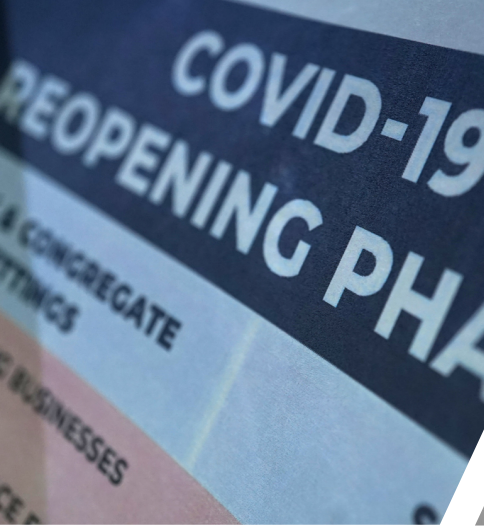

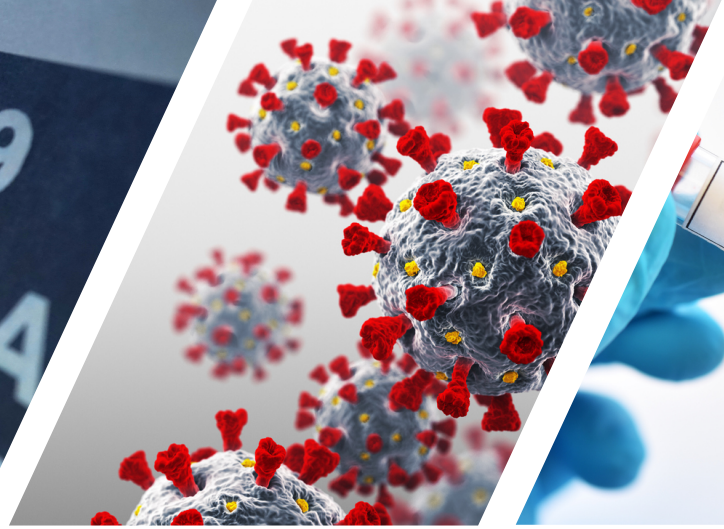

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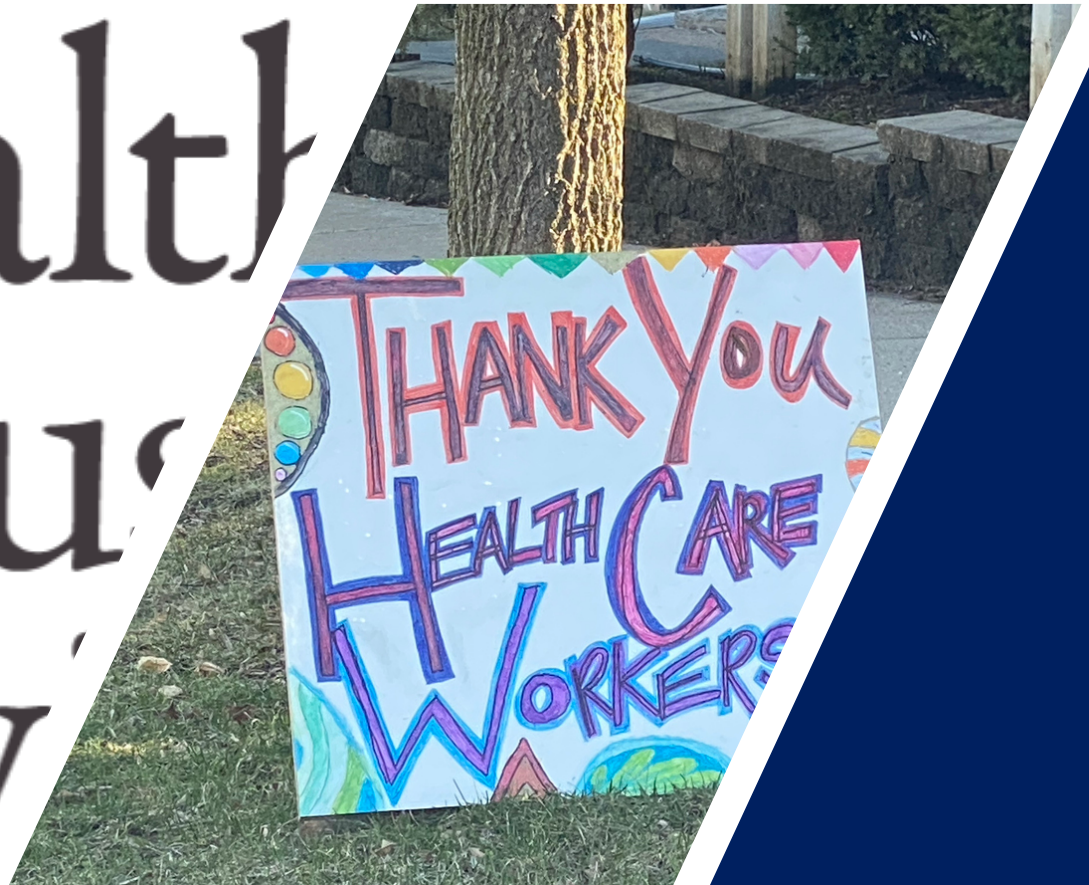


Issue # 242

Monday, December 21, 2020

COVID-19 Report

Highlights

- New infections, hospitalizations and deaths with the coronavirus are at or near record levels in the U.S.
  - **7-day newly-detected cases per million are just off a recent peak and are 5x the pre-4th of July and pre-Labor Day levels**
    - **Tennessee and California are of particular concern, as infection rates per capita are up 5x since Thanksgiving in both states**
  - Covid-19 hospitalizations are also just off a recent peak, with 36.2% of all inpatient beds currently occupied by Covid-19 patients
    - **California is of increasing concern here, as Covid-19 patients now occupy 2 of every 3 beds, up from just more than 1 of every 2 a week ago**
  - **7-day deaths with coronavirus is at a record high level, having increased on twenty of the last twenty-one days**
- So, where is the positive momentum?
  - First, the much-feared infection surge post-Thanksgiving did not materialize:
    - **The trend in week-over-week increases in new cases was slowing heading into Thanksgiving; rather than surging after the holiday, this trend has slowed even further. New cases have been flat for the past week**
    - According to Youyang Gu's model, **the Reproduction Rate (R_t) - a measure of infection spread - has declined fourteen straight days (a sign of slowing infection spread). For the most recent three days, the R_t has been < 1, indicating that spread is now receding**
    - The Midwest, which was experiencing the highest pre-Thanksgiving infection rates among all states, has "cooled" significantly since
  - There was some "progress" over the weekend with hospitalization rates:
    - **For the first time since the weekend of October 17-18, Covid-19 census declined this past weekend**
    - **This represented the largest two-day Covid-19 census decline since September 12-13**
    - Twenty-two states have experienced declining census week-over-week, while six others held steady

- Finishing with developments on the vaccine front and an illustration of when to expect vaccinations for the general public
  - **More than 550k people were vaccinated last week in the U.S. with the Pfizer vaccine; The Moderna vaccine is set to be first administered in the U.S. today** (we added vaccine tracking charts to our report today)
  - According to an article published by the New York Post, **an FDA spokesperson projected that 100 million doses of the Pfizer and Moderna vaccines would be distributed by the end of February**
  - **This FDA official also expressed optimism that Johnson & Johnson's vaccine could be approved sometime in January**
  - **The CDC's Advisory Committee on Immunization Practices approved new guidelines on Sunday providing that persons 75 years and older, plus frontline essential workers, will be next in line for receiving the vaccine. These people will follow the health care workers and nursing home residents who are receiving the initial vaccines**
- We have updated our model to illustrate when all willing persons could receive an initial vaccine dose
  - The anticipated timing depends heavily on:
    - The number of people willing to be vaccinated
    - Whether children will be included, along with adults
    - When additional vaccines will be approved for emergency use
    - How quickly doses of each vaccine can be distributed and administered
  - **Depending on the assumptions we use for this illustration, willing persons could receive at least the first dose as early as mid-April or not until mid-July (or, later depending on the assumptions employed)**

This week's vaccine news

- Pfizer shipped 2.9 million doses of its vaccine in the U.S. during the first week of distribution; More than 0.5 million people received an initial dose
- There were reports of delays in shipments of the Pfizer vaccine; Gen. Gus Perna, Chief Operating Officer of Operation Warp Speed took full responsibility for the delay, which he attributed to a mis-communication of the number of doses that would be available
- Distribution of Moderna's mRNA vaccine in the U.S. begins today
- With the two vaccines (Pfizer, Moderna) approved for emergency use, an FDA official said that the U.S. is on track for distributing 20 million doses by the first week of January, an additional 30 million by the end of January and another 50 million by the end of February (these estimates reflect the above-mentioned delays)
- The CDC's Advisory Committee on Immunization Practices approved new guidelines on Sunday providing that persons 75 years and older, plus frontline essential workers will be next in line for receiving the vaccine. These people will follow the health care workers and nursing home residents who are receiving the initial vaccines
- According to a report published by the New York Post, a third vaccine could be approved by the FDA as early as January. Johnson & Johnson (JNJ) / Jansseen is completing its Phase 3 clinical trials of its vaccine, which JNJ's vaccine differs from Pfizer's and Moderna's in several ways:
  - It is an advenovirus vaccine (versus mRNA)
  - It may only require a single dose, although JNJ is also testing a two-dose regiment
  - It can be maintained at refrigerator temperatures (versus frozen)
  - Efficacy and safety results are unknown at this point
- According to a published Fox News report, Surgeon General-nominee, Dr. Vivek Murthy suggested that the general public could gain access to a vaccine as early as April 2021 but, only if everything went right. Dr. Murthy cited a more-realistic timeline of mid-summer

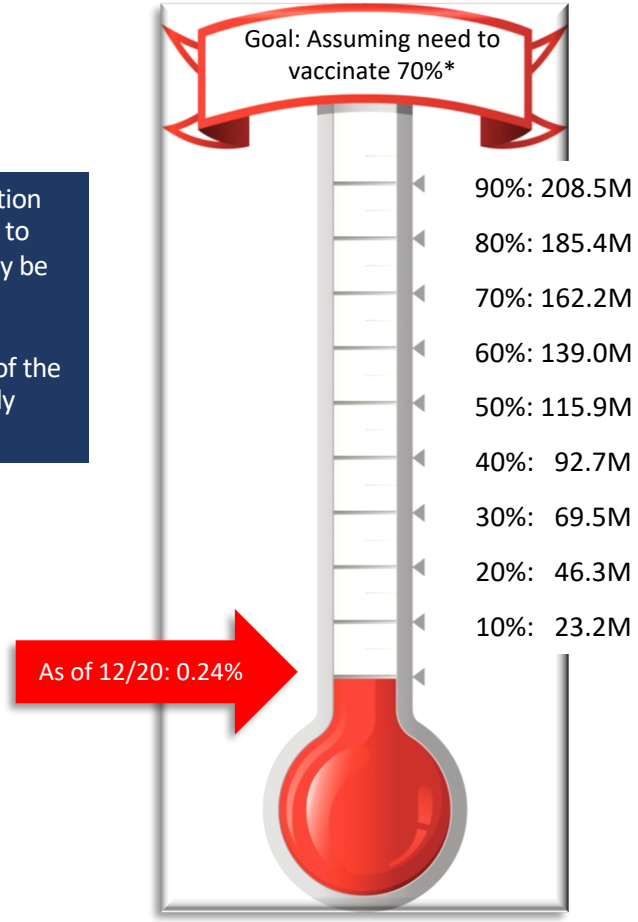
Vaccine Tracking – U.S.

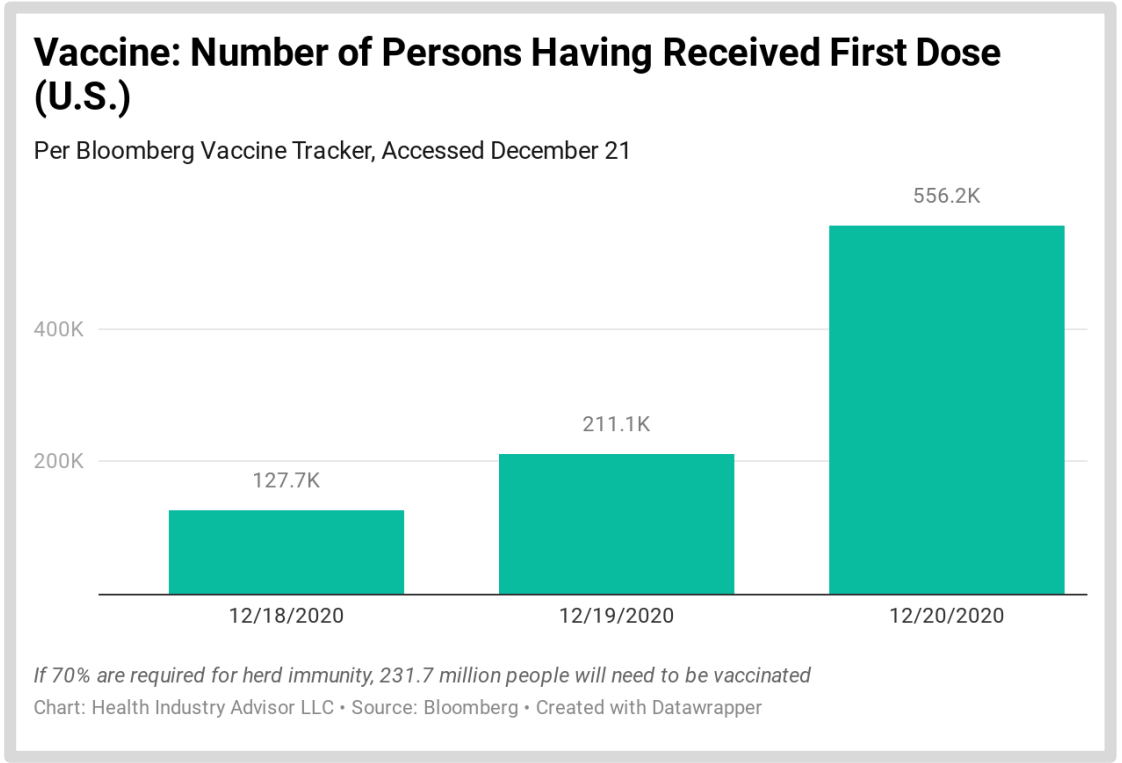
Distribution and administration of the Pfizer vaccine began in the U.S. last week

More than 0.5 million people received the initial dose - a small fraction of how many will need to be vaccinated

* 70% is used for illustration only. Actual rate needed to reach herd immunity may be higher or lower.

Does not reflect impact of the number of people already infected by the virus





Vaccine data from: Centers for Disease Control and Prevention and Bloomberg Vaccine Tracker

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Vaccines – Partial list of vaccines in the queue in the U.S.

Vaccine Manufacturer	Type	Doses Required	Storage Temp	Status in US	Doses Under Contract With U.S	EUA Date	Scope of EUA Approval	Efficacy	Safety	Recent Updates
Pfizer	mRNA	2	-70°C	EUA granted	100 M now Another 100M being negotiated	12/11	16 years old and older	95.0%	Mild, short-term effects No severe adverse effects	Vaccinations of healthcare workers initiated on 12/14; Some issues with persons with allergies
moderna	mRNA	2	-20°C	EUA granted	100 M now 2nd 100M in Q2/2021	12/18	18 years old & older	94.1%	Mild, short-term adverse effects No severe adverse effects	Shipments of initial doses are underway
Johnson & Johnson	Advenovirus	1 (or 2)	2-8°C	In Phase 3 trial	100M	tbd		N/A		Interim data from Phase 3 study expected by end of Jan EUA application anticipated in Feb
AstraZeneca	Advenovirus	2	2-8°C	In Phase 3 trial	300M	tbd		70%		Concerns raised about Phase 3 results, in which single dose appeared to preform better than 2 doses
NOVAVAX	Protein	2	2-8°C	In Phase 3 trial	100M	tbd		N/A		Phase 3 results from UK expected in early 2021 Phase 3 study in the US expected to launch in December
gsk GlaxoSmithKline	Protein	2	2-8°C	Phase 2b to be re-launched in Feb	100M	tbd		N/A		Due to a clinical setback, GSK announced that the vaccine would not be available until Q4/2021

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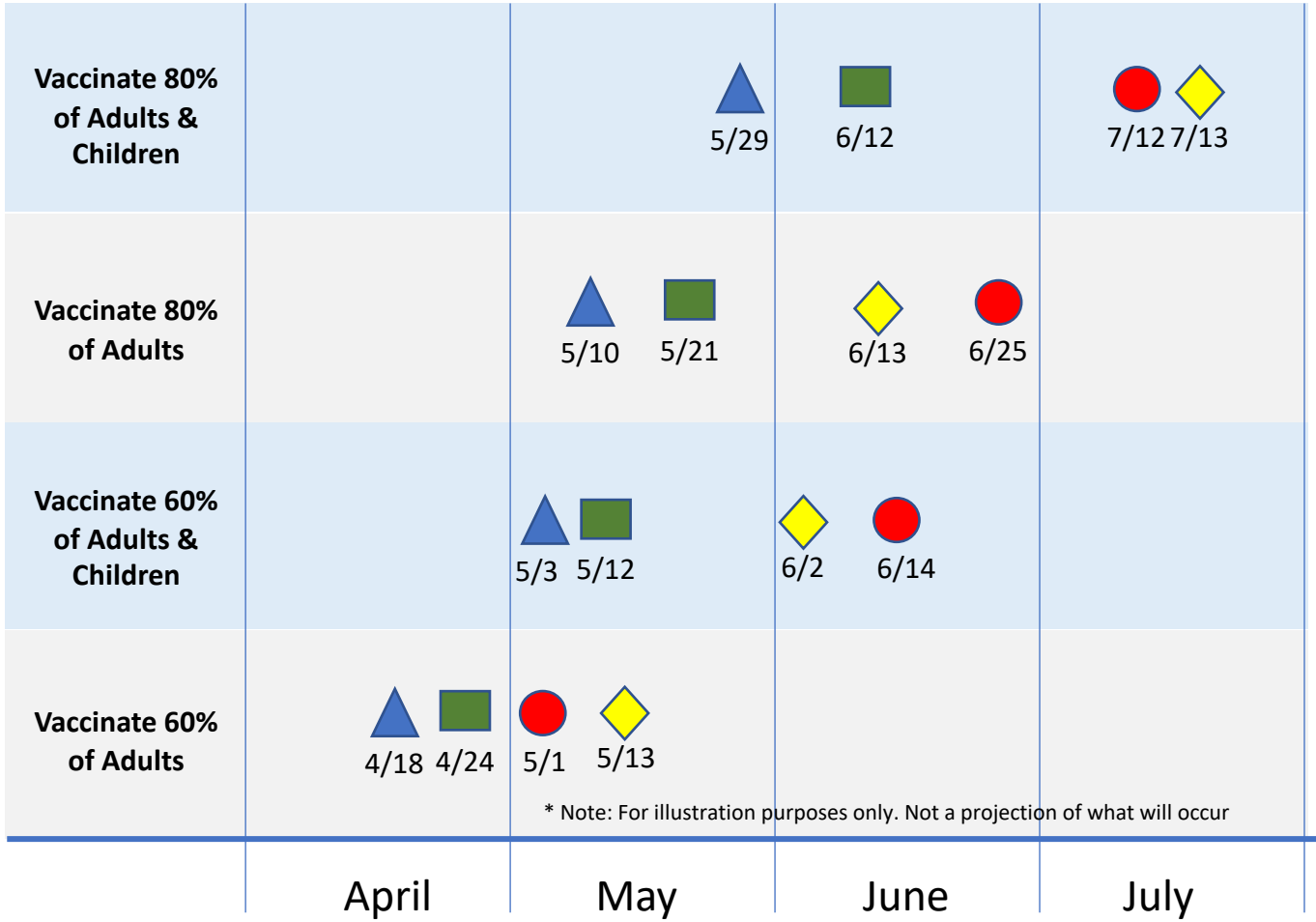
Vaccine Rollout:
When could each interested American expect to have received an initial dose?
Pace of dose distribution, number of willing recipients and timing of JNJ and AstraZeneca vaccines suggest as early as mid-April or as late as mid-July*



How soon every interested person can receive their first shot depends on:

- When each vaccine will become available
- How fast each can be rolled out
- How many people desire to be vaccinated
- Whether children will be included

We modeled 4 scenarios:

JNJ vaccine available March 1
AstraZeneca doses and 2nd contract of 100M Moderna doses available April 1
2nd set of 100M Pfizer doses available on July 1
Each vaccine administered uniformly over 100-day period

Slow rollout: Each vaccine administered uniformly over 120-day period; other assumptions as with 1st scenario

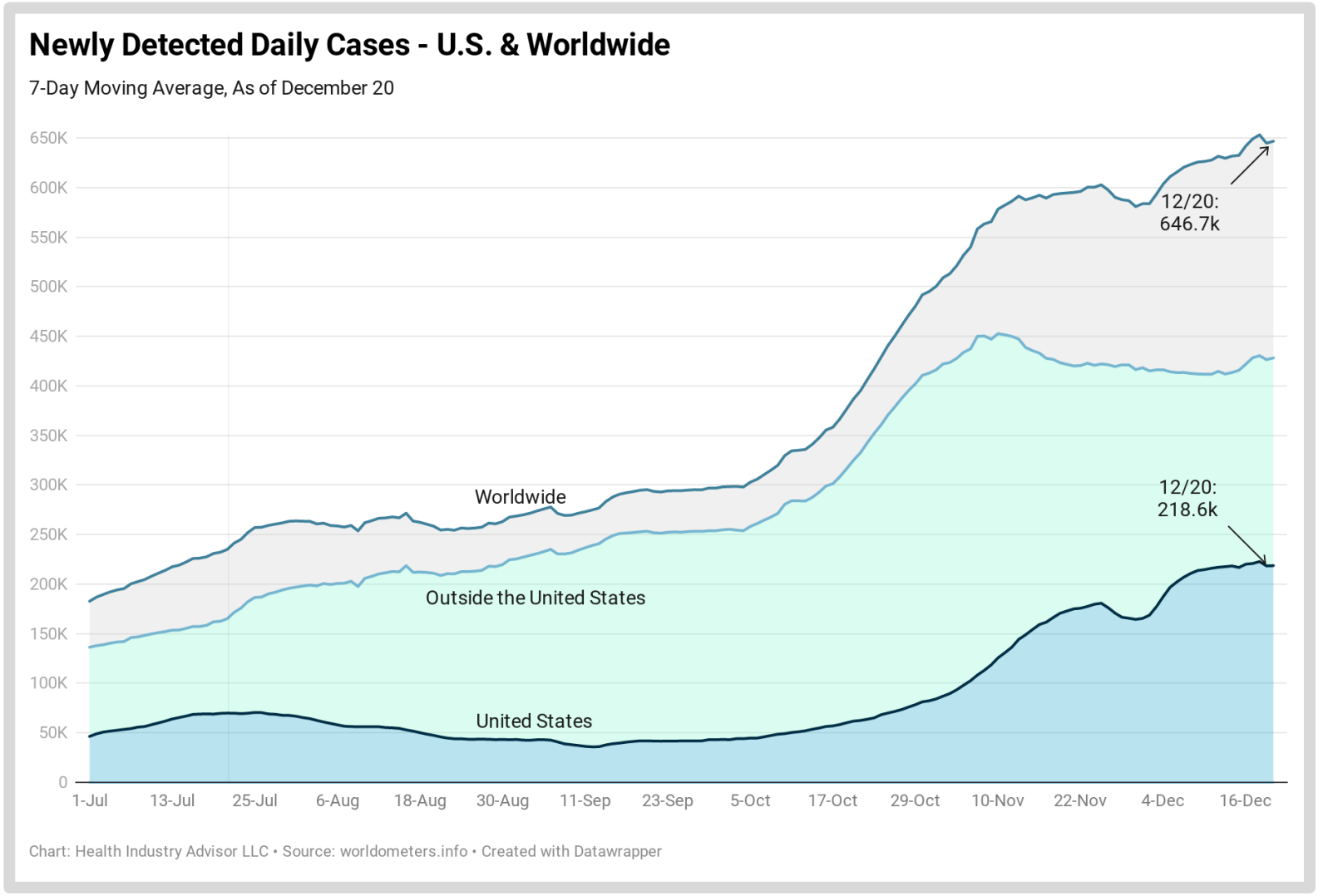
Even slower rollout: Each vaccine administered uniformly over 167-day period; other assumptions as with 1st scenario

AstraZeneca vaccine delayed until Q3, 2021; other assumptions as with 1st scenario

We are averaging ~647k new cases worldwide each day, as of Sunday

The United States is now averaging 219k new cases each day . . . and, seems to have plateaued over the past week

* - 7-day moving average basis



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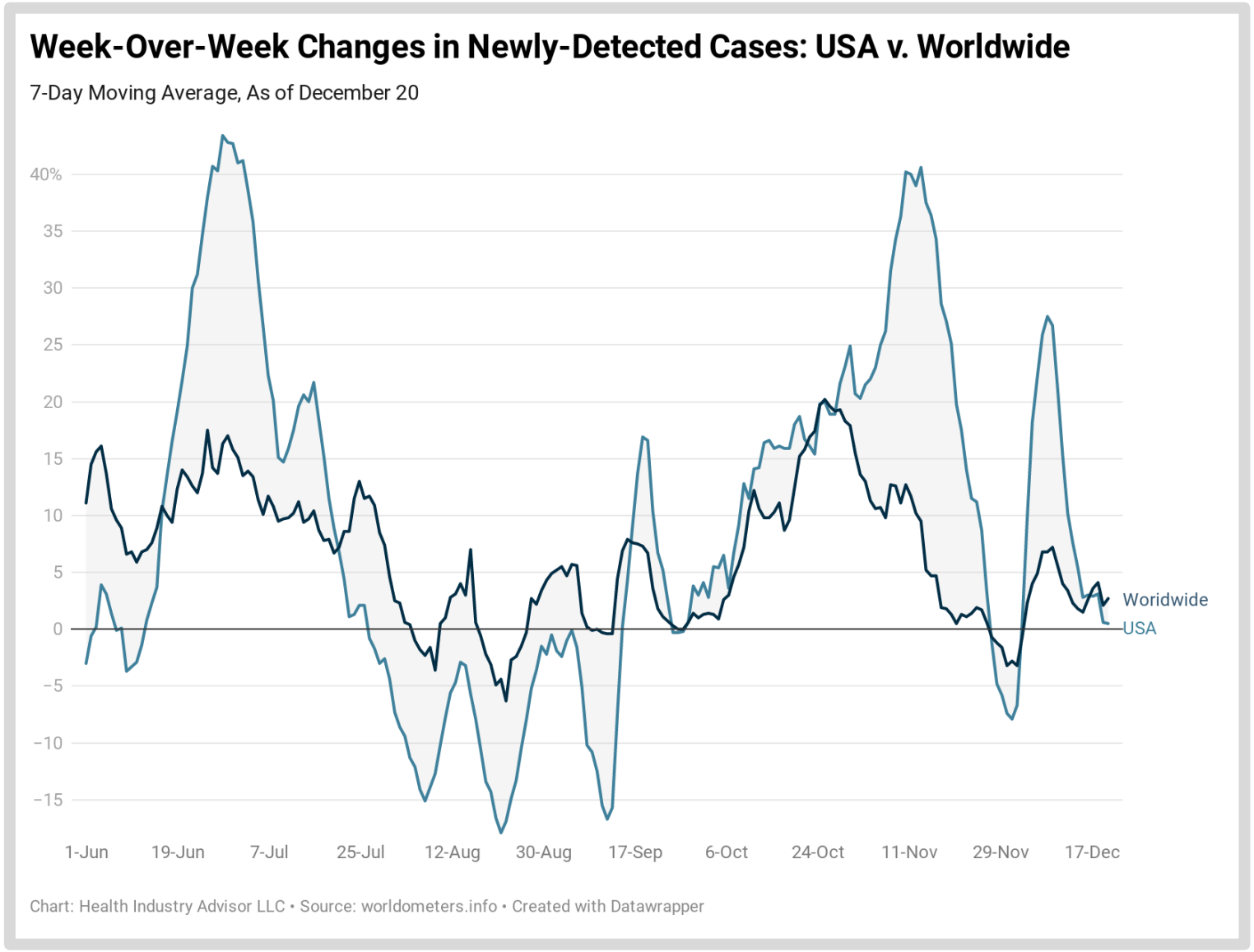
On a week-over-week basis, new cases have barely changed over the past two days



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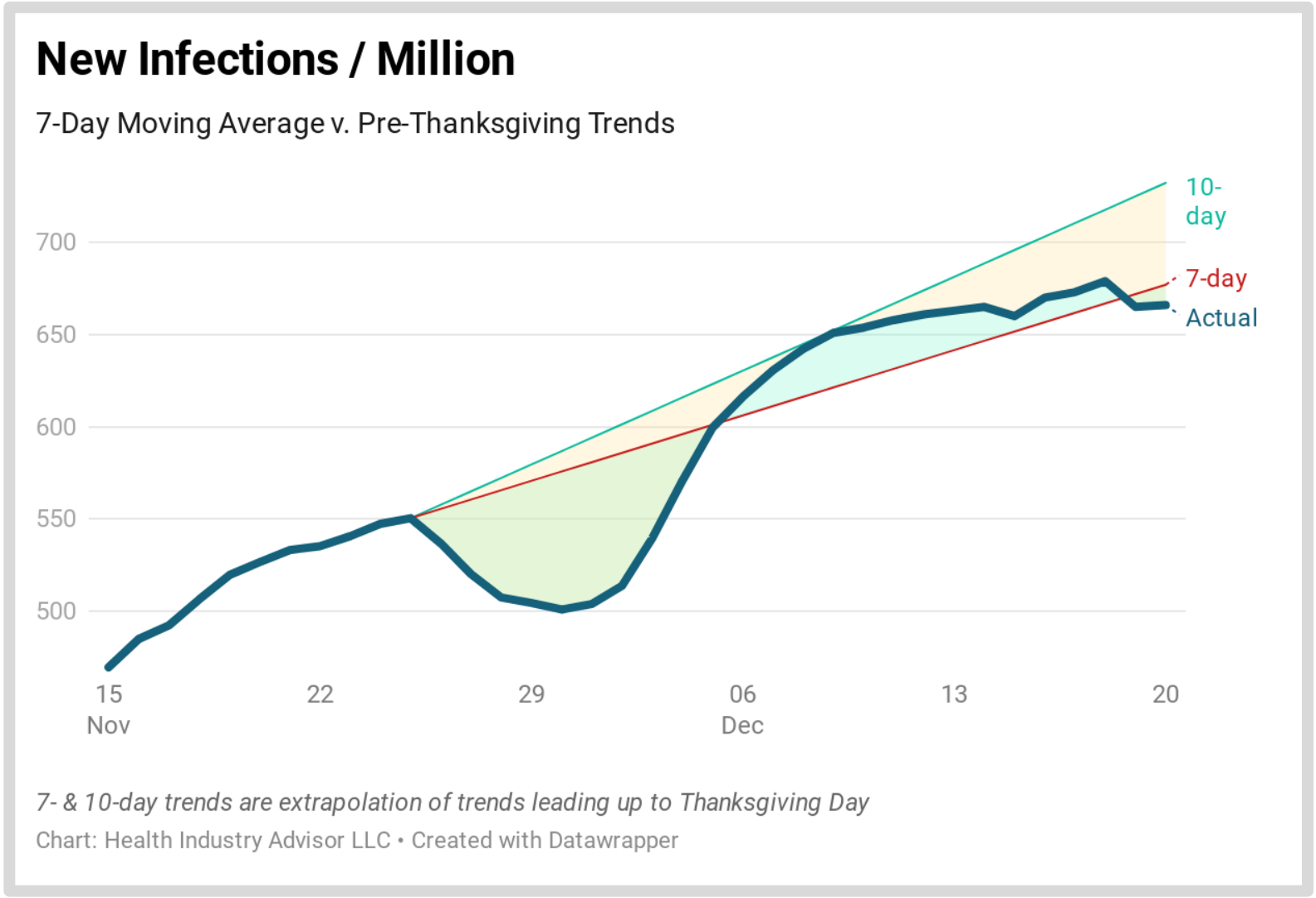
What have we observed with infection rates since Thanksgiving?

Sorting through the "noise" caused by reporting interruptions during Thanksgiving weekend, it appears that the post-Thanksgiving trend is mimicking the 7-day pre-Thanksgiving trend (and, below the 10-day pre-Thanksgiving trend)

We appear to be going into the Christmas holiday in a better position than we were going into the Thanksgiving holiday



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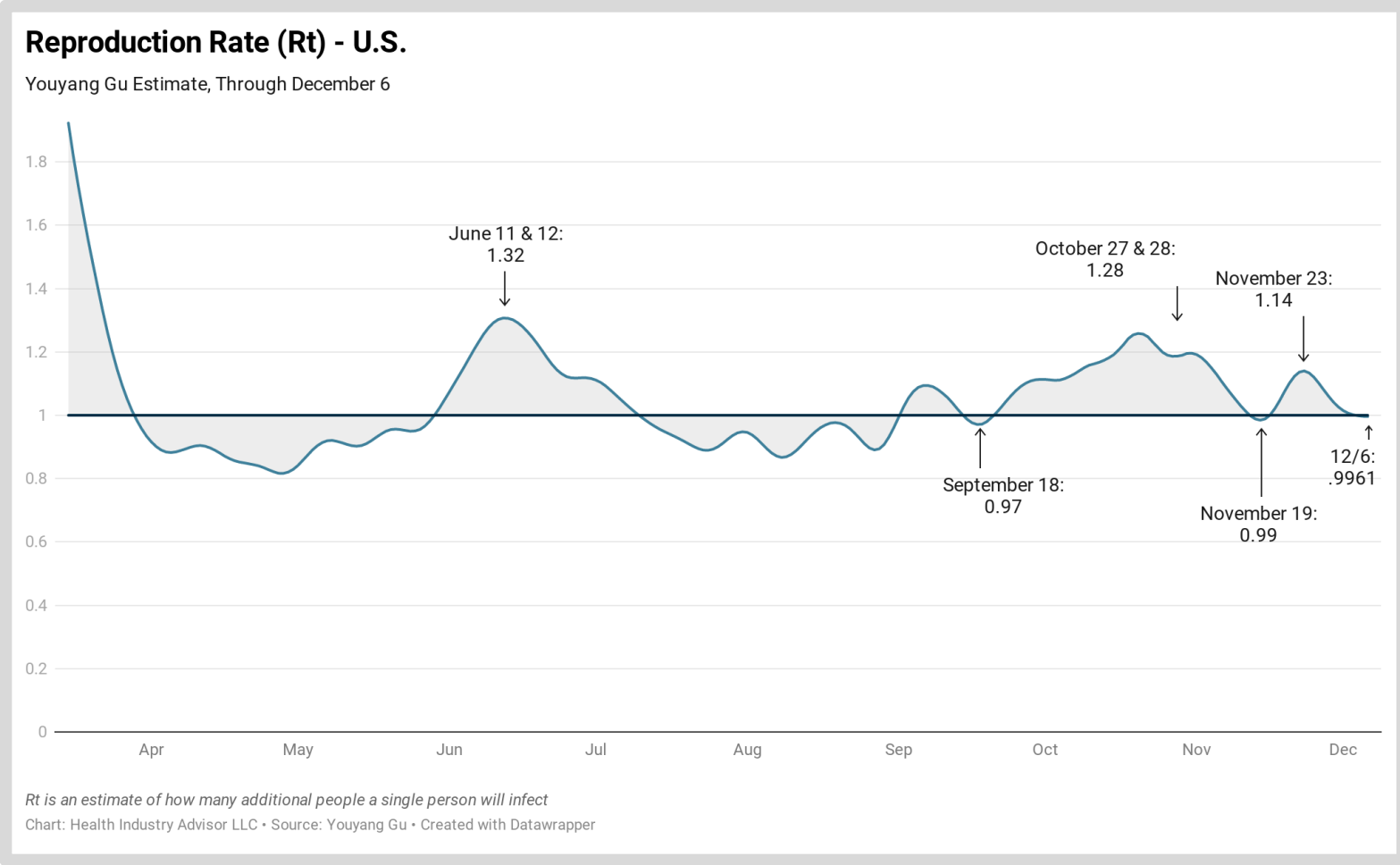
According to Gu's model, the reproduction rate declined 14 consecutive days . . . And has been below 1.0 for three consecutive days

This suggests that the virus spread slowed through and since the Thanksgiving holiday

Gu uses deaths to estimate actual infections and the reproduction rate (R_t), using a machine learning model

Note: Gu backdates two weeks from the death date to estimate when an infection likely occurred

* - Youyang Gu: Covid-19projections.com



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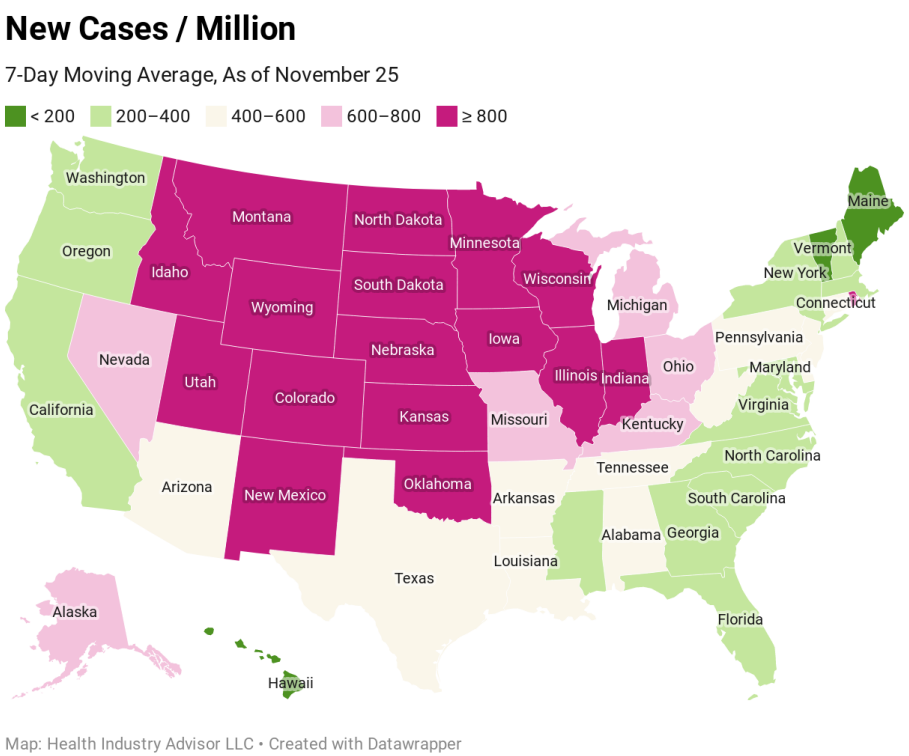
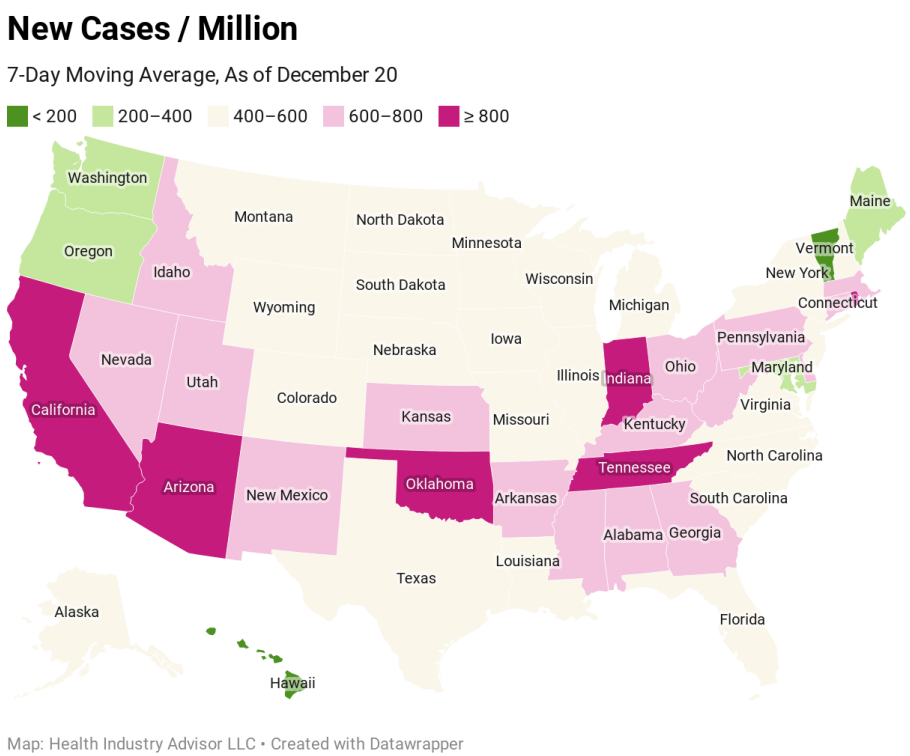
Since Thanksgiving, the “picture” of the virus spread has improved . . . With notable exceptions in Arizona, California and Tennessee
California’s new infection rate per capita is 3x what it was pre-Thanksgiving; Tennessee’s is up nearly 3x; Arizona’s, nearly 60%

As of November 25



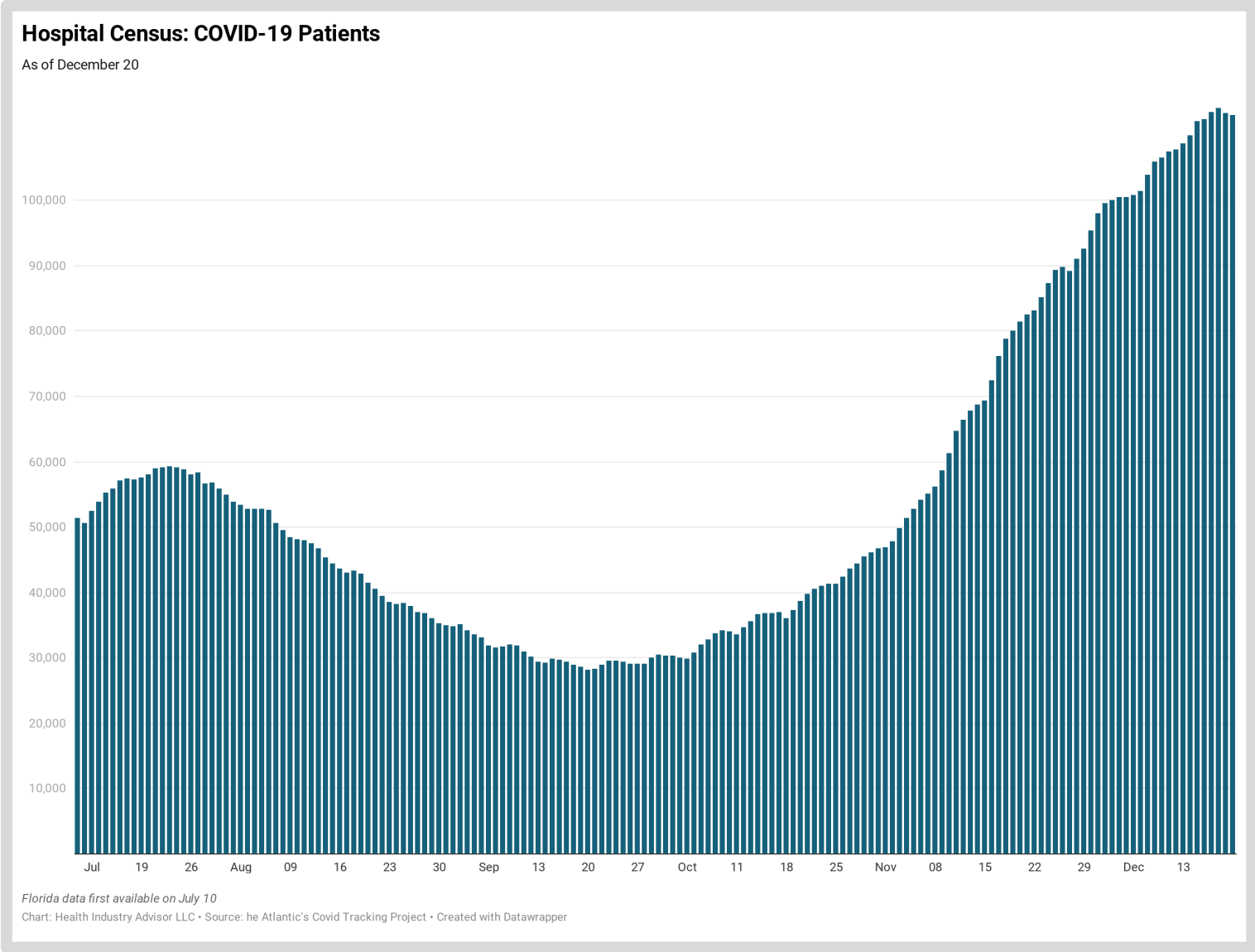
As of December 20



This hasn't happened in a while:

Covid-19 inpatient census declined over the weekend – the first time it has done so since October 17-18

It also was the largest 2-day decline since September 12-13



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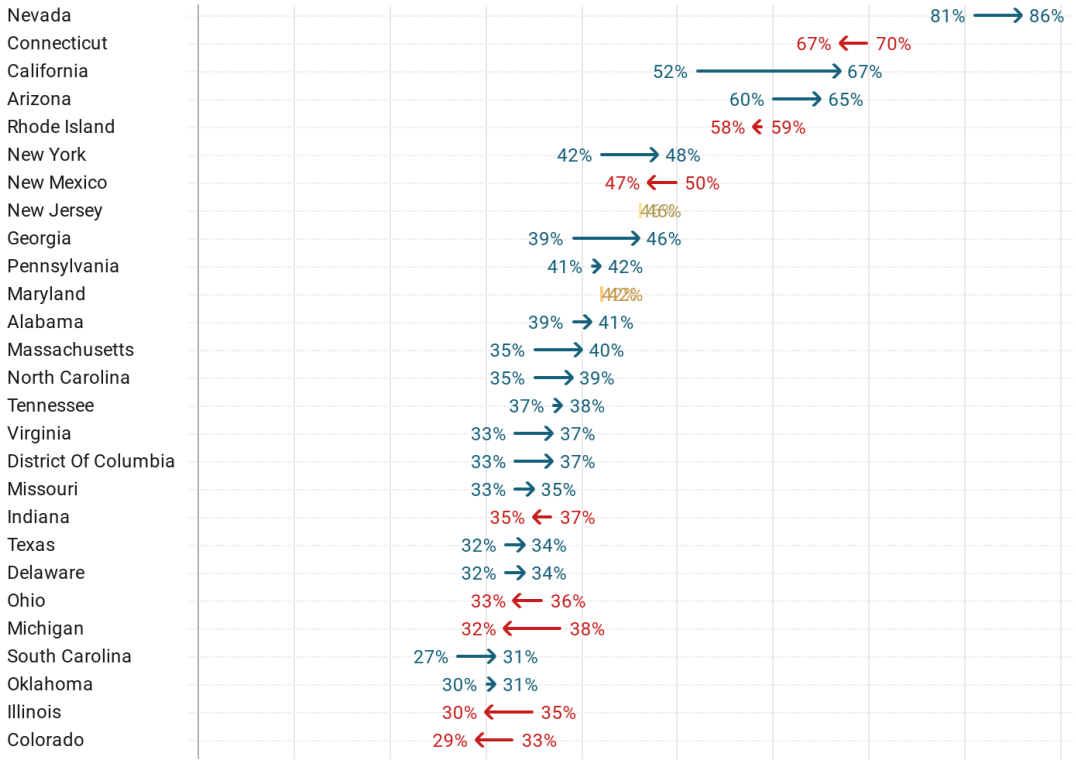
Overall, Covid-19 patients occupy 36.2% of inpatient beds in the U.S., up from 34.8% one week ago
Nevada continues to experience the highest rate, 86%
California has experienced the largest increase week-over-week, followed by Arizona, Georgia, New York and Nevada

Covid-19 Patients / Total Inpatient Beds

7-Day Moving Average, As of December 13 & 20



Covid-19 Patients / Total Inpatient Beds

7-Day Moving Average, As of December 13 & 20

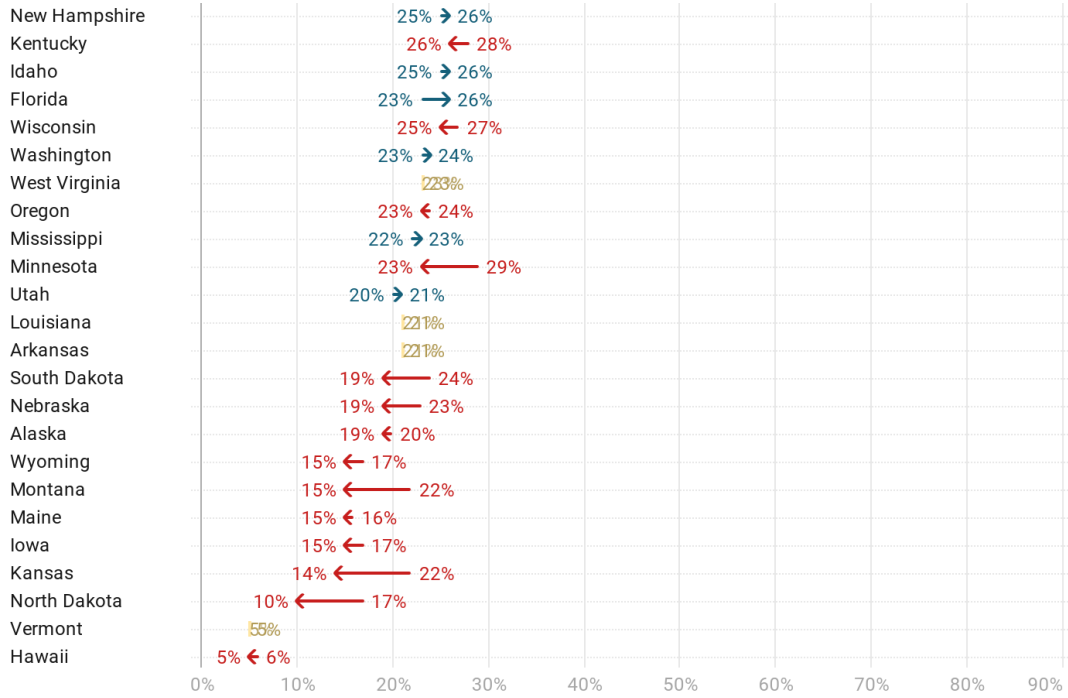
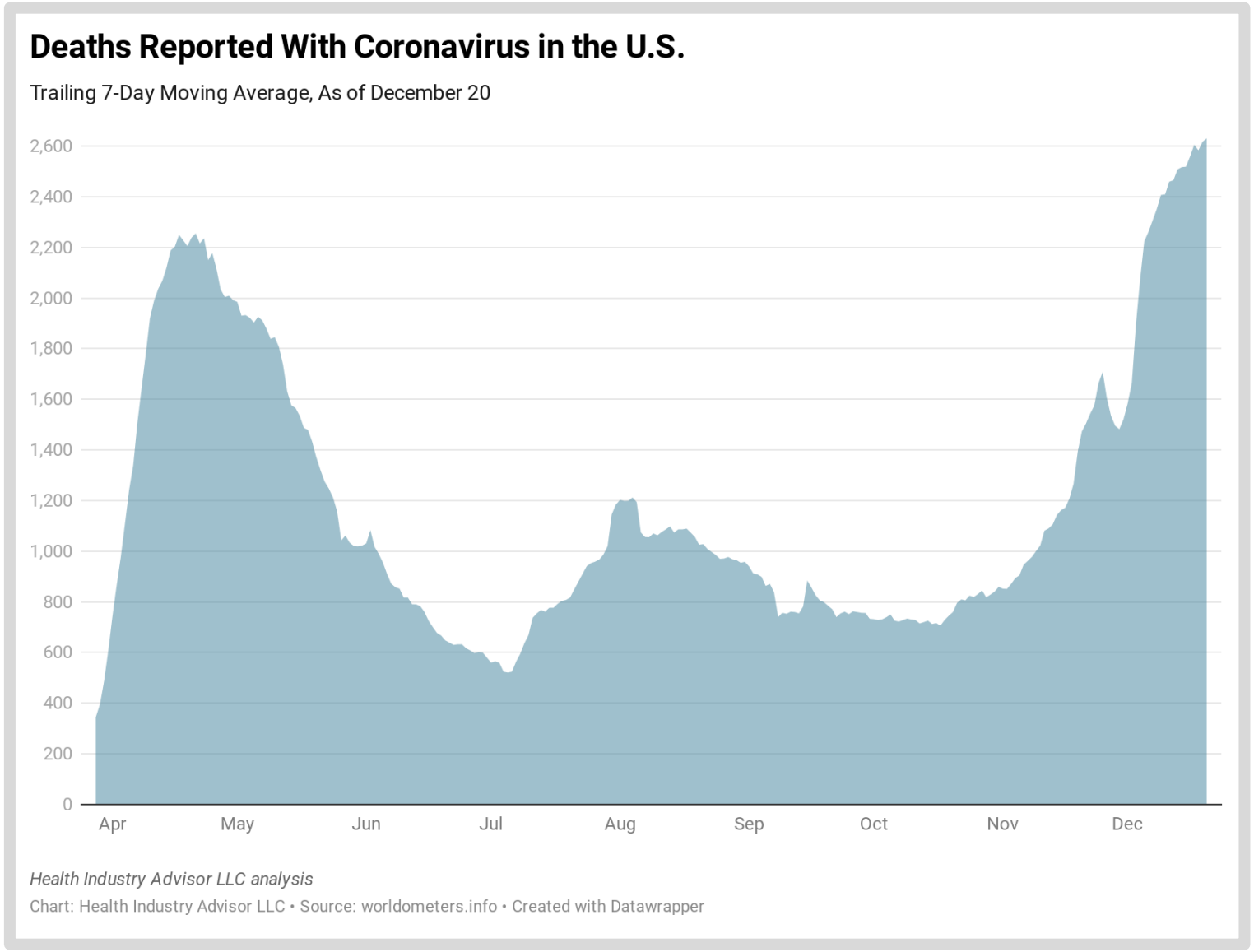


Chart: Health Industry Advisor LLC • Source: The Atlantic's Covid Tracking project & worldometers.info • Created with Datawrapper

The 7-day average deaths have been increasing since Thanksgiving . . . And are higher than at any point during the pandemic

The current 7-day rate is 2,630 deaths per day in the U.S.



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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 and Prevention, National, Regional, and State Level Outpatient Illness and Viral Surveillance https://gis.cdc.gov/grasp/fluview/fluportaldashboard.html
- Centers for Disease Control and Prevention, COVID-19 Laboratory-Confirmed Hospitalizations https://gis.cdc.gov/grasp/COVIDNet/COVID19_5.html
- Centers for Disease Control and Prevention, COVID Data Tracker https://www.cdc.gov/covid-data-tracker/index.html#mobility
- Centers for Disease Control and Prevention, Vaccines, https://www.cdc.gov/coronavirus/2019-ncov/vaccines/index.html
- 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
- Oliver Wyman Pandemic Navigator, https://pandemicnavigator.oliverwyman.com/forecast?mode=country&region=United%20States&panel=mortality
- Bloomberg Vaccine Trackers, https://www.bloomberg.com/graphics/covid-vaccine-tracker-global-distribution/?sref=Z0b6TmHW