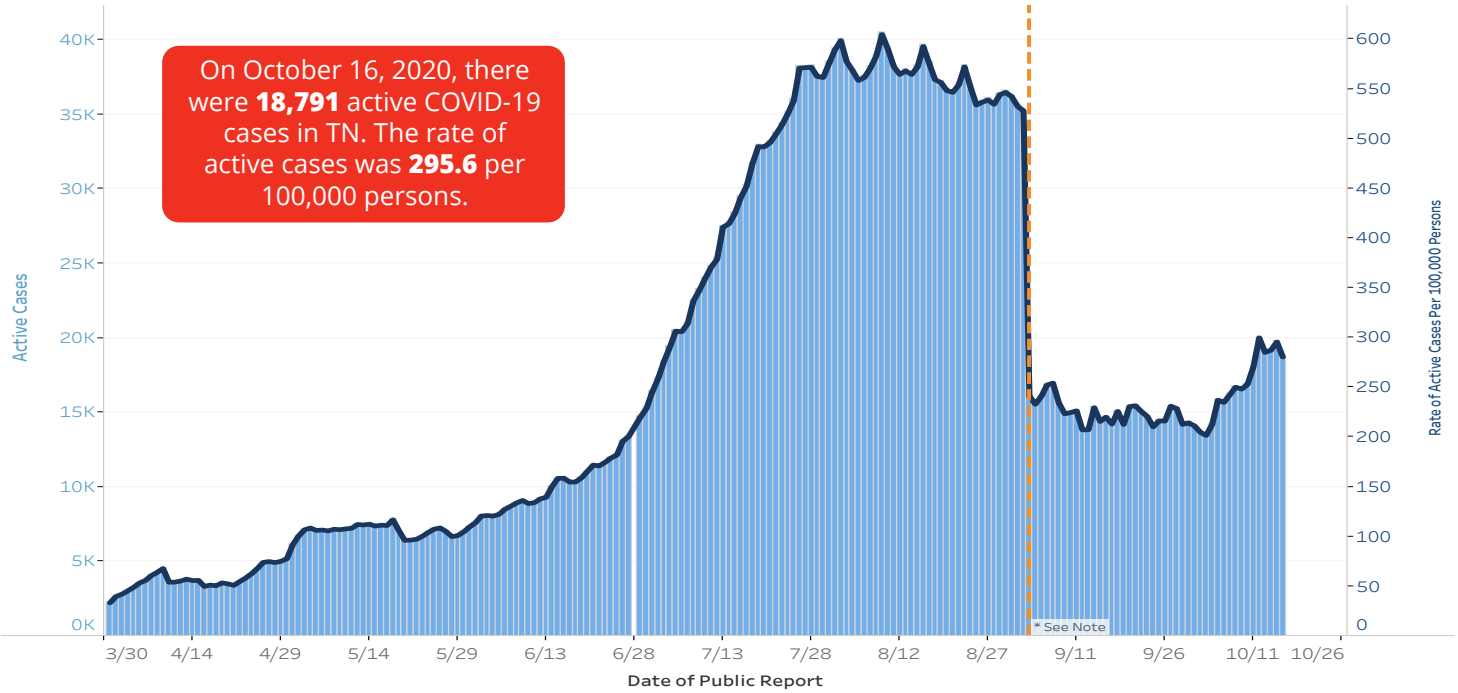
The curve below visualizes the number of new cases each day since the beginning of the COVID-19 outbreak. Since mid-April 2020, the moving 7-day average for new cases has increased over time with higher averages seen in June and July compared to April. On July 11th, 2020, the moving 7-day average was the highest of the pandemic averaging 2,197 new cases/day.



The epidemic curve is based on the day the specimen was collected. Therefore, the most recent day's data may not be complete as test results take an average of 2-5 days to be reflected in the visualization. To learn more about this visualization, please reference the technical notes.

Statewide Number and Rate of Active Cases[2]

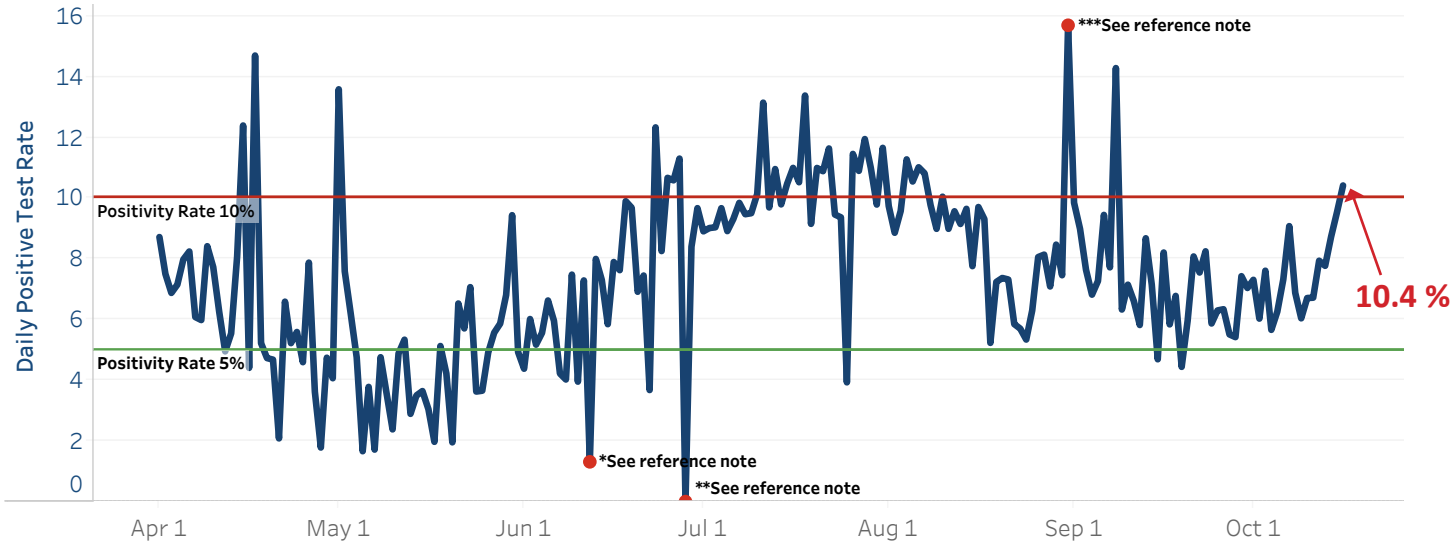
The chart below visualizes the number and rate of active COVID-19 cases in TN. The number and rate of active cases has been higher in July than in previous months, reaching its peak on August 9th, 2020 with 40,492 active cases.



**On September 3rd, 2020 (orange line) TDH updated its defintion of an active case - significantly lowering the number of active cases on that day and moving forward.*

Daily Percent of Positive COVID-19 Tests[3]

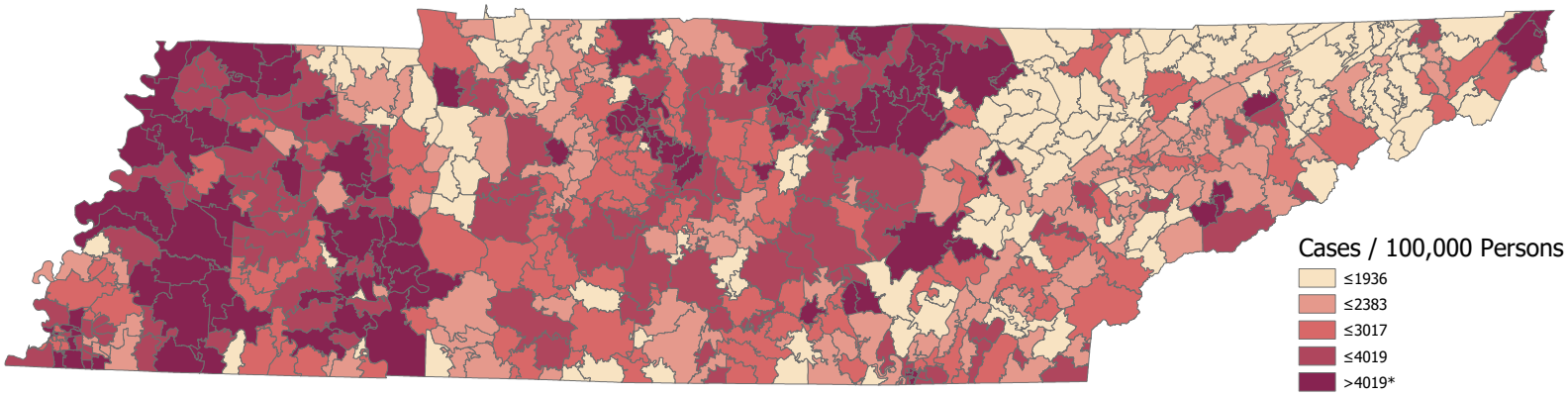
The chart below visualizes the daily percent of positive COVID-19 tests. While the daily percent of positive COVID-19 tests fluctuates, in September the daily positivity rate was more consistently between 5 and 10%, a downward trend from the higher daily positivity rates seen through much of July. For today, October 16, 2020, the daily positivity rate was 10.4% and the positivity rate for the last 7 days was 8.26%.



** On June 12th, 2020 (orange dotted line), a bolus of historic tests were included in the dataset, artificially lowering the daily percent positive this day.*
*** On June 28th, 2020 (green line) no data were reported due to an unplanned shutdown of the state surveillance system.*
**** On August 31st, 2020 (yellow line), there was a large cluster associated with a correctional facility that contributed to the high positivity rate for the day.*

Number of Cases per 100,000 Persons by Zip Code[5]

The map below shows the number of cases per 100,000 persons by zipcode across TN, with the darker zipcodes indicating higher numbers of cases per 10,000 compared to the lighter colors. The zipcodes in white have had no COVID-19 cases reported. This map is updated weekly on Friday, it was last updated on October 14th, 2020.



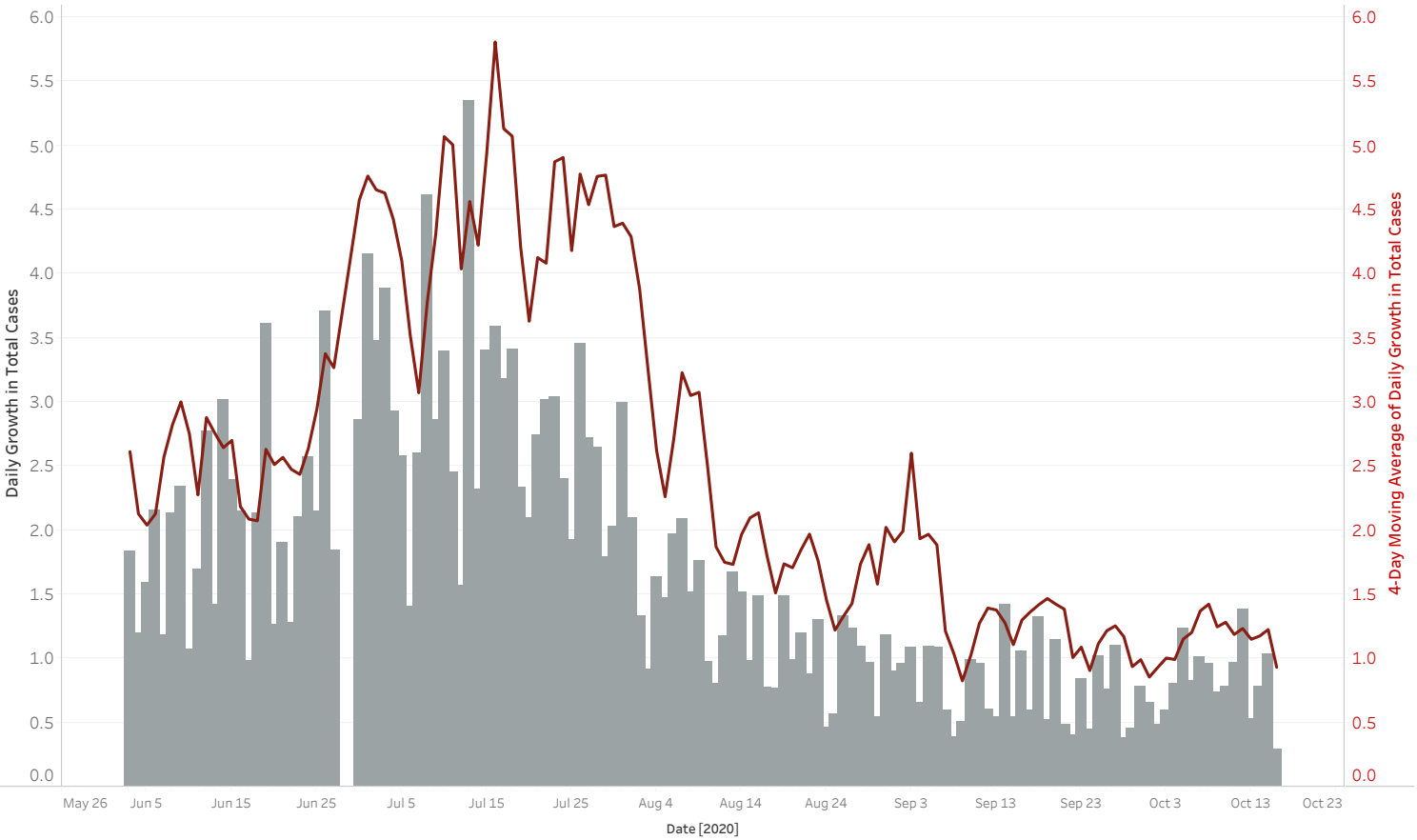
*Highest value is 200,000 cases per 100,000 persons. Cases may exceed the number of people in a ZIP code if the actual population exceeds population estimates.

Growth in Total COVID-19 Cases Across TN[4]

The map below visualizes recent growth in new COVID-19 cases in Tennessee in two ways:

1. **Gray Bar Chart**: The average daily growth rate of total cases in Tennessee.
2. **Red Line**: The 4-day moving average of the daily growth rate that can help to indicate trends in growth.

In the last two weeks, the average daily growth rate has fluctuated but stayed under 1.5%. An averge daily growth rate of 1.5% means, on average, the total number of COVID-19 cases increases by 1.5% each day.

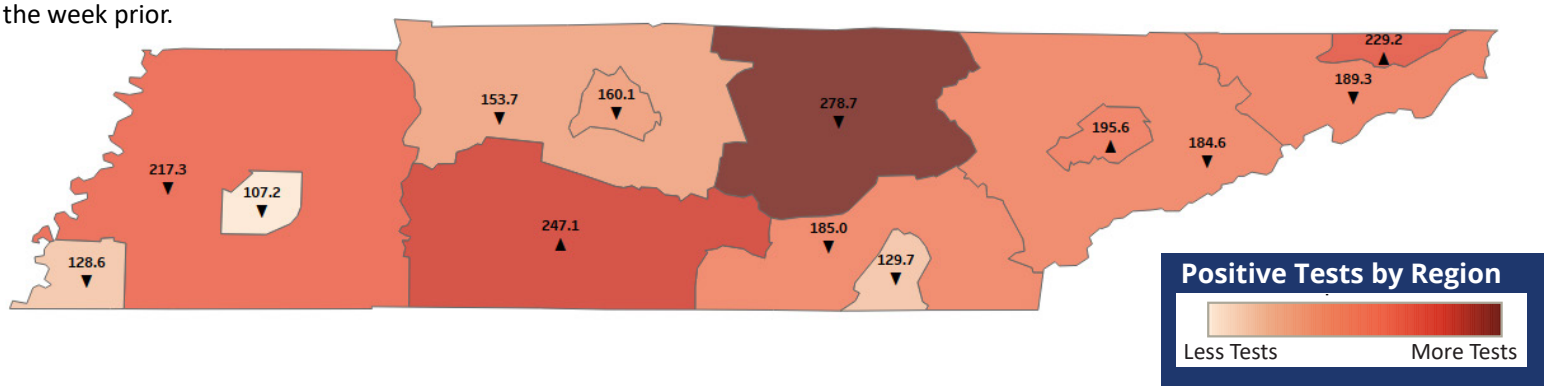


COVID-19 Critical Indicators Report
October 16, 2020

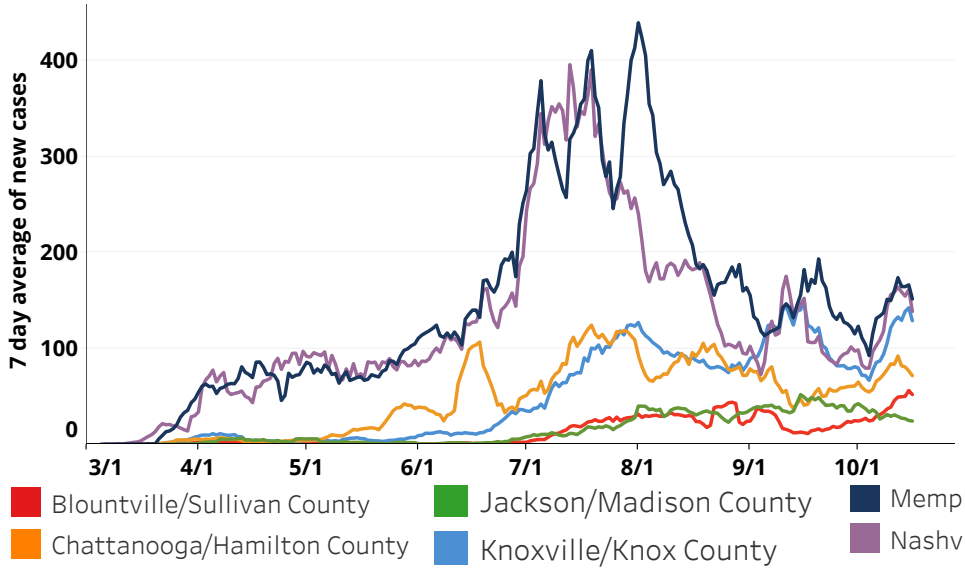
TN Department of Health

Positive Tests per 100,000 Person by Public Health Region (over last 7 days)[6]

The map below shows the number of new positive tests in the last 7 days per 100,000 persons. The arrow indicators represent the trend (up or down) as compared to the week prior. For the week of October 16th, 2020, the highest rate of positive tests was seen in the Upper Cumberland region. Additionally, 10 of the 13 public health regions saw a decrease in the number of positive cases compared to the week prior.

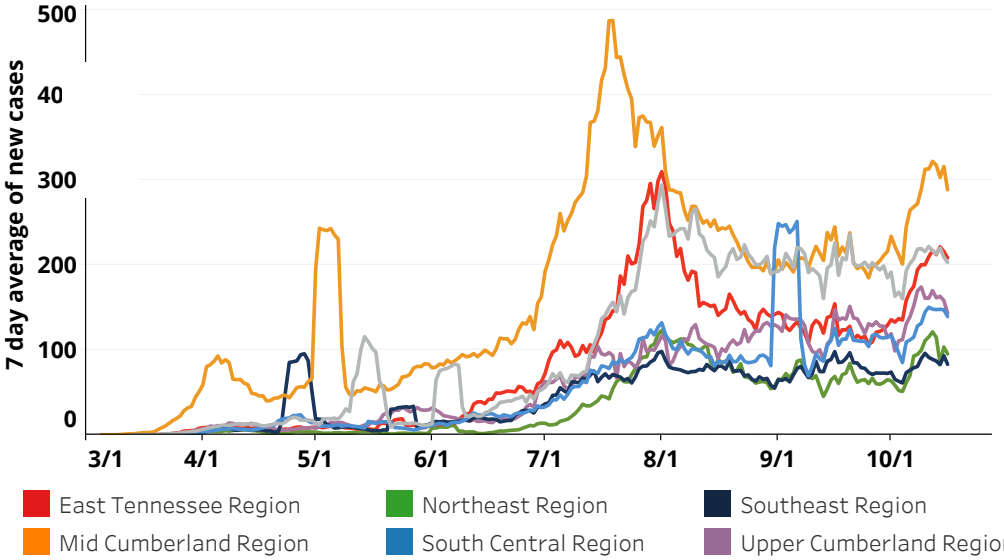


7 Day Running Average of New Cases in Metropolitan Public Health Regions[7]



The plot to the left illustrates the 7 day running average of new COVID-19 cases (based on the date of public report) for the six metropolitan public health regions. The Nashville/Davidson and Memphis/Shelby metropolitan areas have consistently reported higher counts of COVID-19 cases compared to the other four metropolitan areas since the outbreak began.

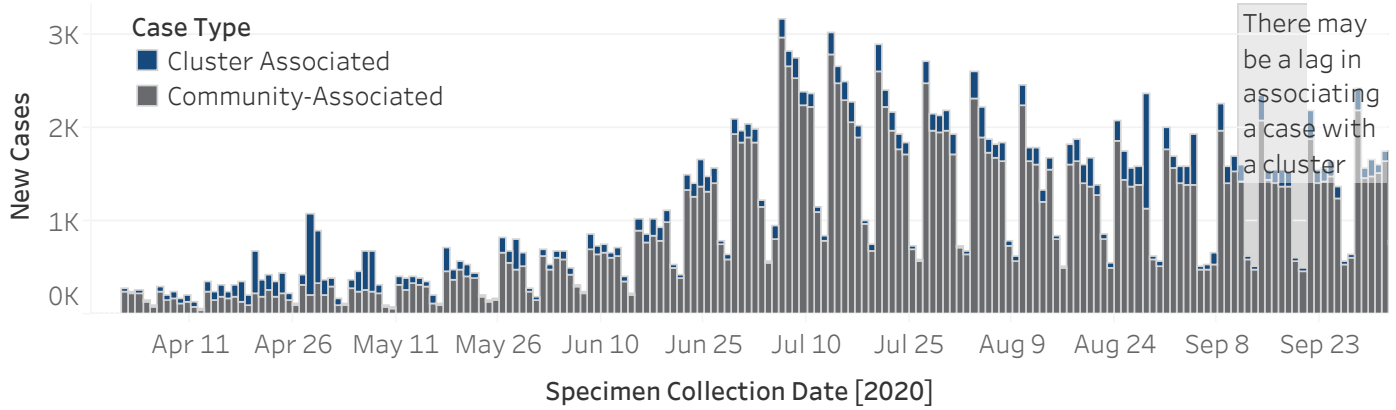
7 Day Running Average of New Cases in Rural Public Health Regions[7]



The plot to the left illustrates the 7 day running average of new COVID-19 cases (based on the date of public report) for the seven rural public health regions.

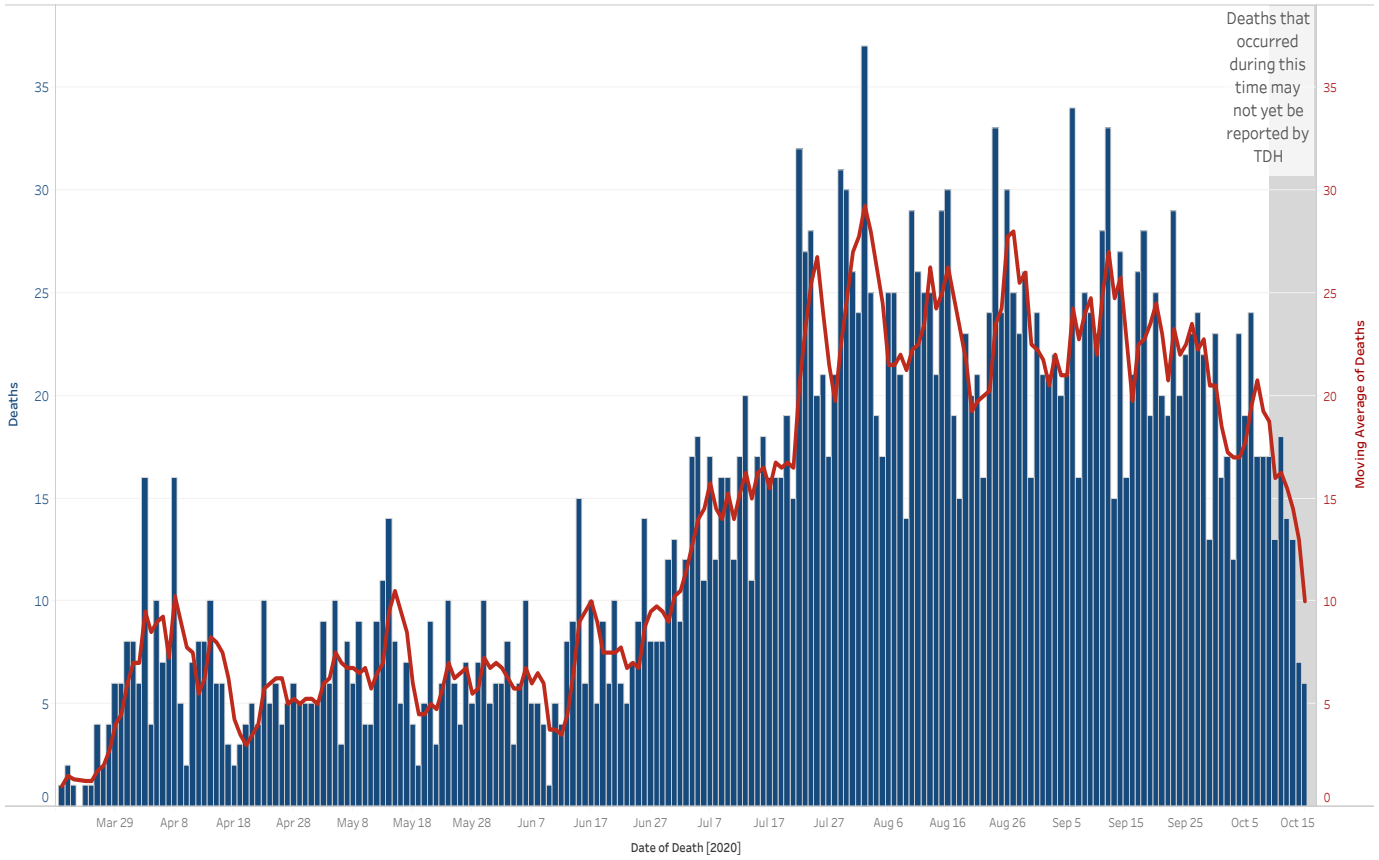
COVID-19 Cluster Associated Cases compared to Community Cases[9]

Aside from a few key days (4/20, 4/28,4/29, 5/6), community associated COVID-19 cases are more prevalent than cluster associated cases in TN.



Number of Deaths per Day (by date of death)[8]

On October 16th, 2020, the total number of confirmed COVID-19 deaths was 2,871 (2,738 confirmed and 133 probable). Below is the number of COVID-19 deaths by the **date of death**. The red line represents the 4d running average number of deaths.



Case Fatality Rate:
1.3 %
(2,871/223,493)

30-Day Case Fatality Rate:
1.6 %
(720/46,406)

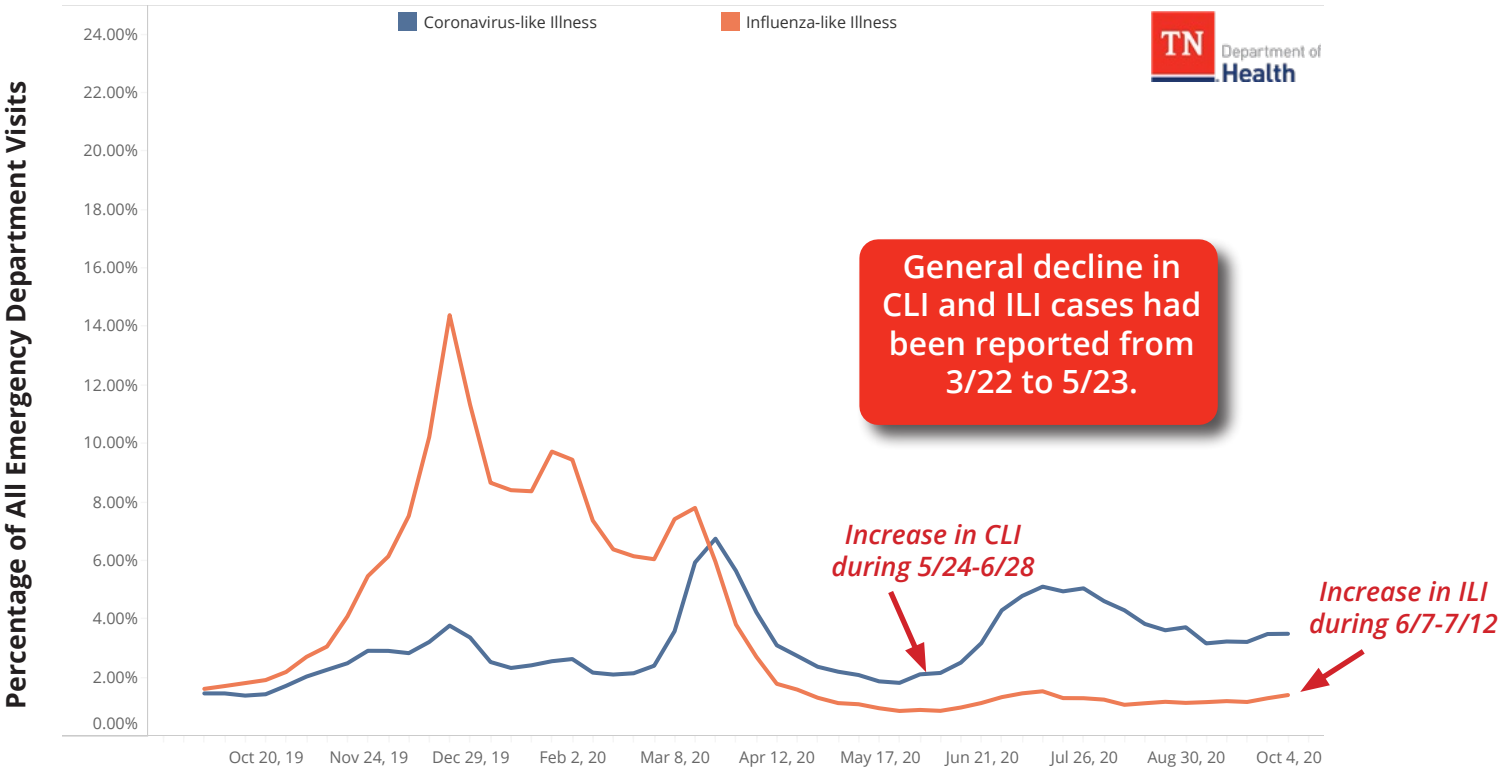
Trends in COVID-19 Symptoms

The following section will visualize the trends in COVID-19 symptoms based on data collected through TN's syndromic surveillance system, ESSENCE. ESSENCE tracks patient chief complaints and discharge diagnoses from 95 emergency departments across the state. The data are typically received from participating EDs within 24 hours of a patient encounter. These data are used to get pre-diagnostic estimates of health conditions (like COVID-19) being reported from emergency departments.

White House State Gating Criteria: Symptoms

Downward trajectory of ILI reported within a 14-day period
AND
Downward trajectory of COVID- like (CLI) syndromic cases reported wihtin a 14 day period

Syndromic Surveillance (Emergency Room) Data[10]



Cornavirus like illness (CLI) is defined as symptom terms, free text, or discharge diagnoses specified by CDC that are likely to be related to illness caused by the 2019 novel Coronavirus. The visits counted within these criteria will contain a percentage illnesses caused by conditions other than novel coronavirus infection. The visits counted within these criteria will contain a percentage illnesses caused by conditions other than novel corona virus infection. These results should be considered preliminary in nature and are not all confirmed diagnoses of disease.

Influenza like illness (ILI) is defined by terms, free text, or discharge diagnoses that are likely to be related to illness caused by seasonal influenza. The visits counted within these criteria will contain a percentage illnesses caused by conditions other than influenza infection. These results should be considered preliminary in nature and are not all confirmed diagnoses of disease.

Trends in COVID-19 Testing Capabilities

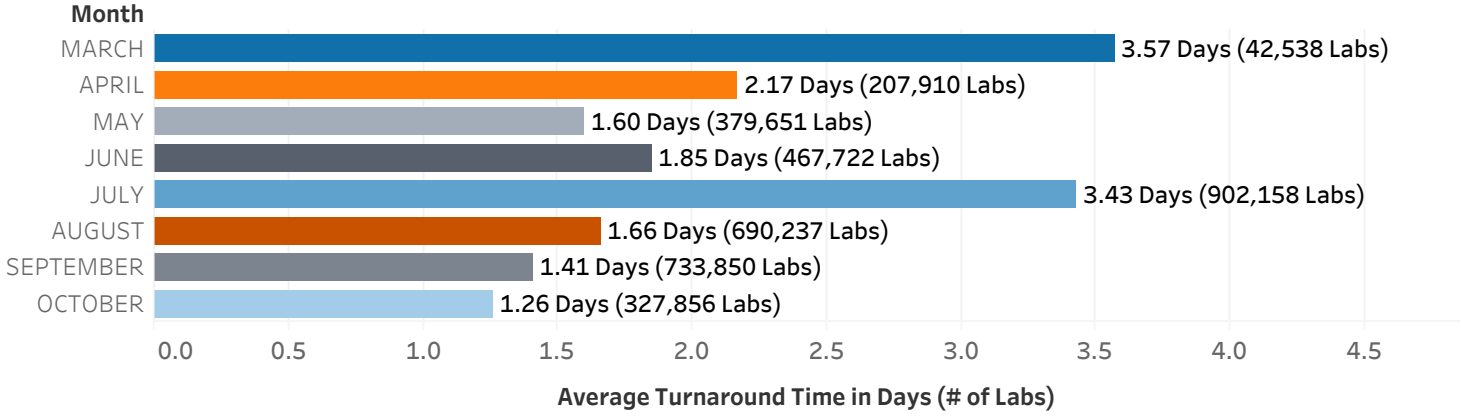
The following section will visualize the COVID-19 testing trends in TN, including laboratory testing turnaround time and the rates of testing across the state.

White House State Gating Criteria: Testing Capabilities

- Ability to quickly set up safe and efficient screening and testing sites for symptomatic individuals and trace contacts of COVID+ results
- Ensure sentinel surveillance sites are screening for asymptomatic cases and contacts for COVID+ results are traced

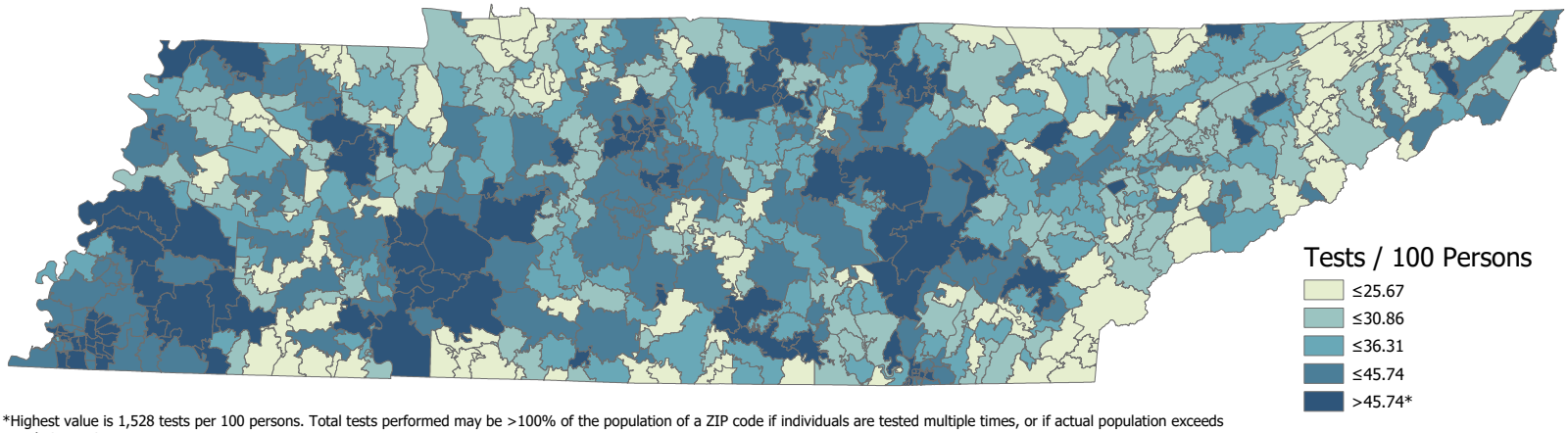
Laboratory Testing & Turnaround Time[11]

Below is the number of COVID-19 laboratory tests conducted in TN from March to July with the average turnaround time (from specimen collection to time of result). The number of tests conducted each month has increased in TN from ~42,000 tests in March to >894,000 tests in July. Lab turnaround time improved from March (3.57 Days) to June (1.85), but increased again in July (3.44 days). TAT time has improved since August.



Number of Completed Tests per 100 Persons by Zip Code[12]

The map below shows the number of completed tests per 100 persons by zipcode across TN, with the darker zipcodes indicating higher numbers of tests per 100 compared to the lighter colors. The zipcodes in white have had no COVID-19 testing reported. The map below is updated weekly on Friday, it was last updated on October 14th, 2020.



*Highest value is 1,528 tests per 100 persons. Total tests performed may be >100% of the population of a ZIP code if individuals are tested multiple times, or if actual population exceeds population estimates.

Trends in COVID-19 Hospital Capacity

The following section will visualize trends in hospital capacity, including the number of COVID-19 positive patients currently admitted, hospital bed utilization, and bed/ventilator availability. All of the visualizations below were created using data from the TN Healthcare Resource Tracking System (HRTS), a tool developed by TDH that manages healthcare facility bed, service and asset availability. These data are reported by hospitals across TN daily.

White House State Gating Criteria: Hospital Capacity

Treat all patients without crisis care

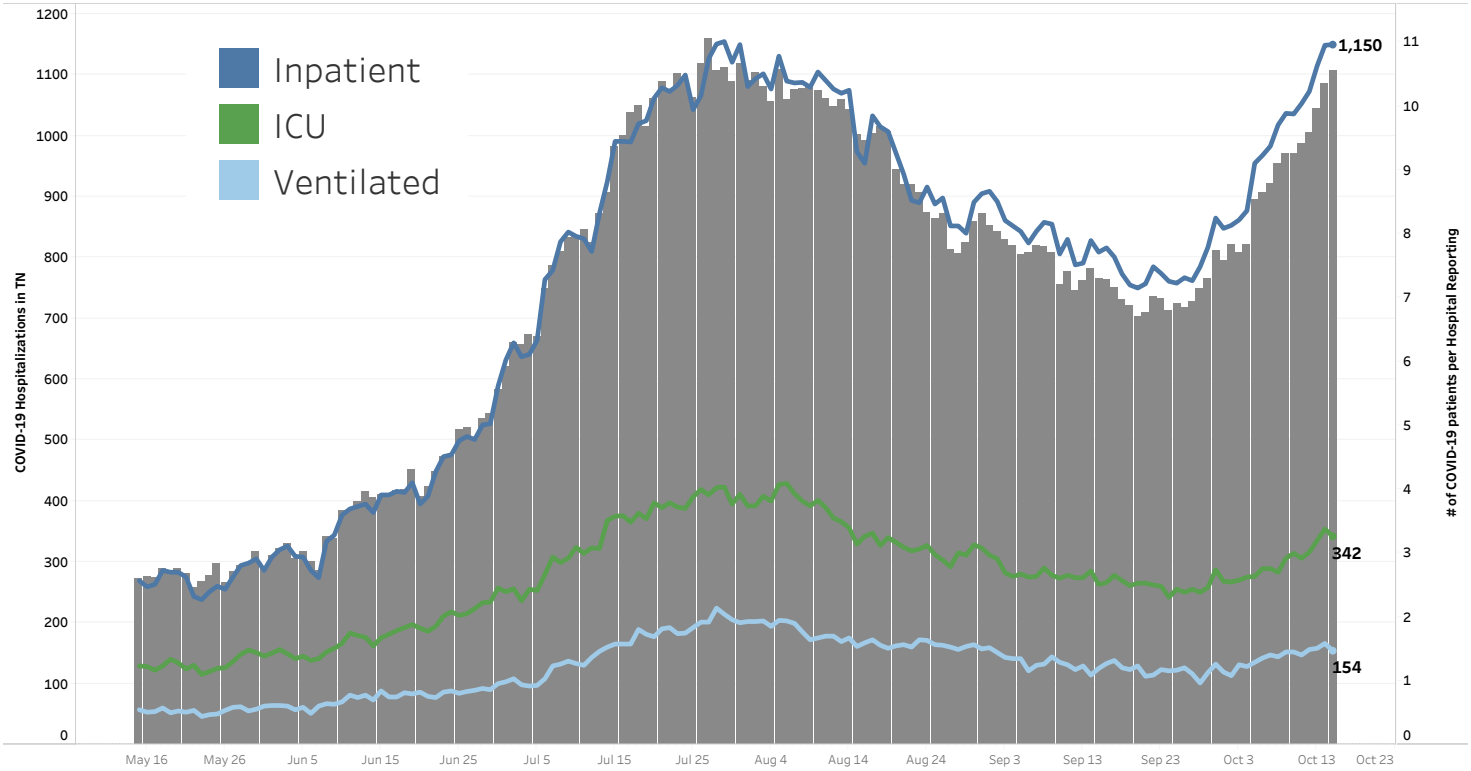
AND

Robust testing program in place for at-risk healthcare workers, including emerging antibody testing

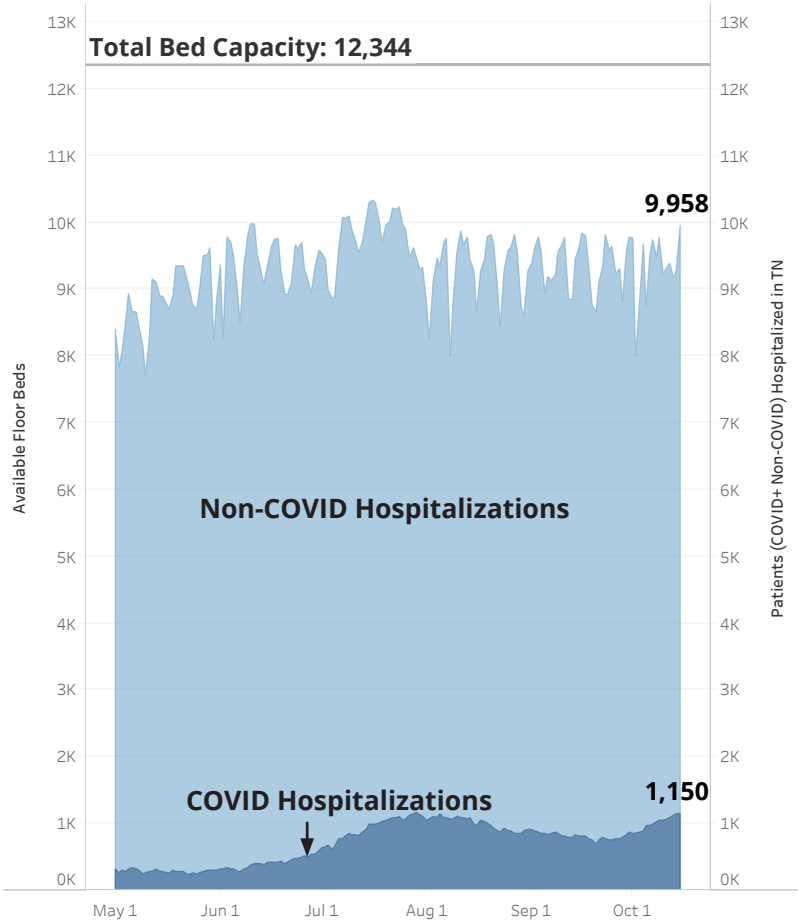
Number/Rate of COVID-19 Hospitalized Patients[13]

Below is the number of COVID-19 patients currently hospitalized (dark blue), and of those hospitalized who are in the ICU (green) and are using ventilators (light blue). The grey bar represents the number of patients per reporting hospital, a rate that can help us better interpret changes in COVID-19 hospitalizations (as not all hospitals report each day).

The trends in both the number of COVID-19 inpatients and the number of patients per reporting hospital have increased since May. The total number of COVID-19 positive patients hospitalized across TN on October 15th was **1,150**. There are 342 COVID-19 patients currently in the ICU and 154 utilizing ventilators. The number of admitted patients per hospital reporting was 10.6 (with 109 hospitals reporting).



Hospital Utilization and Confirmed COVID Hospitalizations in TN[13]



This visual illustrates the total number of hospital beds (adult floor beds) occupied by non-COVID-19 (light blue) and confirmed COVID-19 patients (darker blue) since May 1st, 2020.

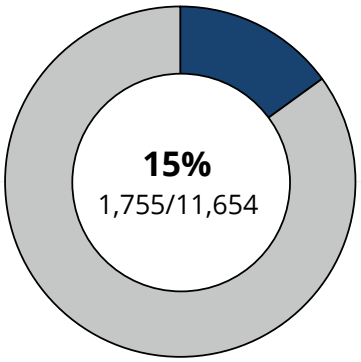
Additionally, please note the following:

- Hospital utilization dipped significantly in TN from mid-March, through April. Through the month of May hospital utilization increased statewide, but primarily due to the resumption of elective procedures, not an increase in COVID positive hospitalizations. The number of COVID-19 hospitalizations in Tennessee was roughly the same on June 1st (296) as it was on May 1st (295). Recently, an increase in admitted COVID-19 positive patients has been seen across the state.

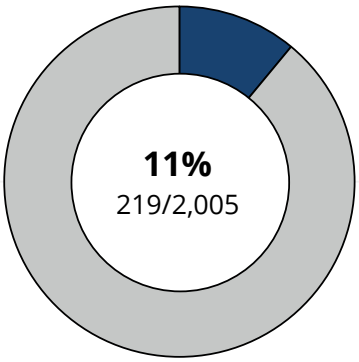
- On October 15th, 2020, 11.5% (1,150/9,958) of all hospitalized patients in Tennessee are COVID-19 patients.

Quick Glance at Hospital Bed & Ventilator Availability[13]

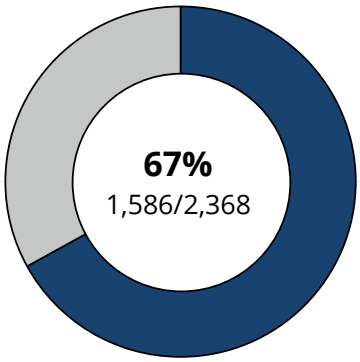
Below is a brief snapshot of the currently available floor beds, ICU beds and ventilators across TN.



Available Adult Floor Beds



Available Adult ICU Beds



Available Adult Ventilators

Technical Notes

1. Epidemic Curve for COVID-19 Cases by Specimen Collection Date (page 2)

The visualization on page 2 shows the daily new COVID-19 cases (blue bars) and 4-day moving average of new cases (red line). A four day moving average is the average of one data point and the three preceding data points. Looking at the moving average helps to understand trends and account for fluctuations in the data.

Are probable cases included in the Epidemic Curve?
Probable cases are included in the epidemic curve in this report. For the probable cases where specimen collection date is not available, the date the patient's illness or symptoms began is used.

Can I recreate this with TDH publicly available data?
Not exactly. The public downloadable datasets (Daily Case Information) present COVID-19 case counts based on the day they were publicly reported, not specimen collection date. However, using the column New_Cases one can create a similar visualization. The primary difference between the visualization using the public dataset method and the one in this report would be that the trends seen in this report should align with trends seen roughly 2-5 days later in the public dataset visualization. Again, this would be because of the 2-5 day lag between specimen collection date and public report date.

2. Statewide Number and Rate of Active Cases (page 3)

The visualization on page 3 shows the number (light blue bars) and rate (dark blue line) of active cases each day in TN.

How does TDH count recovered COVID-19 Cases?
The number of active COVID-19 cases are determined by: total number of cases - inactive/recovered cases. TDH considers a case "inactive/recovered" when: 1) they are at least 14 days beyond their symptom onset date, or are at least 14 days beyond the first test confirming illness if asymptomatic, and 2) are not deceased.

How is the rate of active cases calculated?
The active rate is the total number of individuals who actively have COVID-19 in TN divided by the state population, see example calculation and interpretation below. The population of the state is from the 2018 projected population estimate for Tennessee.

$$\text{Rate of Active Cases: } \frac{(\text{\# of Active Cases})}{(\text{TN Population})} \times 100{,}000 \quad \textbf{\textit{OR}} \quad \frac{(11{,}455)}{(6{,}698{,}359)} \times 100{,}000 = \begin{array}{c}171.0 \text{ per} \\ 100{,}000 \text{ persons}\end{array}$$

To interpret the example, on June 22nd, 2020, there were 11,455 active cases of COVID-19 in TN. The rate of active cases was 171.0 per 100,000 persons, meaning out of every 100,000 Tennesseans 171 of those individuals are currently sick with COVID-19.

Can I recreate this with TDH publicly available data?
Yes. Using the public downloadable datasets (Daily Case Information) you can use the column Total_Active to get the daily number of active cases and the instructions above to calculate the rate. If you want to understand how TDH calculates "Total Active" you can calculate it yourself by subtracting the number of recovered cases (Total_Recovered) and the number of cases who have died (Total_Deaths) from the total number of cases (Total_Cases).

3. Daily Percent of Positive COVID-19 tests (page 3)

The visualization on page 3 shows the daily positivity rate (blue line) as well as two thresholds that indicate if the positivity rate was above either 5% or 10%.

How is the daily percent of positive tests calculated?
The daily percent of positive tests is calculated by taking the number of new positive tests for that day divided by the total number of new tests for that day. These numbers are publicly available in the downloadable data- Daily Case Info. While the number

of new tests conducted that day can be found in the column New_Tests, the new positive number of tests can be calculated by subtracting yesterdays total Pos_Tests from today's total Pos_Test.

Can I recreate this with TDH publicly available data?
Yes. Using the public downloadable datasets (Daily Case Information) and the instructions above one is able to recreate the visualization.

4. Number of Cases per 100,000 Persons by Zipcode (page 4)

The zipcode level map on page 4 presents the number of cases per 10,000 persons across TN. This map can also be found on the TDH webpage under the tab "Maps by Zipcode" here.

How are the number of cases per 100,000 persons by zipcode calculated?
These rates are calculated by the taking the total number of cases for the zipcode divided by the zipcode's population. This is then multipled by 100,000. To interpret the map for the darkest zipcodes, for every 100,000 individuals living in the zipcode 41 or more people have been a COVID-19 case.

Why is the rate by zipcode shown and not the counts?
This map shows the rate of zipcodes, not the counts. A rate is used instead of a count because it allows us to compare the number of COVID-19 cases between different populations. By taking population into the equation, we can more accuaretly compare highly populated zipcodes to less populated zipcodes.

Can I recreate this with TDH publicly available data?
No, zipcode level data is not publicly available.

5. Growth in COVID-19 Cases Across TN (page 4)

The visualization on page 4 shows the average daily change for the total number of cases in TN (grey bars) and the general trend of the average daily change for the previous 4 days (red line). This metric was created to better understand growth in new cases and aligns with the growth rate reported by the New York Times (see article here).

How is the average daily change in total number of cases calculated?
The average daily change in total number of cases is calculated by finding the difference in the total number of cases between today and yesterday (essentially new cases) and dividing by the yesterday's total cases. This is then multiplied by 100 to be visualized as a percent.

Can I recreate this with TDH publicly available data?
Yes. The numbers required to create the calculation explained above are publicly available in the Daily Case Information dataset using the fields Total_Cases and New_Cases.

6. Positive Tests per 100,000 Persons by Public Health Region (Over the last 7 Days) (page 5)

The regional level map shows the number of new positive tests per 100,000 persons by public health region in the last 7 days. The arrows indicate trends (up or down) of the new positive tests rate compared to the week prior.

How is the number of positive tests per 100,000 persons calculated in the map?
These rates are calculated by the taking the number of new positive tests for the region divided by the region's population. This is then multiplied by 100,000 to have the number per 100,000 persons.

Are the number of cases the same as the number of positive tests?
No, not necessarily. The number of positive tests is the total number of PCR-positive laboratory results that have been reported to TDH, while the number of cases are individual people who are either confirmed or probable COVID-19 cases. Individuals are

only counted once in this number, no matter how many positive tests they might have had. Therefore, if an individual tested positive multiple times in a given week in the same area they would be counted multiple times in this map (but would only be counted once in the case counts)

Can I recreate this with TDH publicly available data?
Yes. The numbers required to create the calculation explained above are publicly available in the County New dataset but only at the county level. In order to recreate this visualization one will need to group the counties (and county populations) by their public health region (can be found here).

7. 7 Day Running Average of New Cases in Metropolitan and Rural Public Health Regions (see page 5)

The visualizations on page 5 show the 7 day running average of new COVID-19 cases for all of the metropolitan and rural public health regions. These new case counts are based on their public report date and not specimen collection date. A 7 day moving average is the average of one data point and the six preceding data points. Looking at the moving average helps to understand trends and account for fluctuations in the data.

Can I recreate this with TDH publicly available data?
Yes, using the downloadable dataset- County New and the column New_Case, one is able to see the daily counts at the county level. These counts can added together to create the daily new case counts for each public health region. The 7 day average of new cases can be then calculated by totaling the daily new case counts (by region) for today and the previous 6 days and then dividing by 7.

8. COVID-19 Cluster Associated Cases Compared to Community Cases (page 6)

The visualizations on page 6 show the daily number of new cases separated by if they were a part of community transmission or associated with a cluster.

What the definition of a COVID-19 Cluster?
A COVID-19 cluster is two (2) or more confirmed cases (with positive lab results) of COVID-19 that are linked by the same location of exposure (for example a hospital, nursing home, grocery store, corrections facility, etc.) or exposure event (for example a work party, vacation, etc.) that is not a household exposure. In TN, the most commonly reported clusters have been in corrections facilities and nursing homes.

Can I recreate this with TDH publicly available data?
No, cluster information is not publicly available.

9. Number of Deaths per Day (by date of death) (page 6)

The visualizations on page 6 show the number of COVID-19 deaths by date of death (blue bars) and the 4-day moving average of the number of deaths. A four day moving average is the average of one data point and the three preceding data points. Looking at the moving average helps to understand trends and account for fluctuations in the data.

What is a probable death?
A probable COVID-19 death is if a person dies and the health care provider that signed their death certificate determined that COVID-19 disease was their cause of death or a significant condition contributing to death, then the person meets the probable case criteria and would be considered a probable death.

Is date of the death the same day it is publicly reported?
No, similarly to specimen collection date, the date of death frequently occurs 2-5 days before the death is reported to the public due to lag time in reporting. Therefore, the most recent day's data may not be complete.

How can I calculate the Case Fatality Rate? What about the 30-Day Case Fatality Rate?
A case fatality rate is calculated by taking the total number of COVID-19 deaths divided by the total number of COVID-19 cases.

A 30-day case fatality rate would only look at the total number of deaths and number of cases for the last 30 days. Both of these rates can be produced using the publicly downloadable datasets (Daily Case Information).

Can I recreate this with TDH publicly available data?
Not exactly. The public downloadable datasets-Daily Case Information presents COVID-19 deaths based on the day they were publicly reported, not the date of death. However, using the New_Deaths column one can create a similar visualization. The primary difference between the visualization using the public dataset method and the one in this report would be the trends seen in this report should align with trends seen roughly 2-5 days later with the public dataset visualization. Again, this would be because of the 2-5 day lag between date of death and public report date.

10. Syndromic Surveillance (Emergency Room) Data (page 7)

The visualizations on page 7 shows the percent of all emergency room visits in that are reporting both Cornavirus like Illness (CLI) and Influenza like Illness (ILI) in TN. This dashboard can also be found online here.

Can I recreate this with TDH publicly available data?
Yes and no. While ESSENCE data is not included in the publicly available datasets, the dashboard above does provide the weekly percent of ILI and CLI symptoms in the tool tips. Therefore, one could recreate the visualization if desired.

11. Lab Testing & Turnaround Time (page 8)

The visualization on page 8 shows the volume of COVID-19 lab testing and average turnaround time for the months of March, April, May, June and July (so far) in 2020.

Can I recreate this with TDH publicly available data?
Yes and no, while lab turnaround time is not publicly reported, the lab testing volume can determined using the New_Tests column of the Daily Case Information public dataset.

12. Number of Completed Tests per 100 Persons by Zip Code (page 8)

The map on page 8 shows the number of completed tests per 100 persons by zipcode, indicating areas of low and high amounts of testing across TN.

How is the number of completed tests per 100 persons calculated in the map?
These rates are calculated by the taking the total number of completed test for the zipcode divided by the zipcode's population. This is then multipled by 100 persons. To interpret the map for the darkest zipcodes, for every 100 individuals living in the zipcode 8.76 or more people have been tested for COVID-19.

What if someone is tested more than once?
If someone is tested for COVID-19 more than once, they will be counted the number of times they are tested.

Can I recreate this with TDH publicly available data?
No, zipcode level testing data is not publicly available.

13. HRTS-Reported Hospitalizations & Bed Capacity (page 9)

The visualizations see on pages 9 and 10 shows TN's hospital capacity through active hospitalizations, current bed utilization, and bed availability.

Can I recreate this with TDH publicly available data?
No, HRTS data is not publically available.