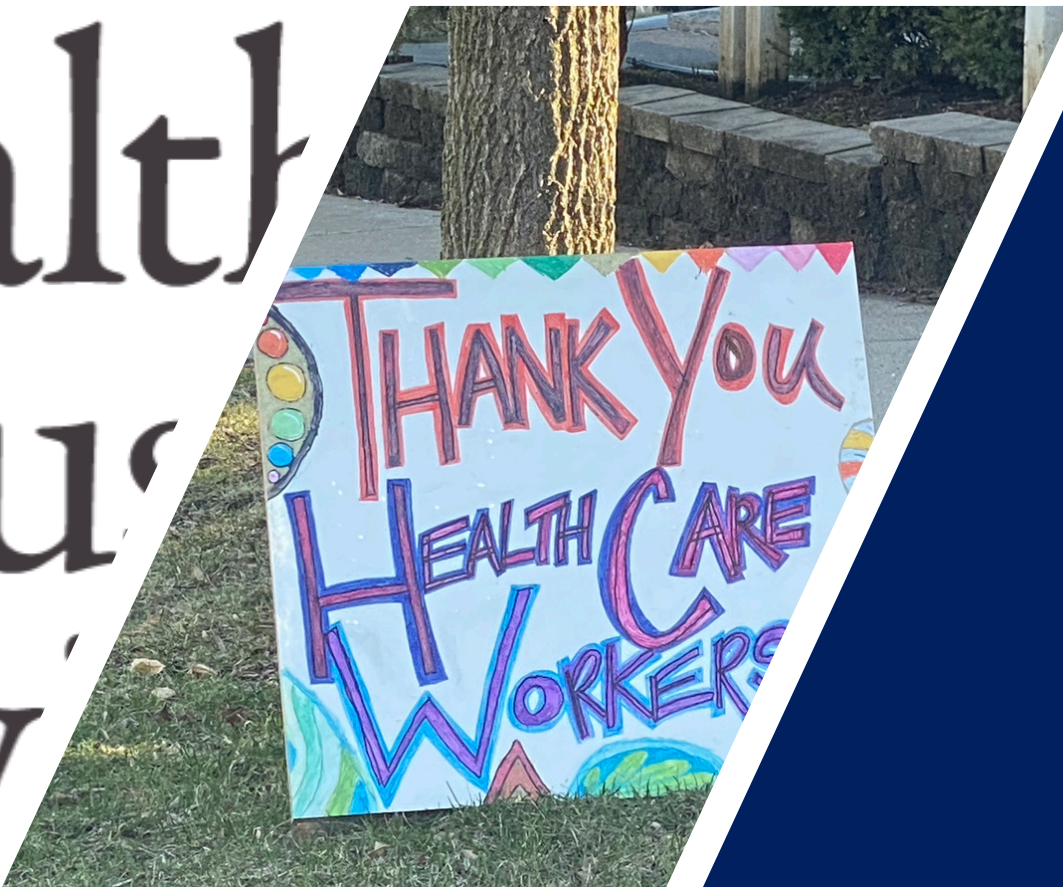




Health
Industry
Adv



Issue # 185

Tuesday, October 13, 2020

COVID-19 Report

Highlights

- **Johnson & Johnson announced a pause in its Phase 3 clinical trial, due to an unexpected illness in one of its study participants**
 - **JNJ joins Astra-Zeneca (AZ), which previously paused its trial; AZ's trial has since resumed in the UK but, remains paused in the US**
 - Two other Phase 3 trials are preceding in the U.S: Pfizer and Moderna; Initial, interim results are anticipated sometime later this month
 - There are reports of significant reactions to the vaccine among some participants – high fever, soreness – lasting several days; these reports also indicate that these participants were not dissuaded by these reactions from taking the vaccine value
- Understanding testing results is an on-going challenge yet, these still provide useful insight in tracking the virus
 - Several states report different subsets of tests and testing populations, leading to marked differences in results. For example, for October 8, Florida reported:
 - Using the most-commonly referenced data, a test-positive rate of 12.4%; this rate (for Florida and several other states), however, only includes people taking the test for the first time
 - Including all viral tests, first-time and repeat, a test-positive rate of 8.1%
 - On its state Covid-19 website, it showed a test-positive rate of 4.1%; this rate only includes residents
 - Despite these challenges, **we find value in understanding trends and correlations with other variables:**
 - **Test-positive rates tend to be highly correlated with rates of new infections per capita.**
 - Test volume alone is insufficient to assess the adequacy of testing in measuring virus spread. **Mapping test volume with test-positive % provides a stronger indication of testing adequacy**
- A great deal of attention is given to the rate of fatalities with the SARS-CoV-2 virus. There are at least 3 measures to consider (1 of which is worthless but, unfortunately cited frequently):
 - Case death rates - most often quoted but worthless. This calculates deaths per detected case. Currently about 2.8%. Worthless, as detected cases are only a fraction of total infections. Some people misuse this to make the claim of how deadly the virus is.
 - Infection fatality rates - a much, much better depiction of the deadliness of the virus. The challenge here is estimating the undetected infections. To my knowledge, only Youyang Gu and Oliver Wyman do these with any credibility. **From their estimates, the infection fatality rate in the U.S. is 0.3-0.7%**
 - Deaths per capita. In the end, the best measure, as it accounts for both how deadly the virus is and its virility (how many people are infected). The challenge with this measure, it doesn't tell us anything in the middle of a pandemic, as it's continually increasing.
- Wrapping up with inpatient hospitalizations with a Covid-19 infection
 - **Inpatient days have been increasing for the past several weeks, after having declined for nearly two months**
 - **To date, the increased in inpatient days has recaptured 20% of the reduction in these days that occurred from late-July to mid-September**
 - Texas has experienced the largest week-over-week increase in inpatient days; the current census, however, is only 30% of where it peaked earlier in the pandemic
 - Ohio is 2nd in week-over-week increase in inpatient days and is at <60% of peak; New York is 3rd and is at 3%; Michigan is 4th and is at 17%
 - **States that are of concern (i.e. experiencing significant increases and are at or near peak): Wisconsin, North Dakota, Oklahoma, Arkansas and Montana**

As of yesterday, there were at least 151 potential vaccines in the pipeline:

- 92 under active investigation in animals
- 43 in safety trials
- 11 in large-scale efficacy tests
- 5 approved for limited use (none in the U.S.)

Pre-Clinical –
Vaccines not yet in clinical trial

92

Phase I –
Vaccines testing safety and dosage

29

Phase II –
Vaccines in expanded safety trials

14

Phase III –
Vaccines in large-scale efficacy tests

11

Limited –
Vaccine approved for limited use

5

Full –
Vaccine approved for full use

0

* - Source: "Coronavirus Vaccine Tracker", New York Times, Updated October 12, 2020
<https://www.nytimes.com/interactive/2020/science/coronavirus-vaccine-tracker.html>

There are now four Phase III clinical trials of a COVID-19 vaccine underway in the United States. JNJ is now the largest

Pfizer, JNJ and Moderna are targeting a 60% “efficacy” (i.e., reduction in infection risk); Astra-Zeneca is targeting 50% (WHO standard: 50%)

All four have established a threshold of a 30% risk reduction (95% confidence interval; consistent with FDA guidance)

Interim checkpoints are used to judge whether sufficient evidence (“events”, infections) is available to end a trial early. Astra-Zeneca has established a single interim checkpoint; Moderna, 2; and Pfizer, 4

COVID-19 Phase III Clinical Trial Protocols - United States

	Pfizer	Moderna	AstraZeneca	JNJ
Sample Size	44,000	30,000	30,000	60,000
Participants getting vaccine	15,000	15,000	20,000	30,000
Type of vaccine	mRNA	mRNA	Adeno v	Adeno v
Efficacy target	60%	60%	50%	60%
Lower 95% CI efficacy	30%	30%	30%	30%
Number of events at completion	164	151	150	154
Number of interim analyses	4	2	1	N/A
Number of events 1st look	32	53	75	20
Number of shots	2	2	2	1
Deep freezing required	Yes	Yes	Yes	No

Table: Eric Topol, MD • Created with Datawrapper

Interpretation: Pfizer’s “first look”, can occur after 32 infections among its participants. Using the FDA’s proposed evaluation criteria, the trial may be considered successful, if there is at least a 50% lower infection rate among participants receiving the vaccine versus those receiving the placebo. At that point, the company could apply for Emergency Use Authorization (EUA)

Pfizer’s trial would be complete after 164 infections among its participants. The trial may be considered successful, if there is at least a 30% lower infection rate among participants receiving the vaccine versus those receiving the placebo. At that point, the company could apply for full approval

The Netherlands and Russia have experienced extended periods of rising infections rates per capita, followed by Israel and Germany

This rate has risen for five consecutive days in the United States

Consecutive Days of Increases in Newly Detected Cases Per Capita

7-Day Moving Average, As of October 12

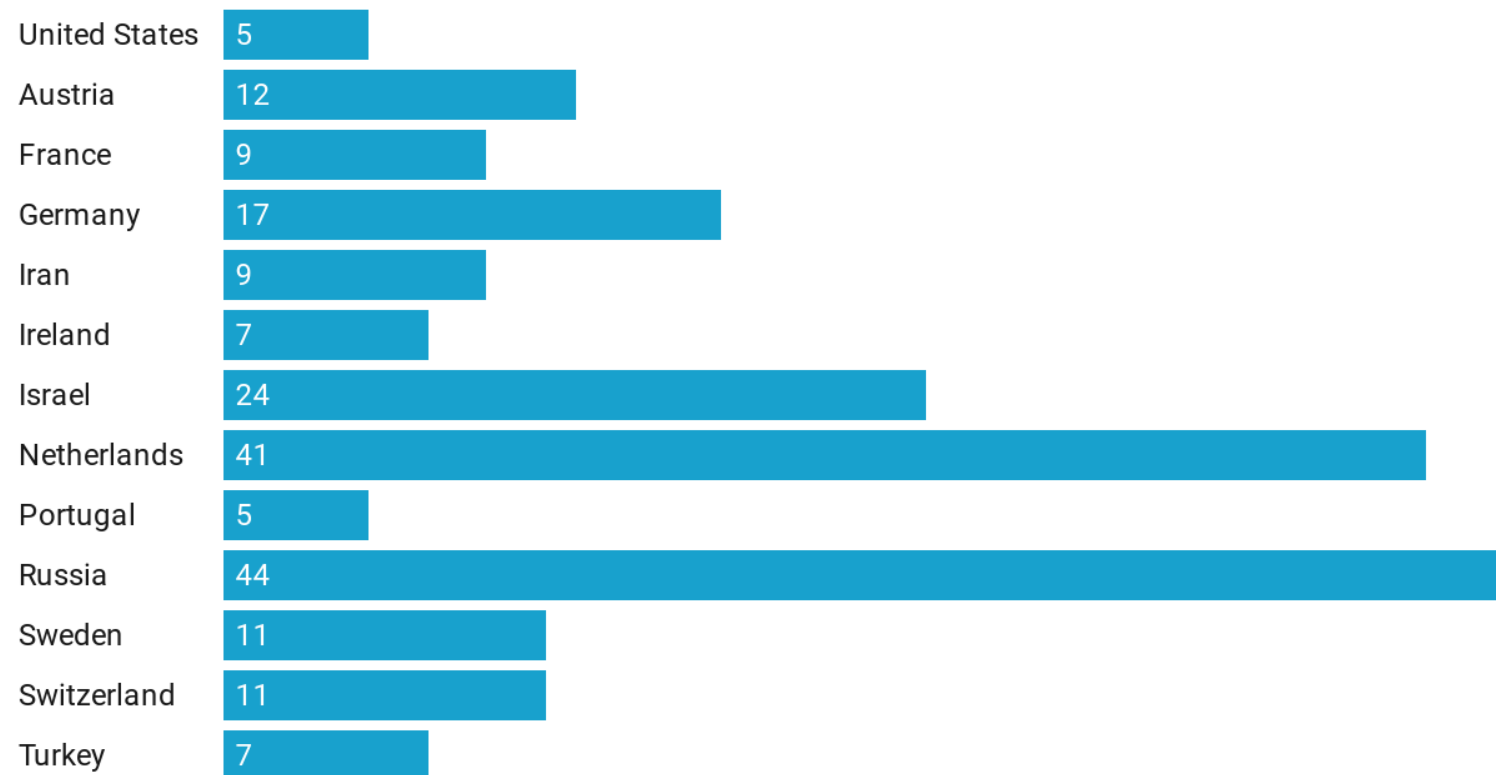


Chart: Health Industry Advisor LLC • Source: Worldometers.info • Created with Datawrapper

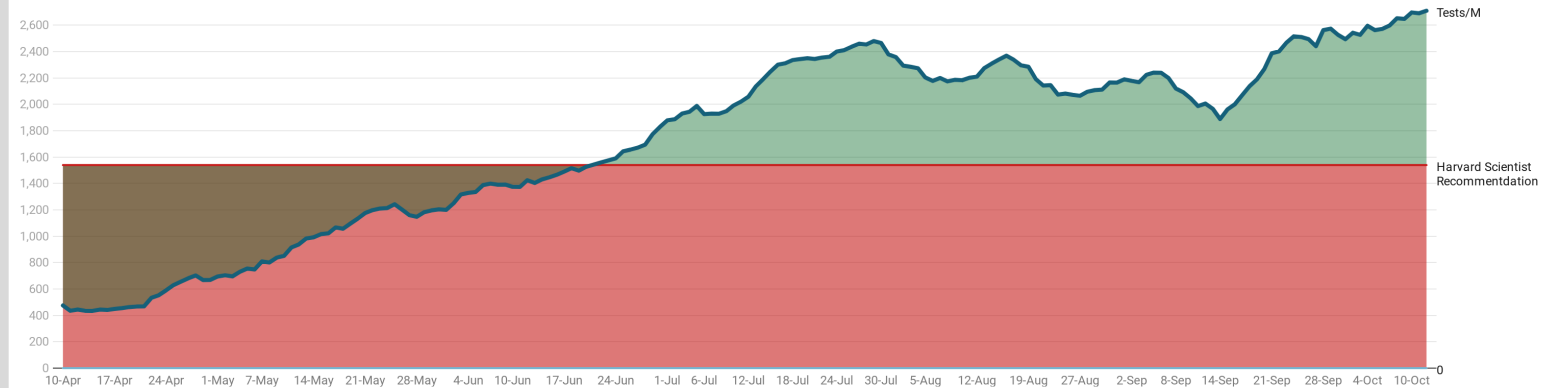
The 7-day average testing volume set a record high yesterday

Test volume yesterday was the 5th highest of any day; 5 of the 6 highest volume days have been posted in October

The 7-day test-positive rate increased yesterday, even though the daily rate was under 5%

Daily Tests Per 1 Million - United States

Trailing 7-Day Moving Average, As of October 12

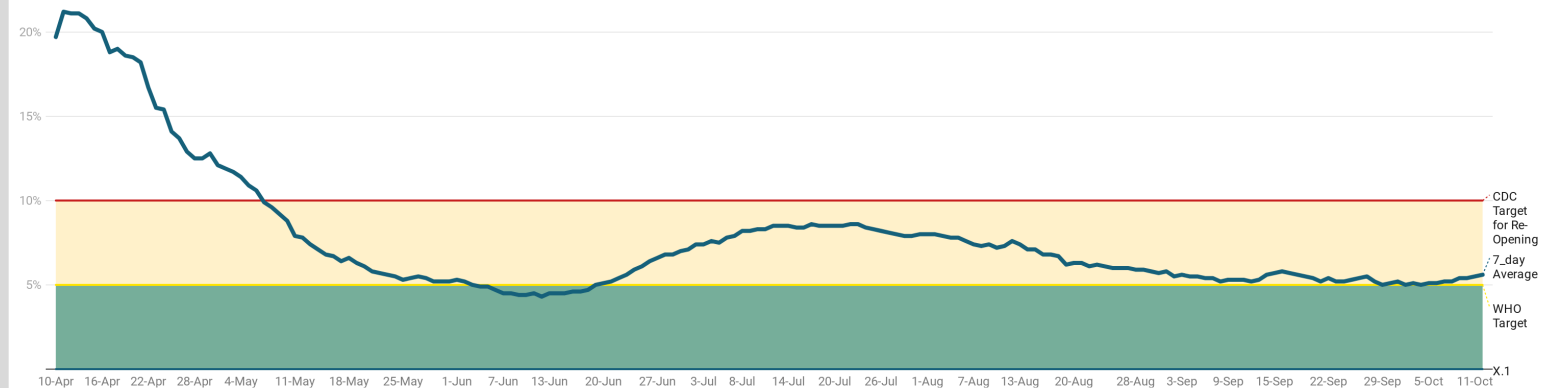


Health Industry Advisor LLC analysis

Chart: Health Industry Advisor LLC • Source: The Atlantic's Covid Tracking Project • Created with Datawrapper

Test-Positive Rate - United States

Trailing 7-Day Moving Average, As of October 12



Health Industry Advisor LLC analysis

Chart: Health Industry Advisor LLC • Source: The Atlantic's Covid Tracking Project • Created with Datawrapper

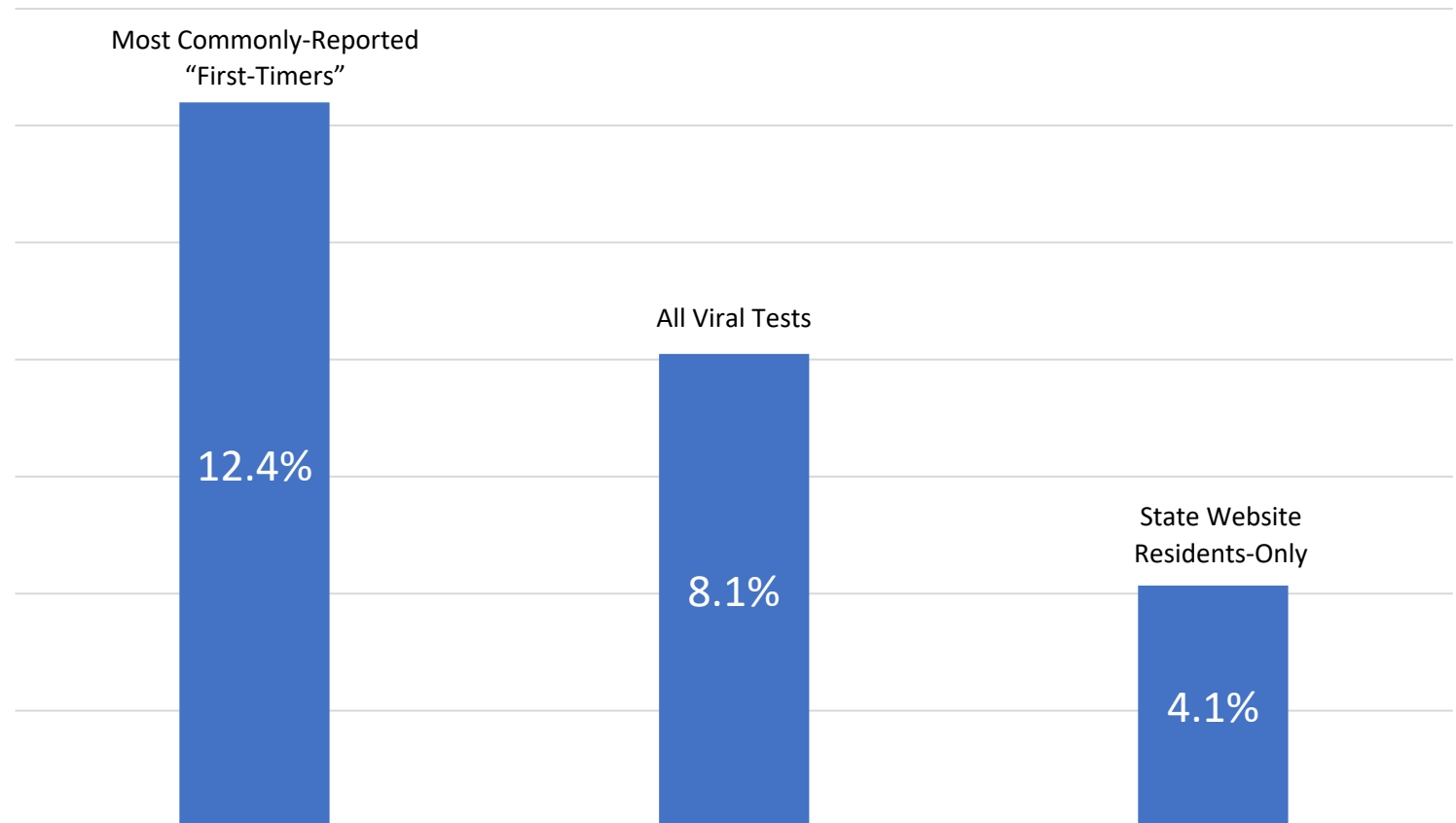
There are several ways in which testing results are reported, as illustrated in this chart

The column on the left represents the data most commonly-referenced by external sources. In several states however, including Florida, these data encompass first-time testers only

The second column – from the same source, but largely ignored due to its difficulty to capture consistently – represents all viral tests (first and repeat)

The third column is what the state reports on its website; it reflects results from testing residents-only

Florida Test-Positive % October 8, 2020

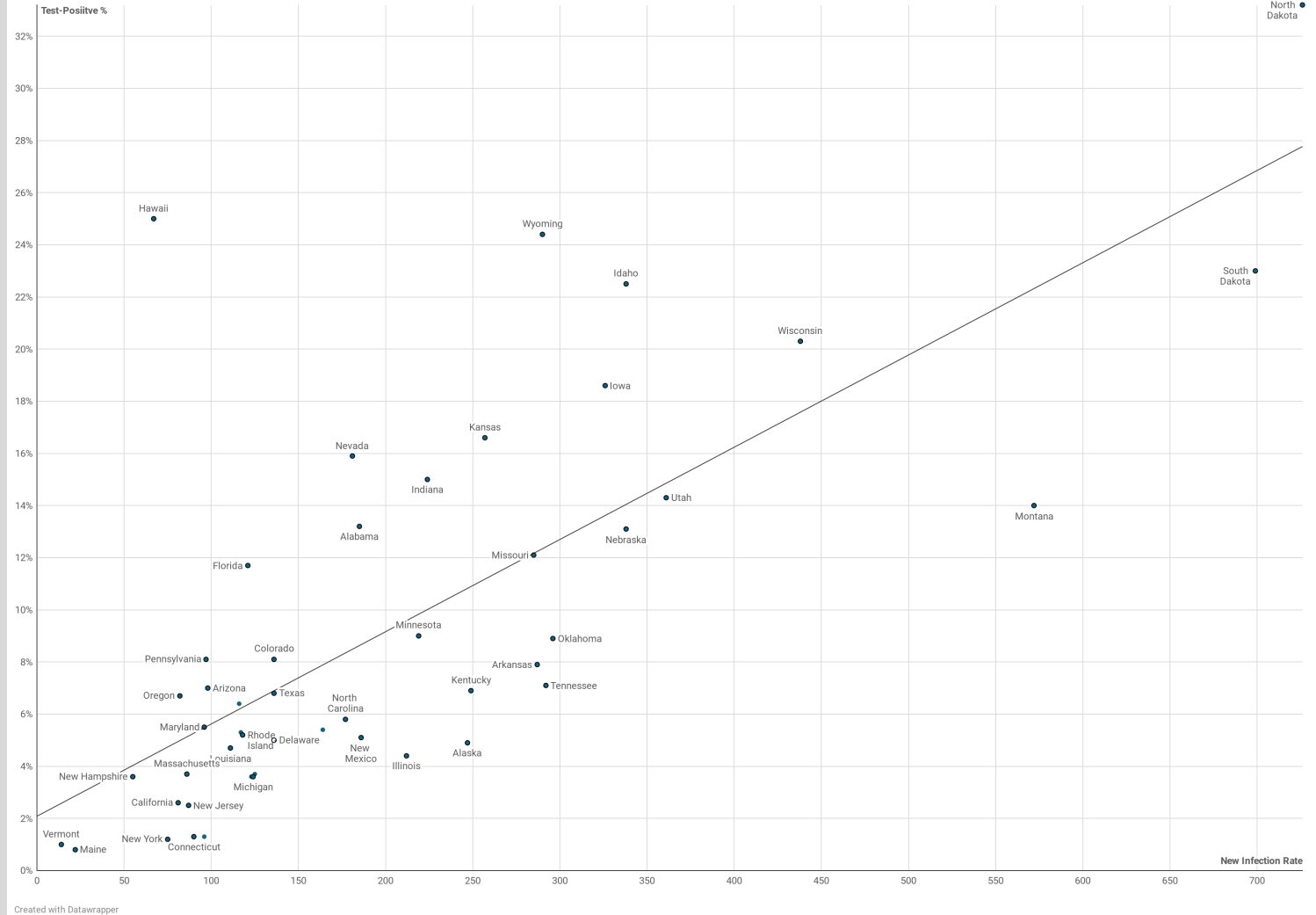


Despite the myriad issues with testing data, test-positive rates appear to be highly correlated with detected infection rates

For example, state with high test-positive rates also tend to have high newly detected case rates – indicating are indicative of infection spread

New Infection Per Capita v. Test-Positive %

7-Day Moving Averages, As of October 11



The appropriate testing level depends on the test-positive results, not simply the volume per capita

For example, Montana performed 2.9x as many tests per capita in the last seven days than Vermont. Based on each state's test-positive results, however, Vermont is conducting sufficient testing; Montana is not

In Montana's case, the high test-positive rate, even at high testing volume, suggests that the state may only be testing the more severe cases . . . And, not capturing a full view of its infection spread

Testing Volume v. Test-Positive %

7-Day Average, As of October 11

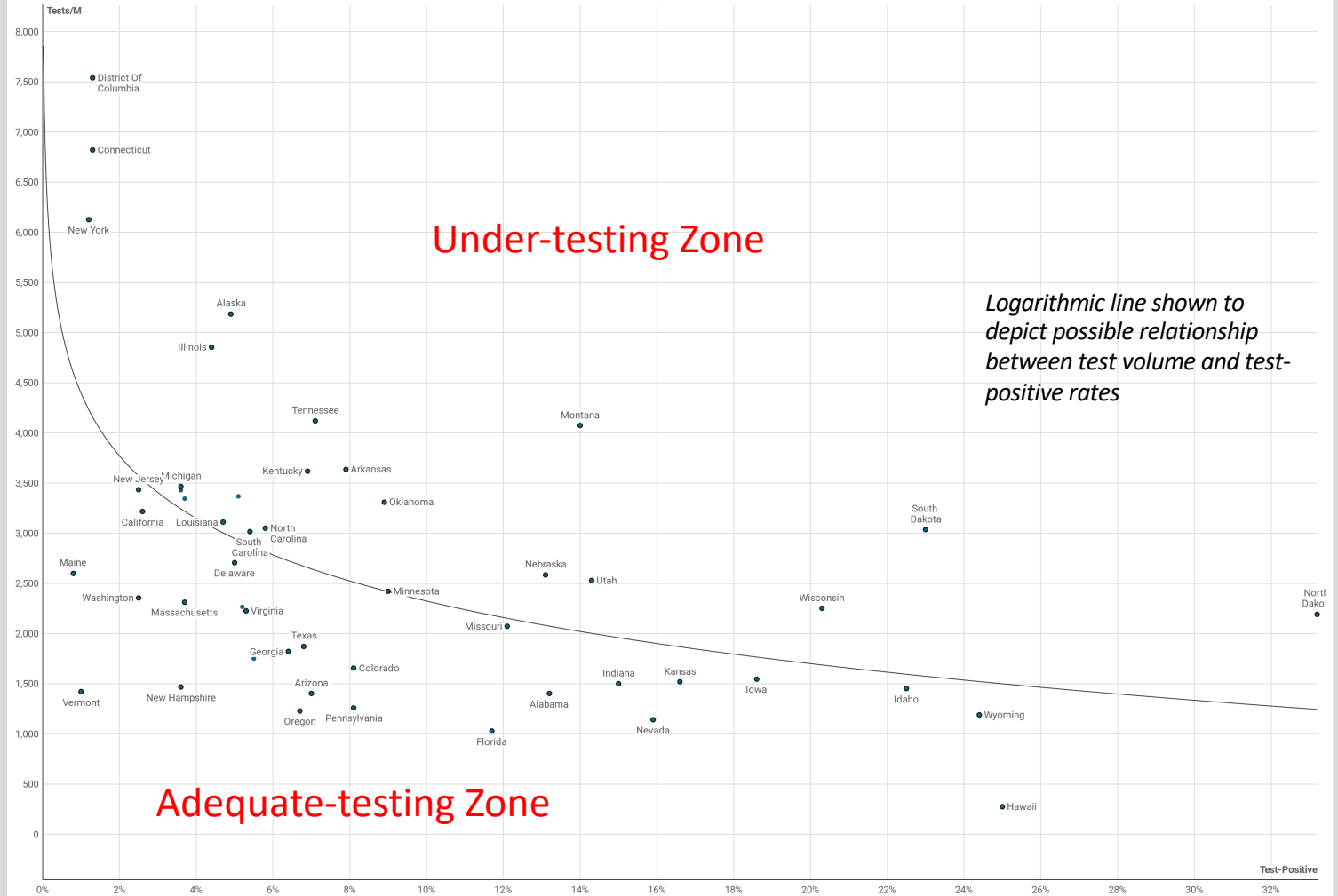


Chart: Health Industry Advisor LLC • Source: The Atlantic's Covid Tracking Project • Created with Datawrapper

There were more newly detected cases reported yesterday than on any Monday since August 10

Newly Detected Cases

Through October 12

Mondays Highlighted

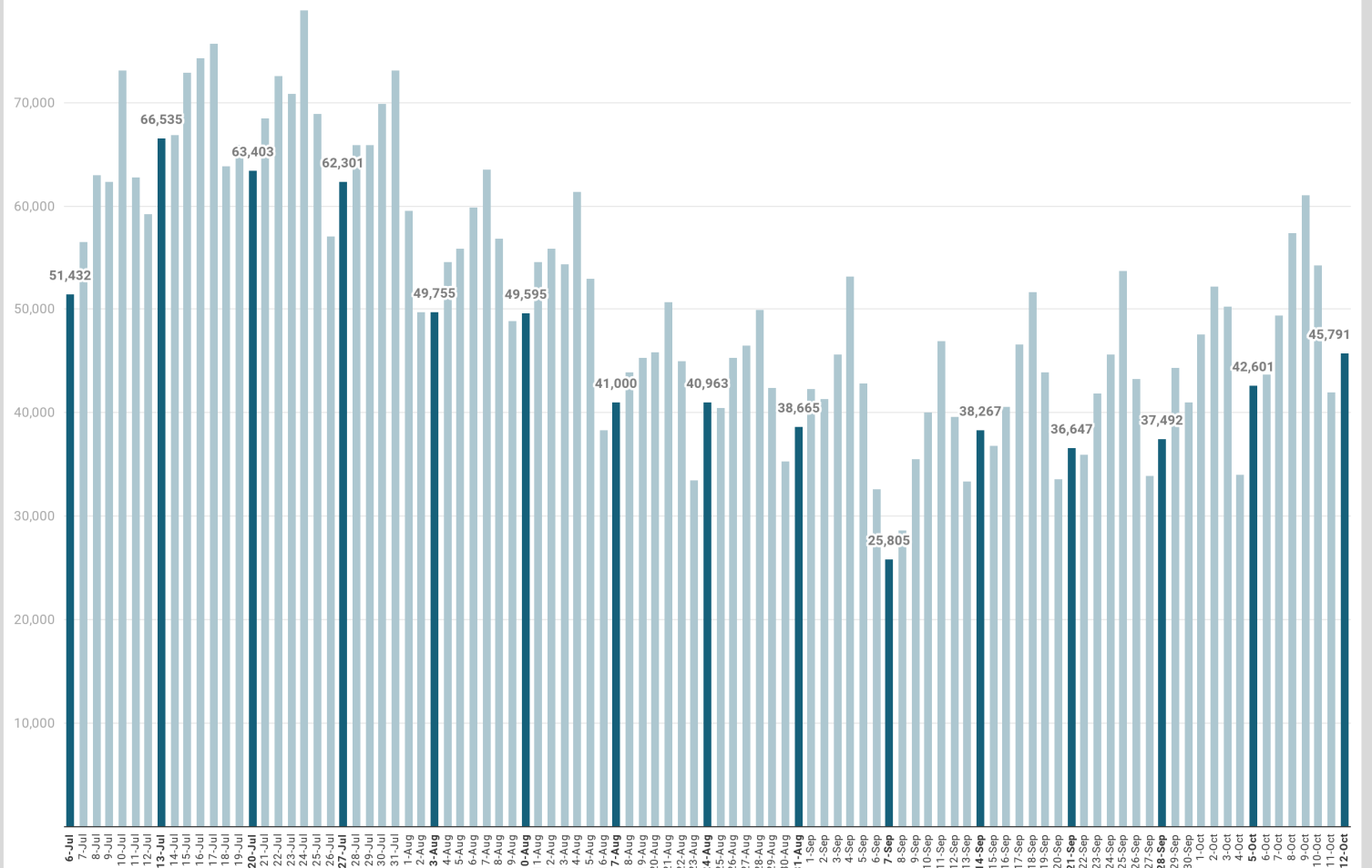


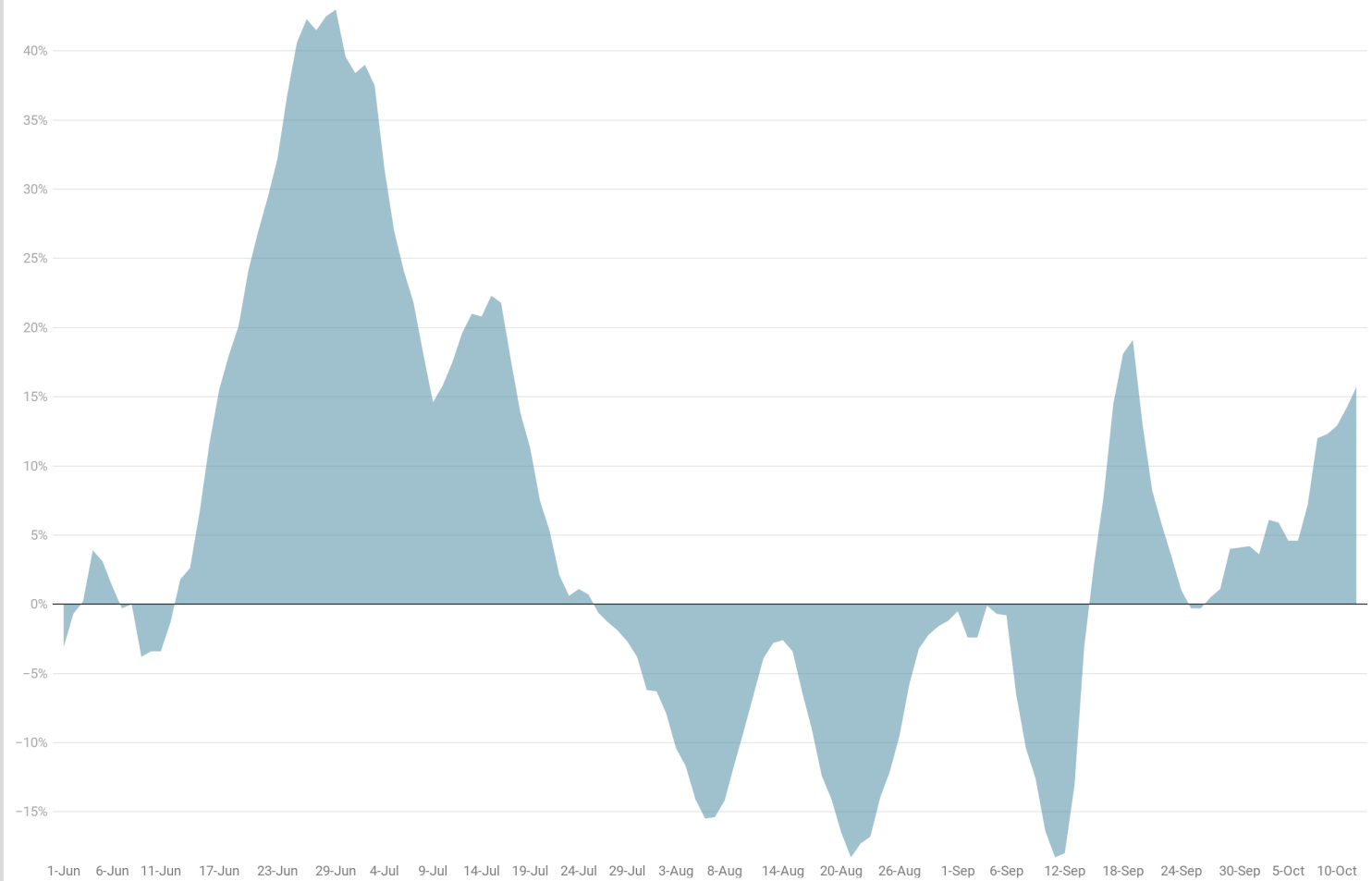
Chart: Health Industry Advisor LLC • Source: eorlometers.info • Created with Datawrapper

Following a seven-week period of decline, new cases began increasing on a week-over-week basis on September 15

Yesterday, this rate was up 15.7% on a week-over-week basis

Week-Over-Week Change In New Cases

Through October 12



Health Industry Advisor LLC analysis

Chart: Health Industry Advisor LLC • Source: worldometers.info • Created with Datawrapper

The rate of new infections per capita* in the U.S. is now trending upward

This rate is now back to where it was on August 17

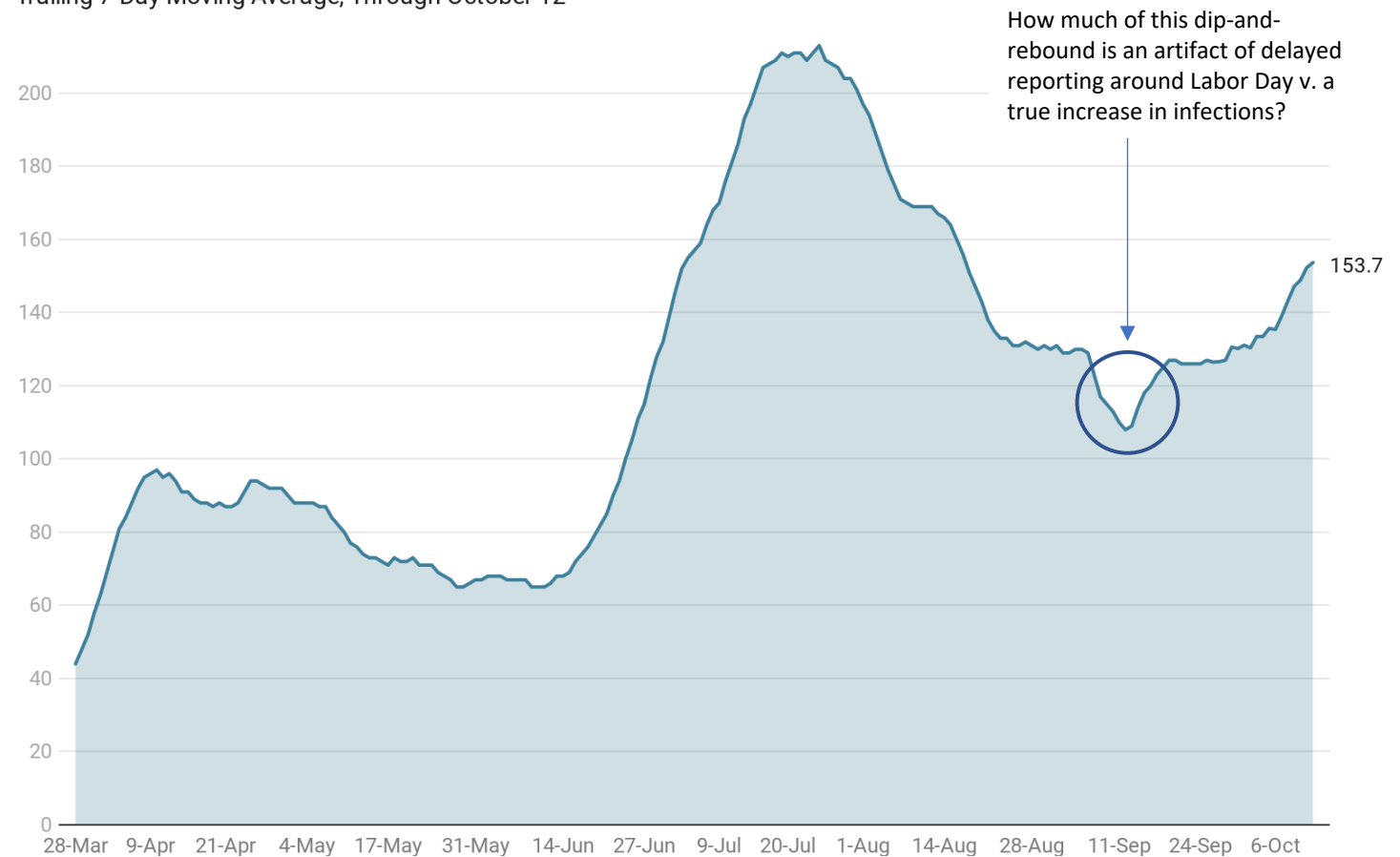
Idaho set a new high 7-day infection rate yesterday; its previous high was back on July 21

Illinois also set a new high; its previous high was recorded on May 30

* - 7-day moving average basis

New Infections Per 1 Million Population - United States

Trailing 7-Day Moving Average, Through October 12



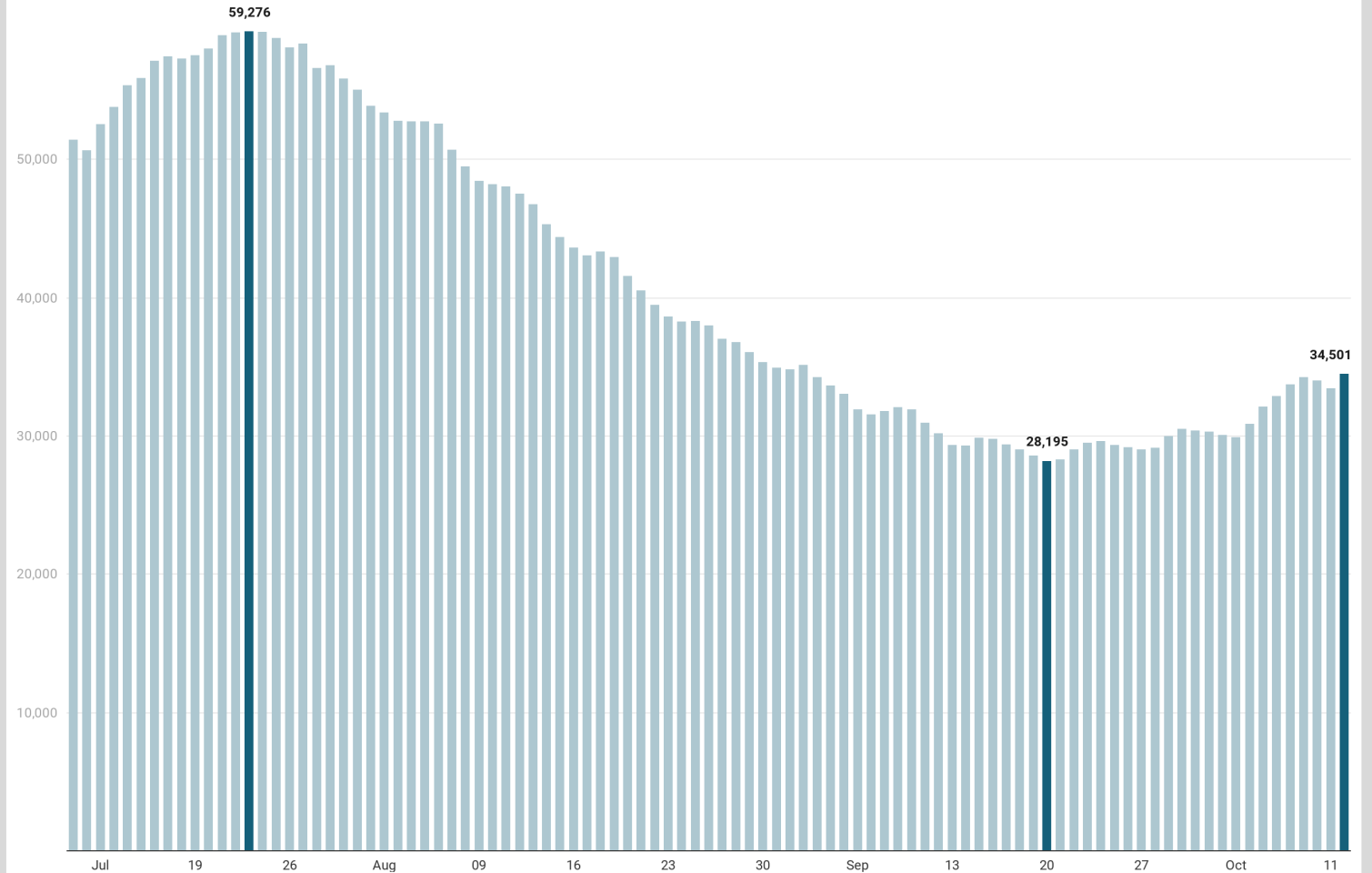
Health Industry Advisor LLC analysis

Chart: Health Industry Advisor LLC • Source: worldometers.info • Created with Datawrapper

Despite the recent rise in Covid-19 hospitalizations, the census has only regained 20% of the reduction in inpatient days from late-July to September 20

Hospital Census: COVID-19 Patients

As of October 12



Florida data first available on July 10

Chart: Health Industry Advisor LLC • Source: the Atlantic's Covid Tracking Project • Created with Datawrapper

Critical to understanding the rise in Covid-19 inpatients is comparing where the demand is relative to peak inpatient demand during the pandemic

Texas has experienced the largest increase in Covid-19 inpatient days over the past week yet, the current Covid-19 census is only 30% of its peak level in this state; Ohio, which is 2nd in increased days is at <60% of peak; New York, 3rd is at 3%; and Michigan, 4th is at 17%

States with significant increased inpatient days that are at or near peak: Wisconsin, North Dakota, Oklahoma, Arkansas and Montana

Week-Over-Week Change in Covid-19 Inpatient Days v. % of Peak in Inpatient Days Since Pandemic Start

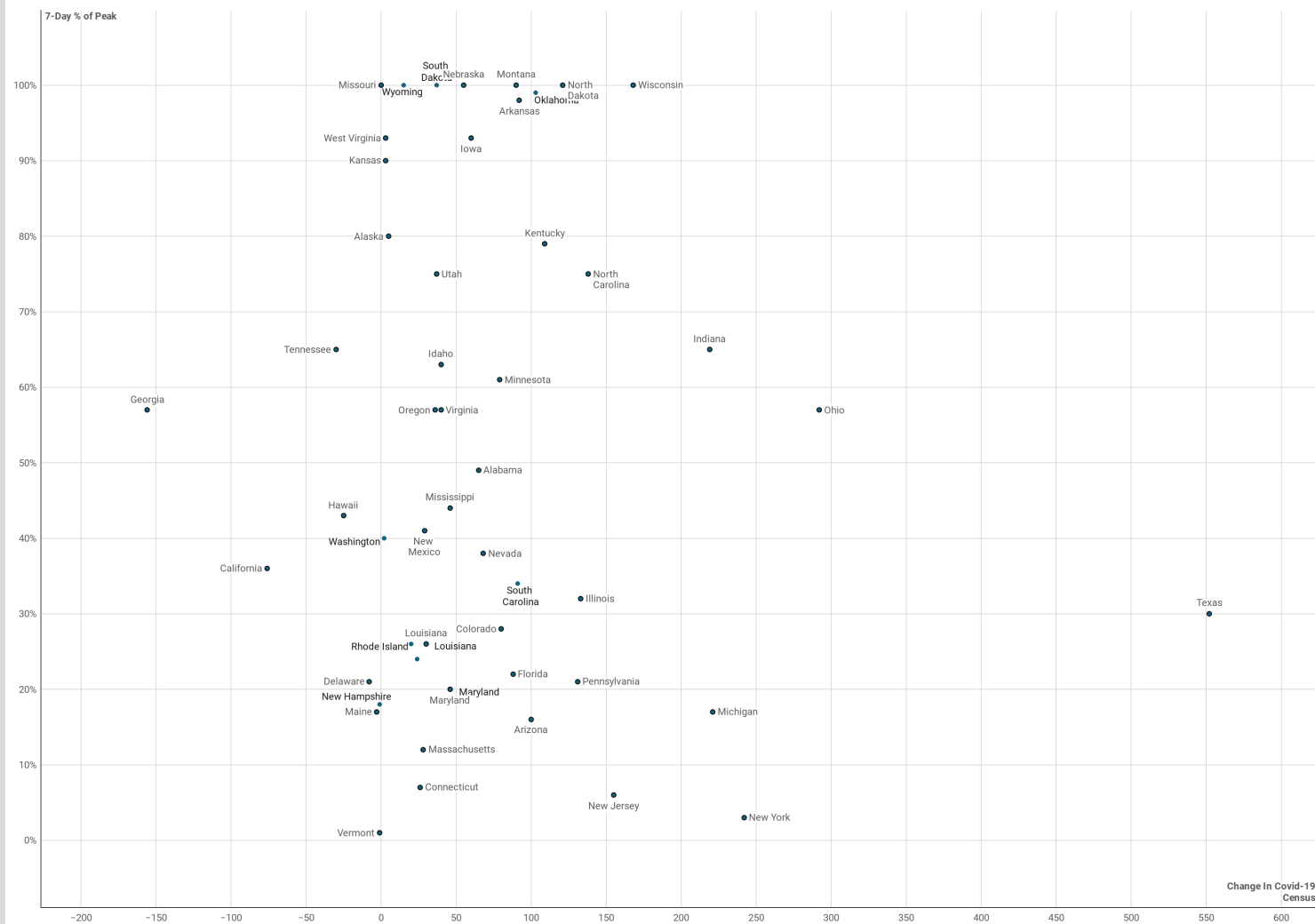


Chart: Health Industry Advisor LLC • Source: The Atlantic's Covid Tracking Project • Created with Datawrapper

The 7-day average deaths per day declined yesterday; this rate is lower than at any point since July 10

Deaths Reported With Coronavirus in the U.S.

Trailing 7-Day Moving Average, As of October 12



Health Industry Advisor LLC analysis

Chart: Health Industry Advisor LLC • Source: worldometers.info • Created with Datawrapper

Except for Labor Day,
there were fewer deaths
reported yesterday than
on any Monday since
March 23

Newly Reported Deaths

Through October 12

Mondays Highlighted

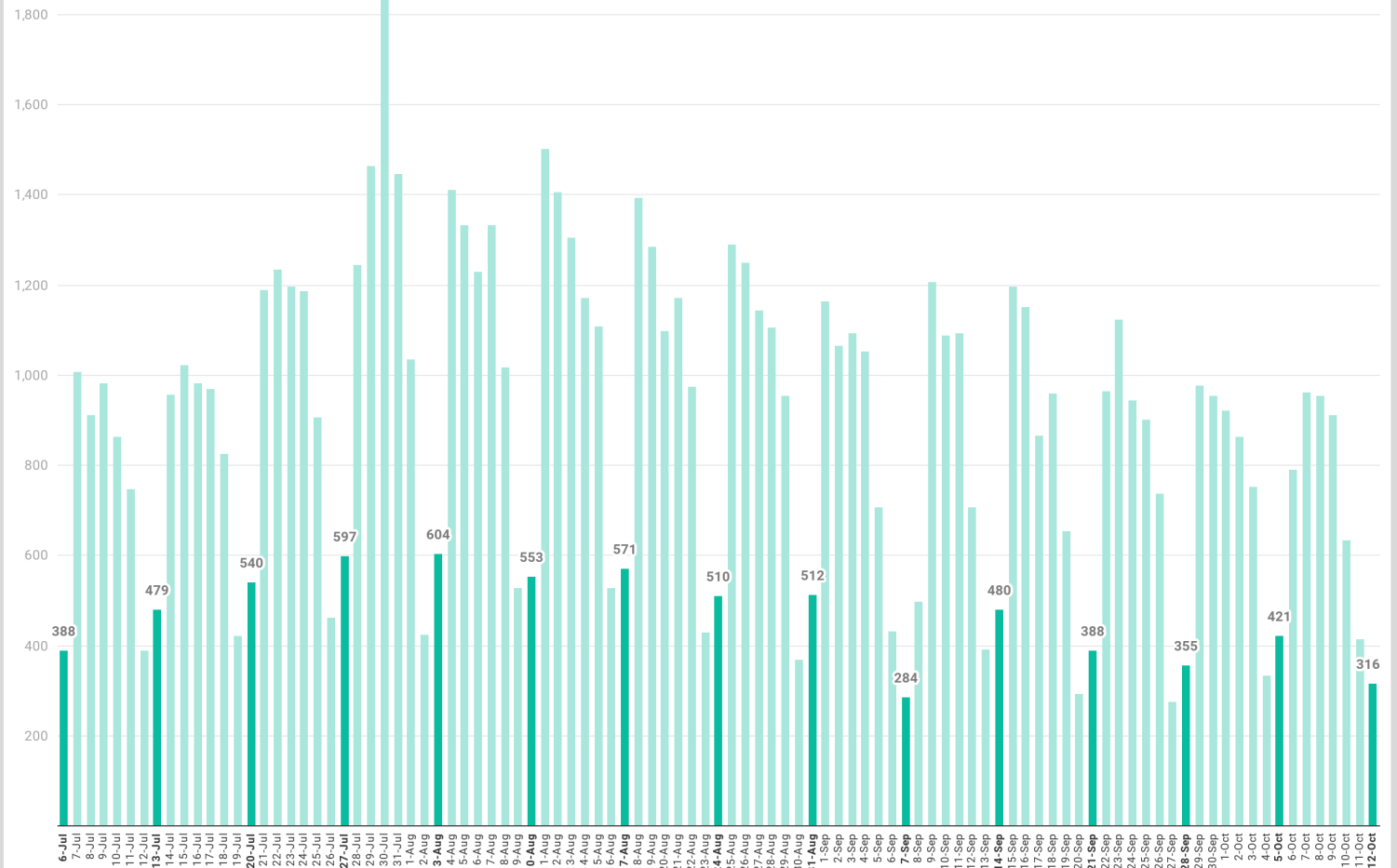


Chart: Health Industry Advisor LLC • Source: eorlometers.info • Created with Datawrapper

Since actual infections are significantly greater than reported cases, the case death rate overstates the actual fatality rate from SARS-CoV-2 infections

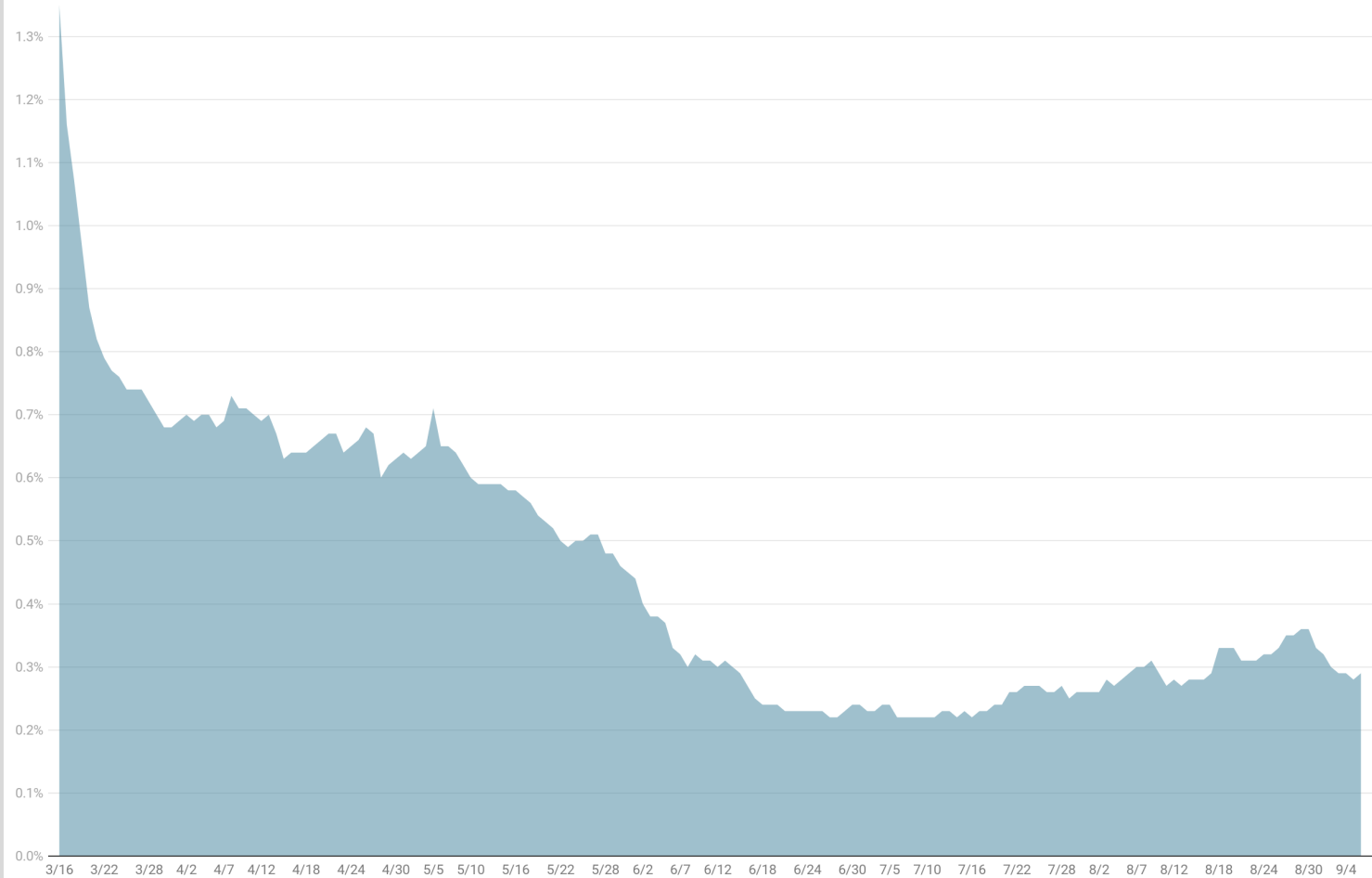
To address this, Youyang Gu* uses a machine-learning model to estimate true infections and the implied infection fatality rate (IIFR)

Gu pegged the 7-day moving average IIFR at 0.29%, as of early September (his latest estimate of this rate)

Source: [COVID-19 Projections Using Machine Learning](#)

Infection Fatality Rate

7-Day Moving Average



Last Updated: October 6

Chart: Health Industry Advisor LLC • Source: Youyang Gu • Created with Datawrapper

Reports of case fatality rates are grossly-overstated, due to the significant level of undetected cases

Two sources have made reasonable efforts to estimate actual infections – yet, even these have a wide disparity in their latest estimates

Still, these sources would place the cumulative infection fatality rate in the range of 0.3-0.7%

	Youyang Gu Model ¹	Oliver Wyman Model ²
Estimated Infections	53,104,843	30,754,505
Infection Fatality Rate (cumulative)	0.30%	0.70%

1 – [COVID-19 Projections Using Machine Learning](#), As of October 11

2 – [Covid-19 Pandemic Navigator](#), As of October 4

Data Sources

The following data sources are accessed on a daily or weekly basis:

- The Atlantic's Covid Tracking Project: <https://covidtracking.com>
- Worldometers.info: <https://www.worldometers.info/coronavirus/>
- Centers for Disease Control, National, Regional, and State Level Outpatient Illness and Viral Surveillance
<https://gis.cdc.gov/grasp/fluview/fluportaldashboard.html>
- Centers for Disease Control, COVID-19 Laboratory-Confirmed Hospitalizations
https://gis.cdc.gov/grasp/COVIDNet/COVID19_5.html
- Centers for Disease Control, COVID Data Tracker <https://www.cdc.gov/covid-data-tracker/index.html#mobility>
- Institute for Health Metrics and Evaluation, COVID-19 estimate downloads
<http://www.healthdata.org/covid/data-downloads>
- New York Times, Covid-19 data <https://github.com/nytimes/covid-19-data>
- COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University
<https://github.com/CSSEGISandData/COVID-19>
- COVID-19 Projections Using Machine Learning, <https://covid19-projections.com>