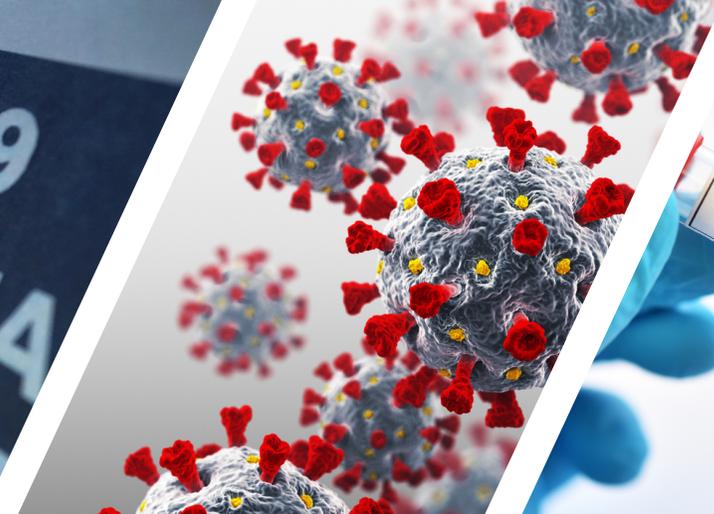
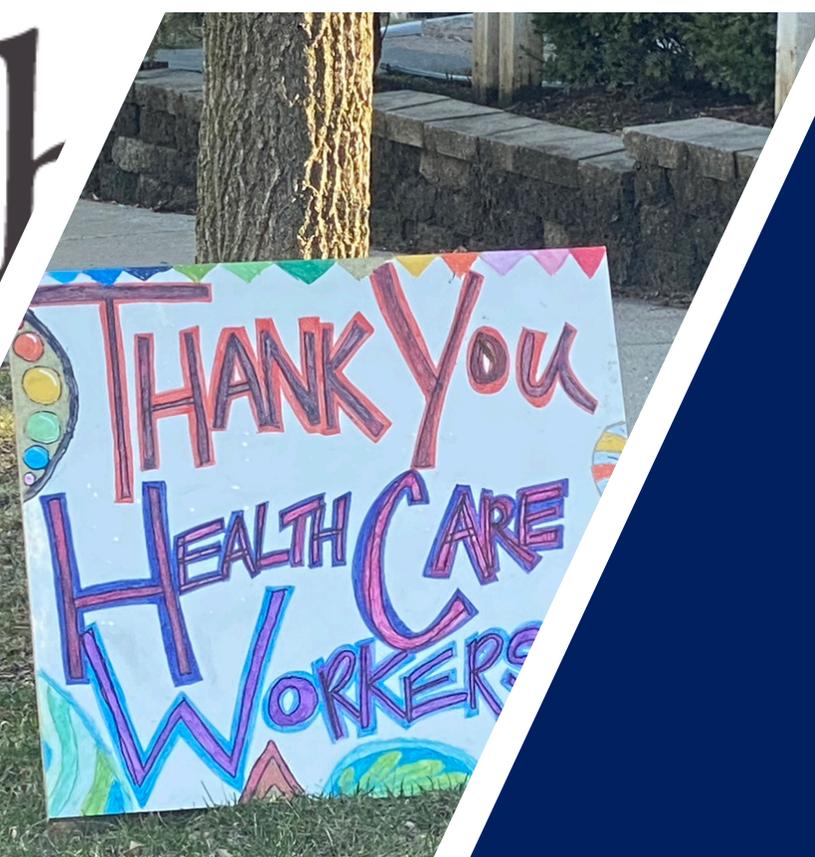


COVID-19
REOPENING PHA
CONGREGATE
SETTINGS
BUSINESSES



Health Industry Adv



Issue # 238

Wednesday, December 16, 2020

COVID-19 Report

Highlights

- Starting with the vaccines - the hits keep coming
 - The **FDA's report on the Moderna candidate vaccine contains some very encouraging information:**
 - **Vaccine efficacy is remarkably high (94.5%) and is consistent across age, sex and race/ethnic groups, as well as persons with conditions considered high risk if infected by Covid-19.** In fact, there were no infections among participants 65 years or older or, among non-whites receiving the vaccine
 - **Adverse reactions are mostly mild and short-lived.** These reactions include injection site pain, fatigue, headache, muscle pain, joint pain and chills. Most subside within 24-48 hours
 - These adverse reactions are more common after the second dose than the first. **Older participants (65 years and older) had a lower incidence of these reactions than younger participants**
 - **Severe adverse reactions occurred in 1.0% of participants, with no distinction between those receiving the vaccine or the placebo**
 - Yesterday, we shared a model showing scenarios of when all interested persons could receive the initial dose, based on assumptions of vaccine approval, pace of administration and willingness to be vaccinated. Within a day, developments suggest we may have been conservative in our base scenario
 - **The U.S. government has exercised an option for an additional 100 million doses of the Moderna vaccine;** we had only considered the original 100 million doses of this vaccine
 - **JNJ is reportedly on pace to seek emergency use authorization of its candidate vaccine in late-January; AstraZeneca is on pace to seek approval in February.** We had assumed these would be available at the end of March and June, respectively
- Each Tuesday, the Covid-19 Forecast Hub updates its ensemble forecast of Covid-19 cases and deaths in the U.S. This week's forecast encompasses estimates from 59 independent research groups and universities
 - **The ensemble forecast now suggests new daily cases continuing to increase until shortly after New Year's Day. Newly-detected cases are projected to surpass 250k around the beginning of the year**
 - **Average daily deaths are projected to increase throughout the next four weeks, surpassing 3,000 per day during the first full week of January**
 - Cumulative deaths are projected at 376.5k by January 9
 - The Institute for Health Metrics and Evaluation (IHME) produces its own forecasts of Covid-19 cases, hospitalizations and deaths. IHME extends its forecast out to April 1 and provides scenarios based on increased and relaxed restrictions, as well as rapid vaccinations
 - IHME's base projection model suggests new cases peaking on about January 8
 - **Hospitalizations are projected to increase another 38%, before peaking at the end of January, according to IHME projections**
- New cases continue to increase. New case trends in the U.S., however, continue to counter the concern about a post-Thanksgiving surge
 - **The 7-day average new cases have leveled off over the past 4-5 days and, in fact declined yesterday**
 - The trend in new cases per capita is now on a shallower slope than it was pre-Thanksgiving; Indeed, the rate at which this trend is slowing is itself increasing
 - **The Reproduction Rate (Rt) - a measure of how many persons an infected person subsequently infects - declined eight consecutive days. This rate is nearing 1.0, below which point new cases decline**

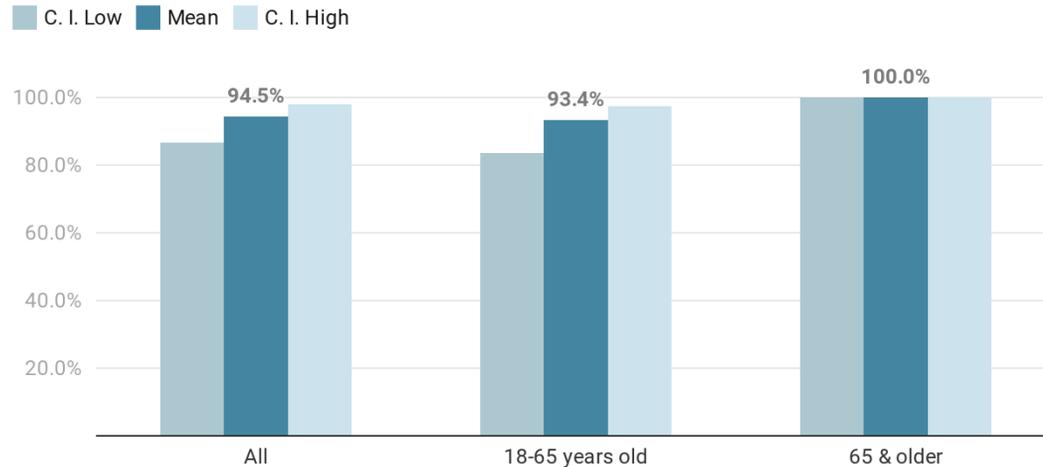
This week's vaccine news

- Moderna's mRNA vaccine received support of FDA staff yesterday. The FDA released its report, in advance of Thursday's meeting of the Vaccine and Related Biological Products Advisory Committee (VRPPAC) meeting to consider endorsing the vaccine (see next slides for key report findings)
- If approved for emergency use, administration of the Moderna vaccine could begin in the U.S early next week. Of course, vaccinations of using the Pfizer vaccine began on Monday
- Johnson & Johnson's (JNJ) initial results from the Phase 3 clinical study of its candidate vaccine are anticipated in early-January. Emergency Use Authorization (EUA) could come by the end of January
- AstraZeneca's results for its candidate vaccine are now expected in late-January; EUA could be granted in February
- Pfizer, JNJ and Moderna are now testing their candidate vaccines in children
- The U.S. exercised an option to buy an additional 100 million doses of Moderna's vaccine, increasing the total commitment to 200 million from this manufacturer
- The U.S. now has contracts for 900 million doses and is negotiating for another 100 million doses of the Pfizer vaccine (only the Pfizer vaccine is approved for emergency use at this time)

Moderna's candidate vaccine showed promising efficacy during the Phase 3 clinical trial – 94.5% efficacy across all participants
 Vaccine efficacy was deemed consistent across race and ethnic groups – indeed there were zero infections among non-whites receiving the vaccine

Vaccine Efficacy - By Age

Moderna Vaccine: Phase 3 Clinical Trial

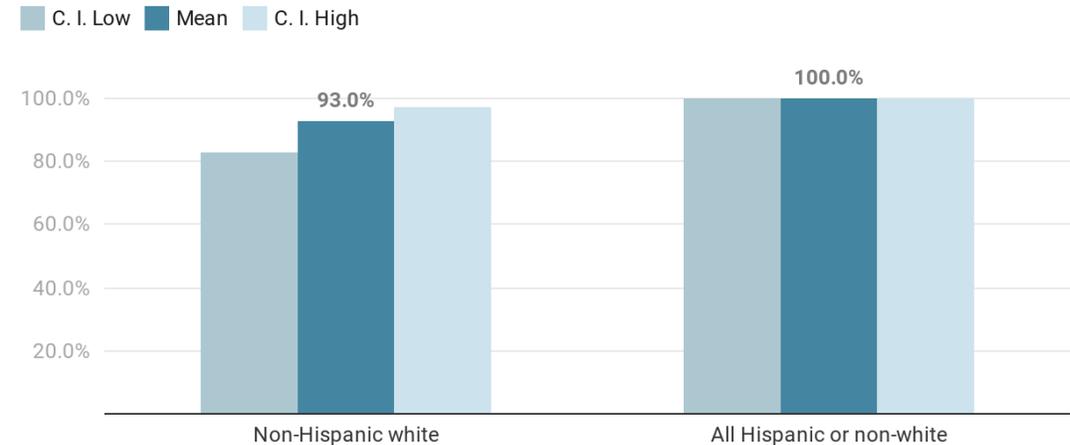


Unlike with those receiving the placebo, there were zero infections among participants 65 years of age and older

Chart: Health Industry Advisor LLC • Source: FDA • Created with Datawrapper

Vaccine Efficacy - By Race/Ethnicity

Moderna Vaccine: Phase 3 Clinical Trial



Unlike with those receiving the placebo, there were zero infections among Hispanic/Latino, American Indian/Alaskan Native or Black/African American participants

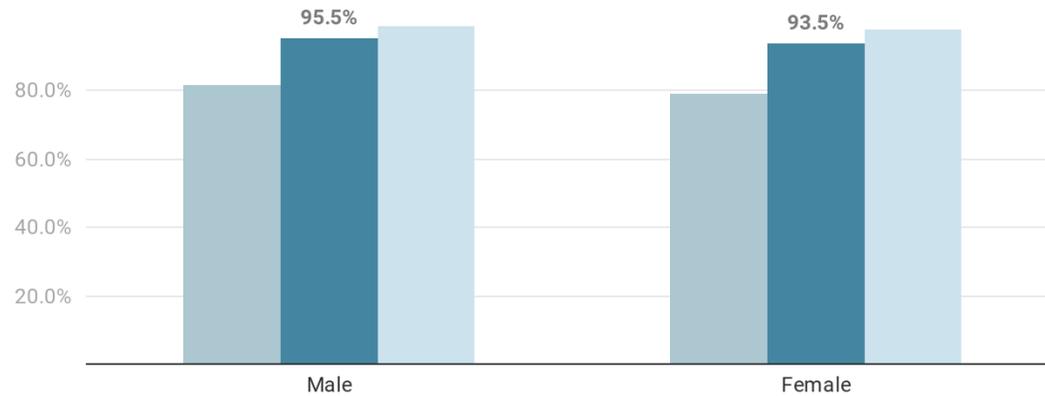
Chart: Health Industry Advisor LLC • Source: FDA • Created with Datawrapper

Vaccine efficacy was similarly deemed strong across sex and for participants deemed at-risk (those with chronic lung disease, significant cardiac disease, severe obesity, diabetes, liver disease or HIV)

Vaccine Efficacy - By Sex

Moderna Vaccine: Phase 3 Clinical Trial

■ C. I. Low ■ Mean ■ C. I. High



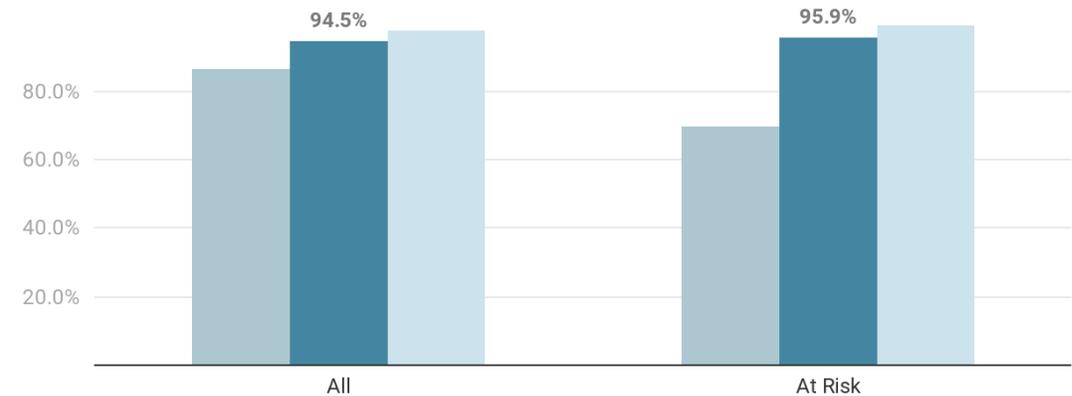
* At Risk : Chronic Lung Disease, Significant Cardiac Disease, Severe Obesity, Diabetes, Liver Disease or HIV

Chart: Health Industry Advisor LLC • Source: FDA • Created with Datawrapper

Vaccine Efficacy - By Risk Classification*

Moderna Vaccine: Phase 3 Clinical Trial

■ C. I. Low ■ Mean ■ C. I. High



* At Risk : Chronic Lung Disease, Significant Cardiac Disease, Severe Obesity, Diabetes, Liver Disease or HIV

Chart: Health Industry Advisor LLC • Source: FDA • Created with Datawrapper

The Moderna vaccine was deemed safe, based on the phase 3 clinical study

Most reactions were considered mild and of short-duration (24-48 hours)

These reactions occurred more frequently with the 2nd dose than with the first. Also, persons 65 years and older had a lower rate of adverse reactions than younger participants

Severe adverse reactions were relatively few and were not different among study participants receiving the vaccine or the placebo

Safety: Adverse Reactions Among Those Receiving Vaccine

Moderna Phase 3 Clinical Trial

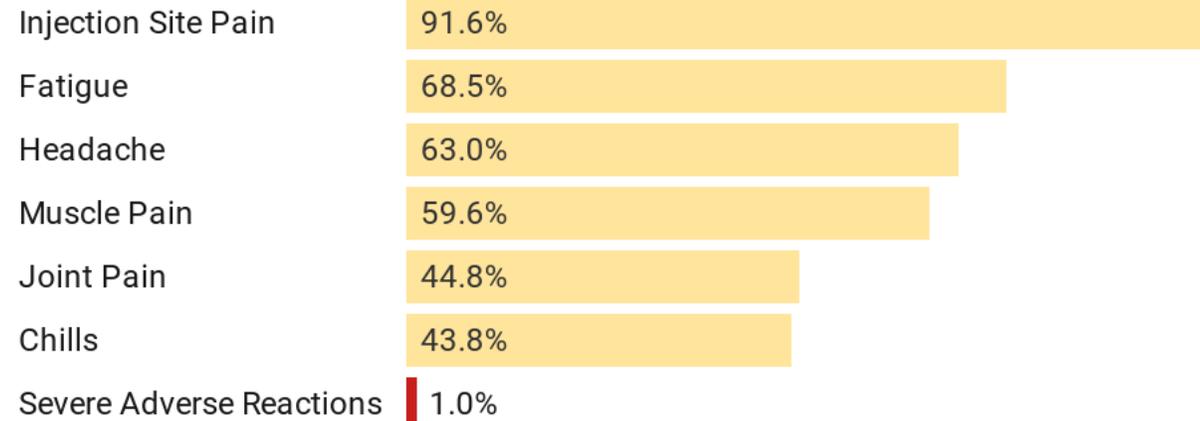


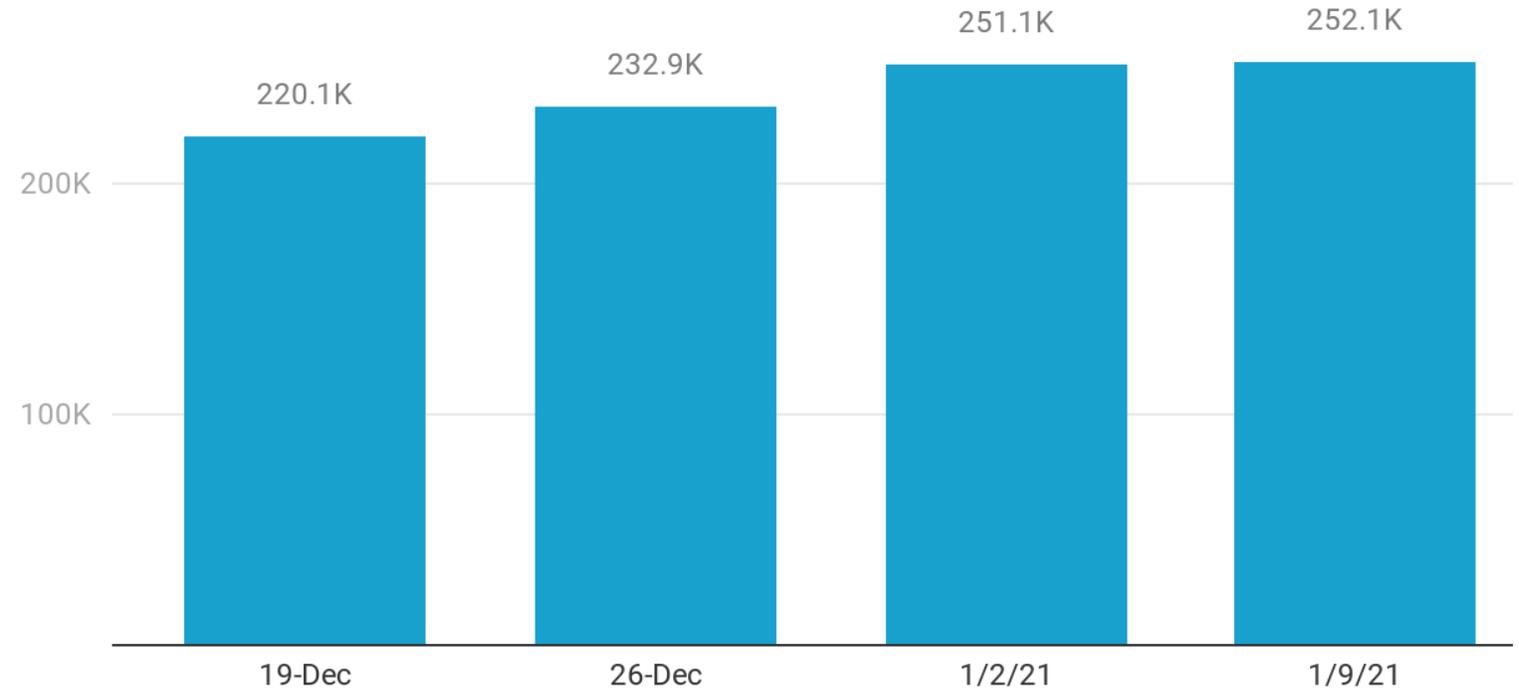
Chart: Health Industry Advisor LLC • Source: FDA • Created with Datawrapper

The COVID-19 Forecast Hub serves as a central repository of forecasts and predictions from more than 50 international research groups

The composite forecast suggests that newly-detected cases could level-off after New Year's Day

Average Daily Detected Cases

Covid-19 Forecast Hub, Composite Forecast As of December 15



For the week ending on the date shown

Chart: Health Industry Advisor LLC • Source: Covid-19 Forecast Hub • Created with Datawrapper

The composite forecast suggests that daily deaths will continue to rise each of the next four weeks and could average > 3,000 daily by the first full week of January

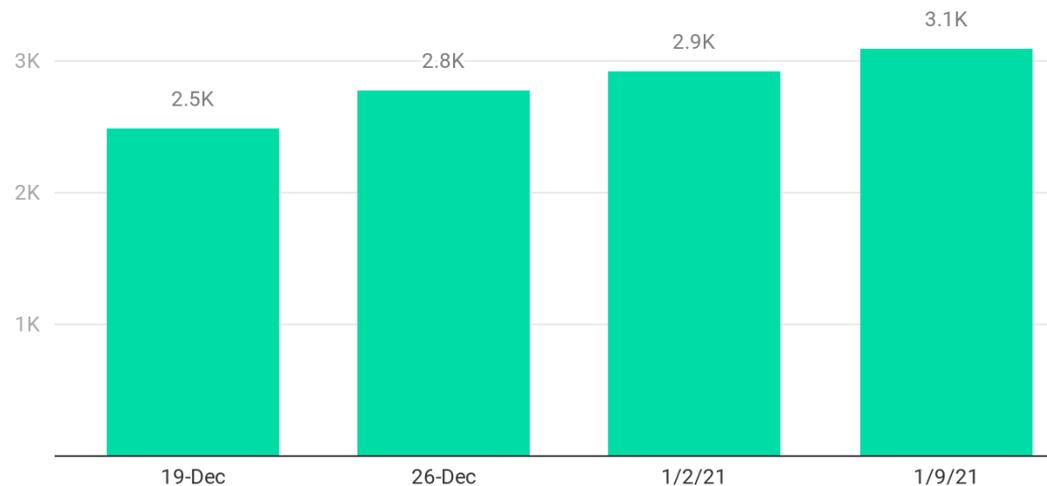
This composite forecast estimates total deaths will exceed 350k during the week following Christmas

Daily Deaths

Total Deaths

Average Daily Deaths

Covid-19 Forecast Hub, Composite Forecast As of December 15

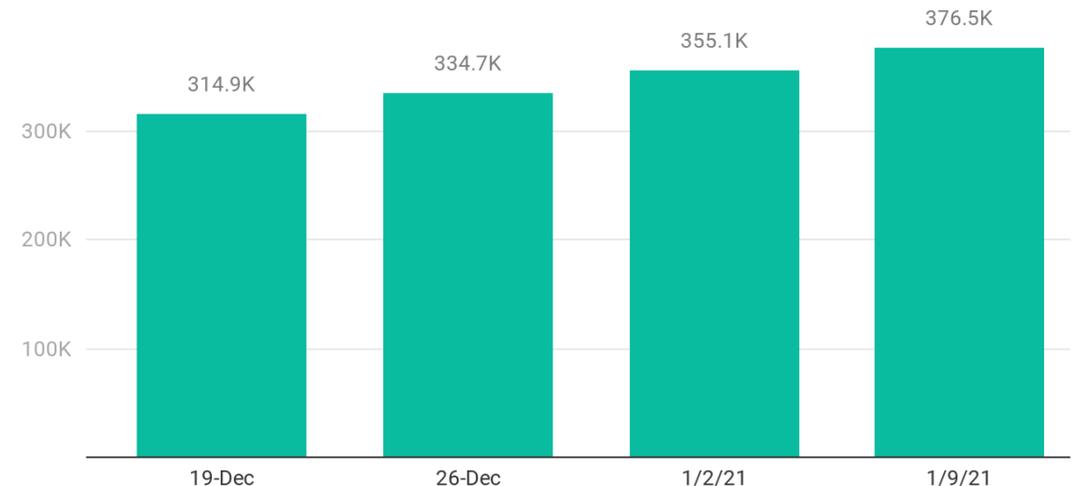


For the week ending on the date shown

Chart: Health Industry Advisor LLC • Source: Covid-19 Forecast Hub • Created with Datawrapper

Total Deaths

Covid-19 Forecast Hub, Composite Forecast As of December 15



For the week ending on the date shown

Chart: Health Industry Advisor LLC • Source: Covid-19 Forecast Hub • Created with Datawrapper

The Institute for Health Metrics and Evaluation (IHME) updated its Covid-19 projections for the U.S. on December 10

IHME current projections suggest that new daily cases could peak on January 8

Rapid vaccination efforts are not expected to have a discernable impact on daily infection estimates until February

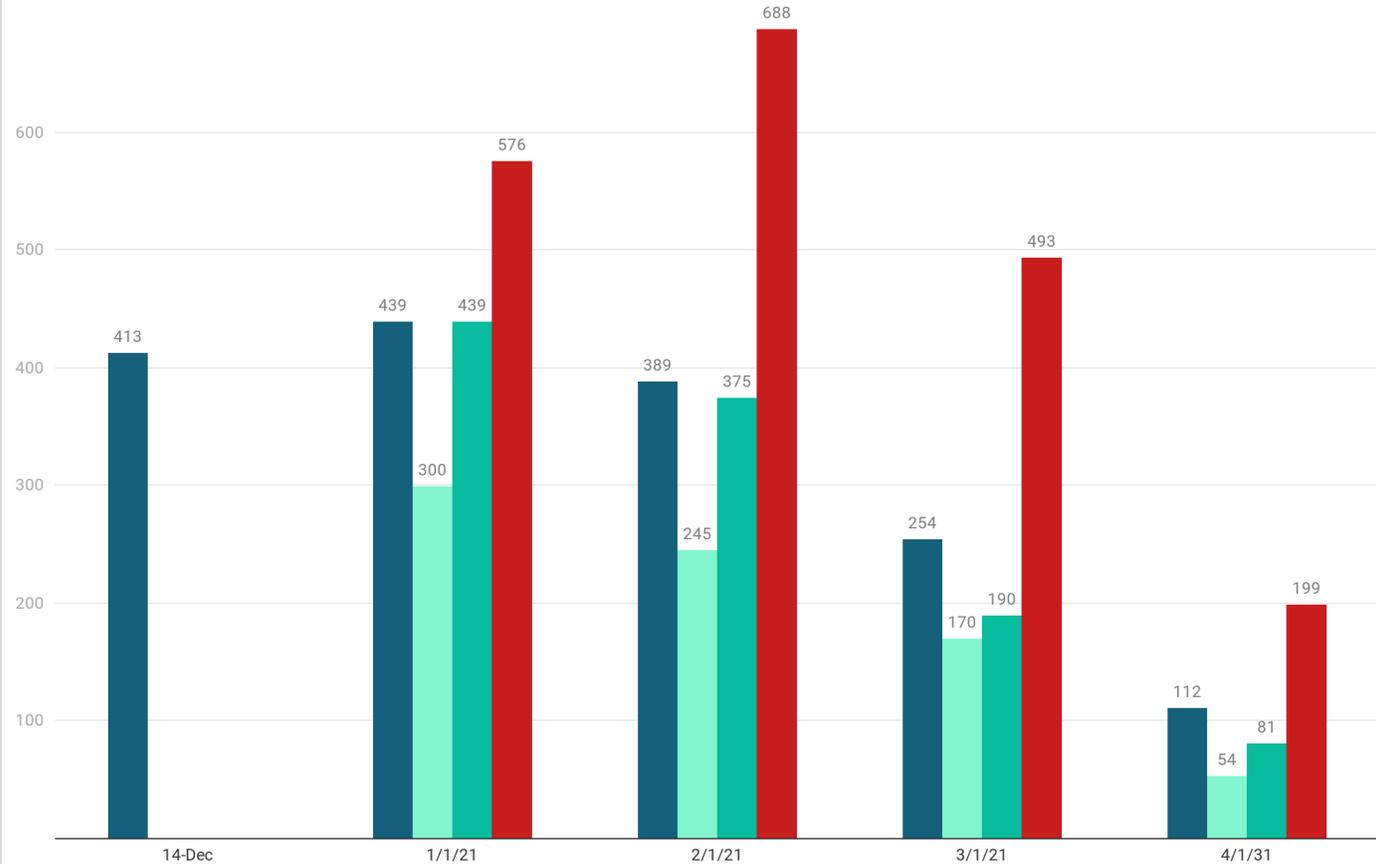
If restrictions are eased, IHME suggests that new infections could accelerate - not peaking until January 26

IHME is a strong advocate for heavy-restrictions, including mask mandates. This is reflected in the rapid decline in infections in this scenario

Estimated Daily Infections

Institute for Health Metrics and Evaluation (IHME) Projections

Projected Universal Masks Rapid Vaccine Rollout Eased Restrictions



As of December 10

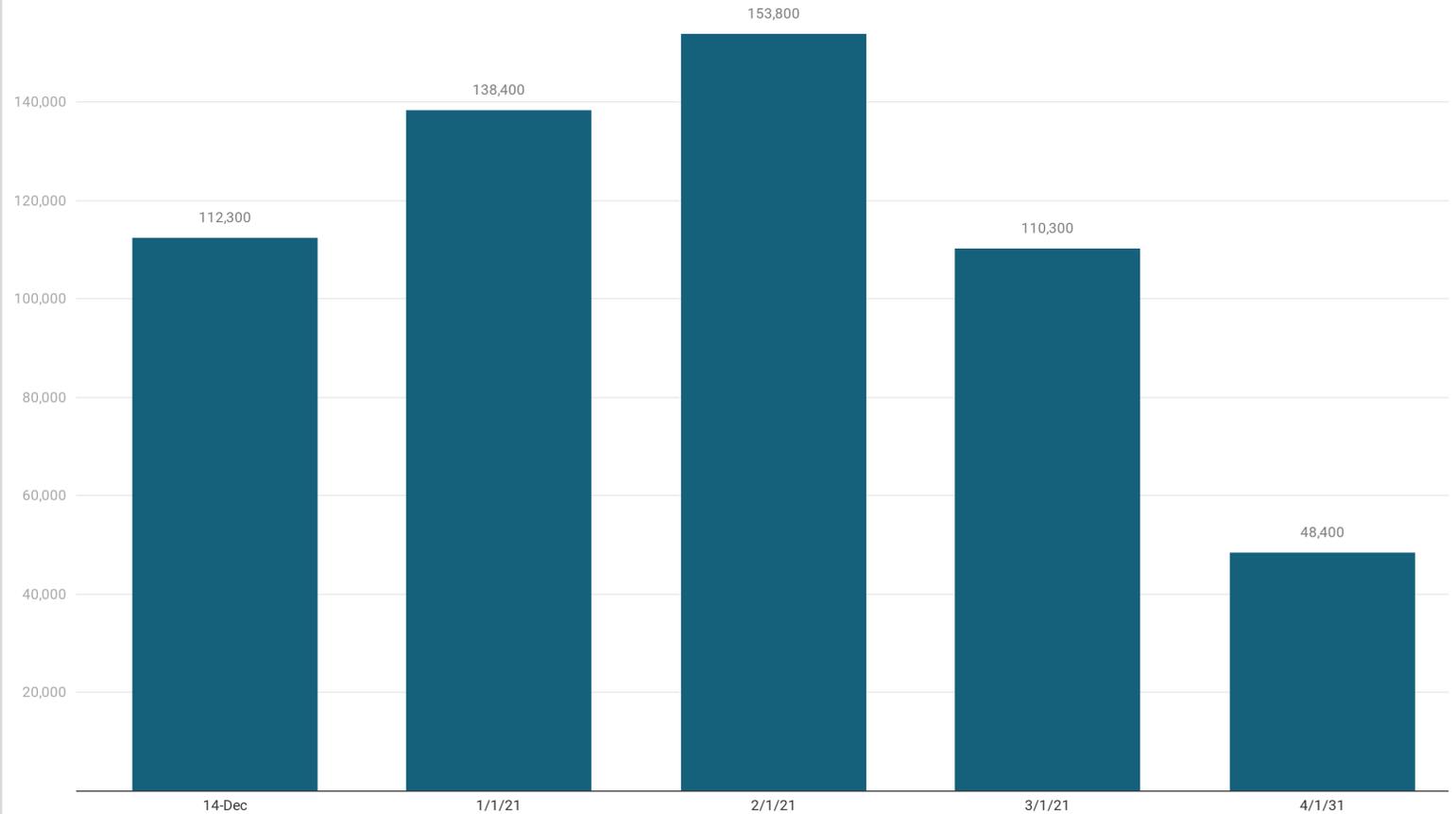
Chart: Health Industry Advisor LLC • Source: IHME • Created with Datawrapper

IHME projects the strain on hospital beds will intensify for the next six weeks, before peaking on January 27

This peak is projected to be nearly 40% higher than the current level

Projected Hospital Beds Occupied By Covid-19 Patients

Institute for Health Metrics and Evaluation (IHME) Projections



As of December 3

Chart: Health Industry Advisor LLC - Source: IHME - Created with Datawrapper

We are averaging ~632.5k new cases worldwide each day, as of Sunday

New cases in the United States appear to have leveled-off over the past 4-5 days. These are now averaging ~217k new cases each day

Outside the U.S. newly-detected cases have declined since November 10

* - 7-day moving average basis

Newly Detected Daily Cases - U.S. & Worldwide

7-Day Moving Average, As of December 15

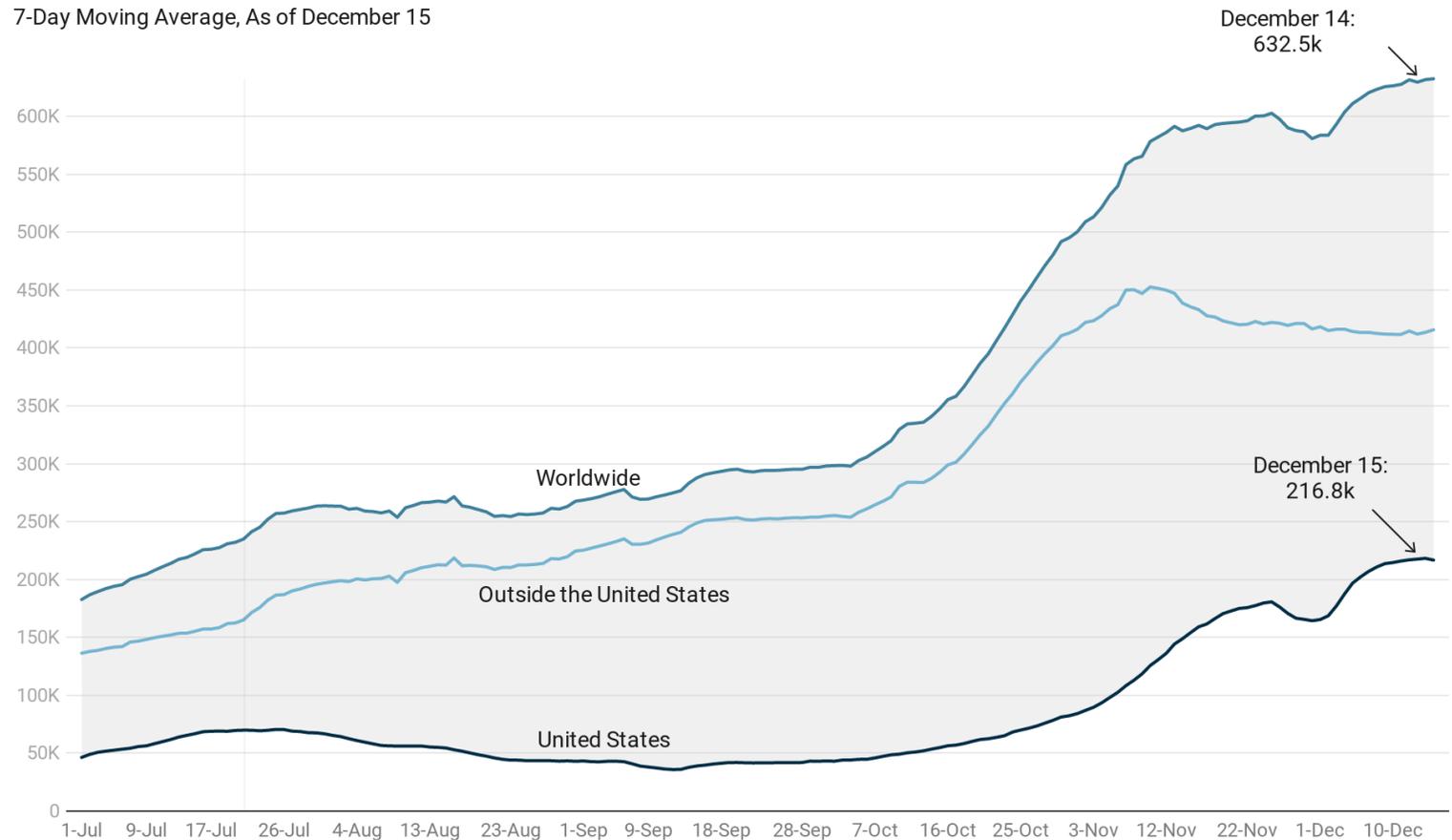


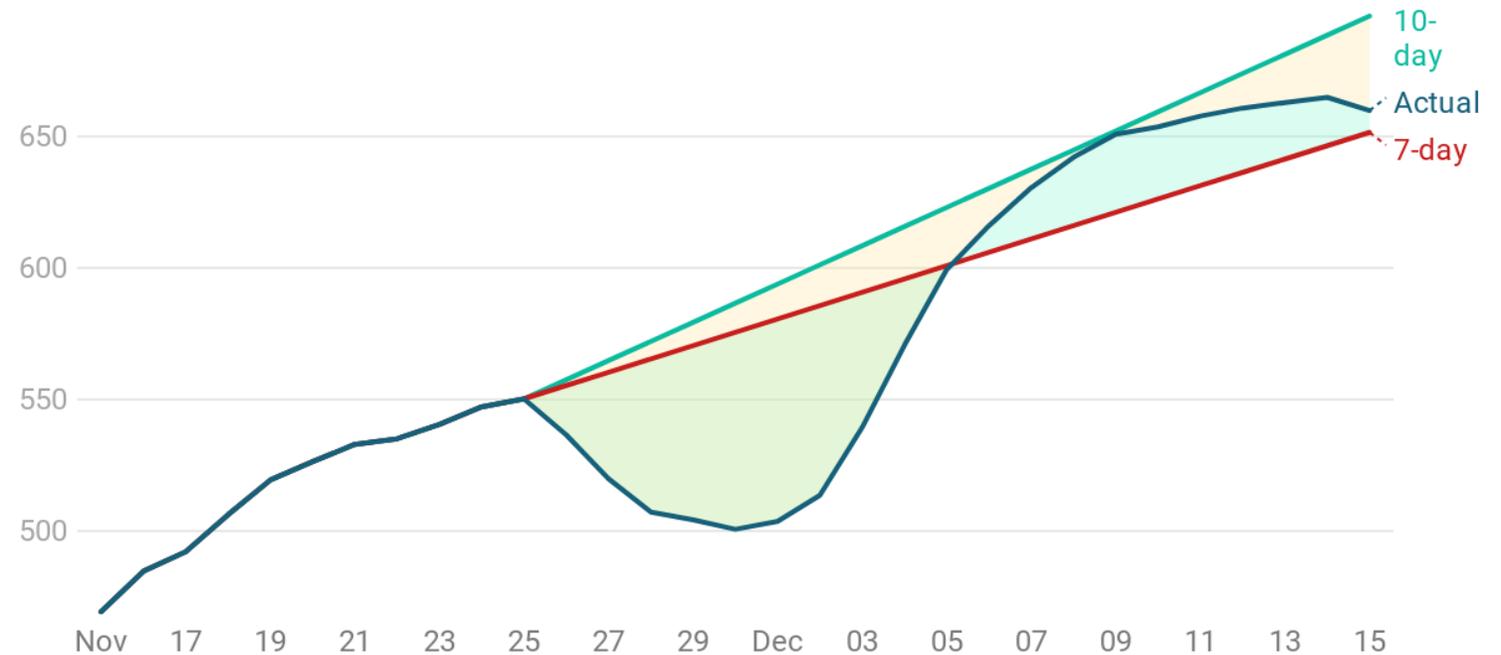
Chart: Health Industry Advisor LLC • Source: worldometers.info • Created with Datawrapper

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 returning to the 7-day pre-Thanksgiving trend (and, below the 10-day pre-Thanksgiving trend)

New Infections / Million

7-Day Moving Average v. Pre-Thanksgiving Trends



7- & 10-day trends are extrapolation of trends leading up to Thanksgiving Day

Chart: Health Industry Advisor LLC • Created with Datawrapper

Did Thanksgiving lead to a surge in infections in the U.S.?

Perhaps not . . . based on Gu's* estimates of the reproduction rate (R_t)

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

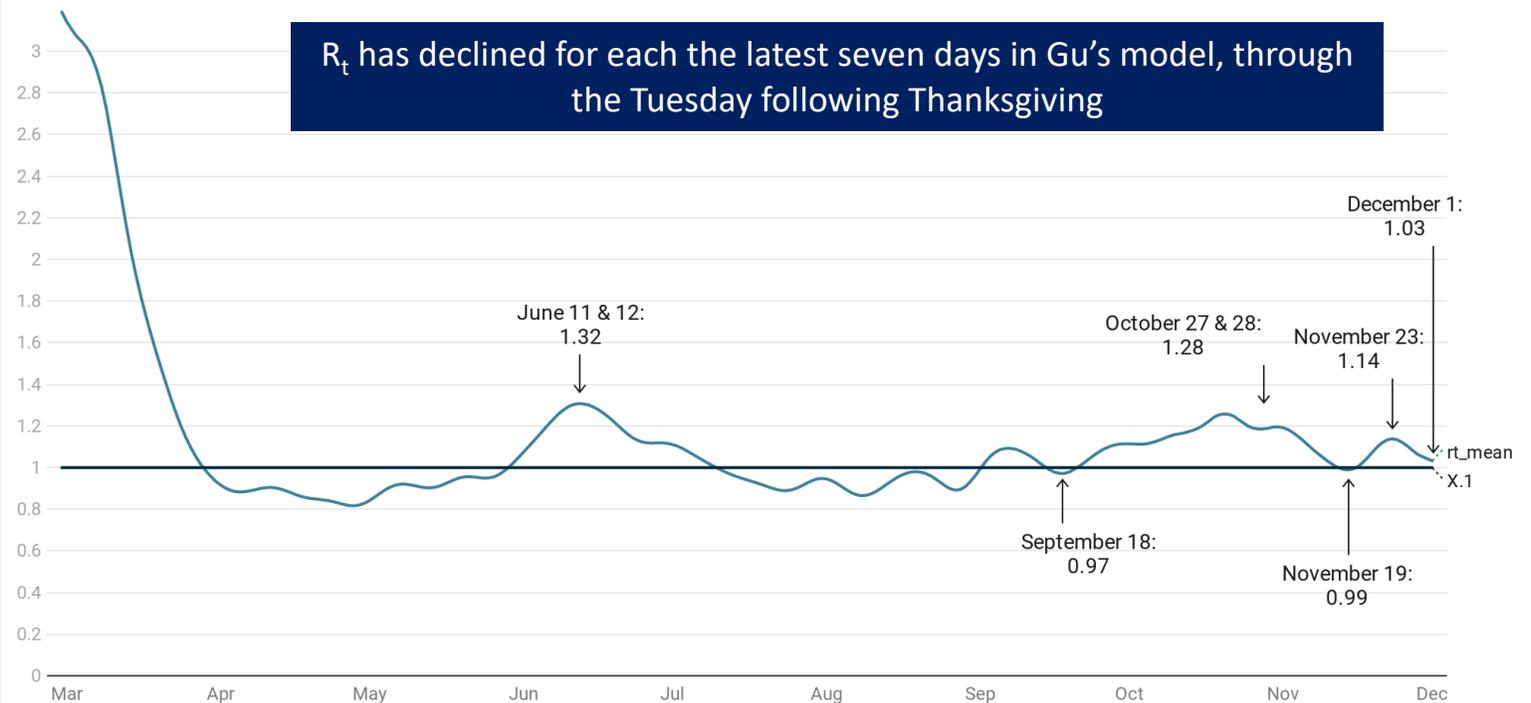
Gu backdates two weeks from the death date to estimate when an infection likely occurred

Using this model, the reproduction rate rose from November 19 to November 23, then declined each of the next eight days

* - Youyang Gu: Covid-19projections.com

Reproduction Rate (R_t) - U.S.

Youyang Gu Estimate, Through December 1



R_t is an estimate of how many additional people a single person will infect

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

Another way of looking at the momentum in new case growth in the U.S.:

The week-over-week change in new case began to decline on November 11. Reporting interruptions around the Thanksgiving holiday disrupted this pattern – temporarily.

Similarly, the *rate of change* in this week-over-week changes (i.e., its “derivative”) began to decline on November 6; this also was temporarily disrupted by the holiday reporting issues

Note the “derivative changes direction first, then the week-over-week change and, finally, the new cases measure

New Case Trends in the United States

Including “first” and “second derivative”

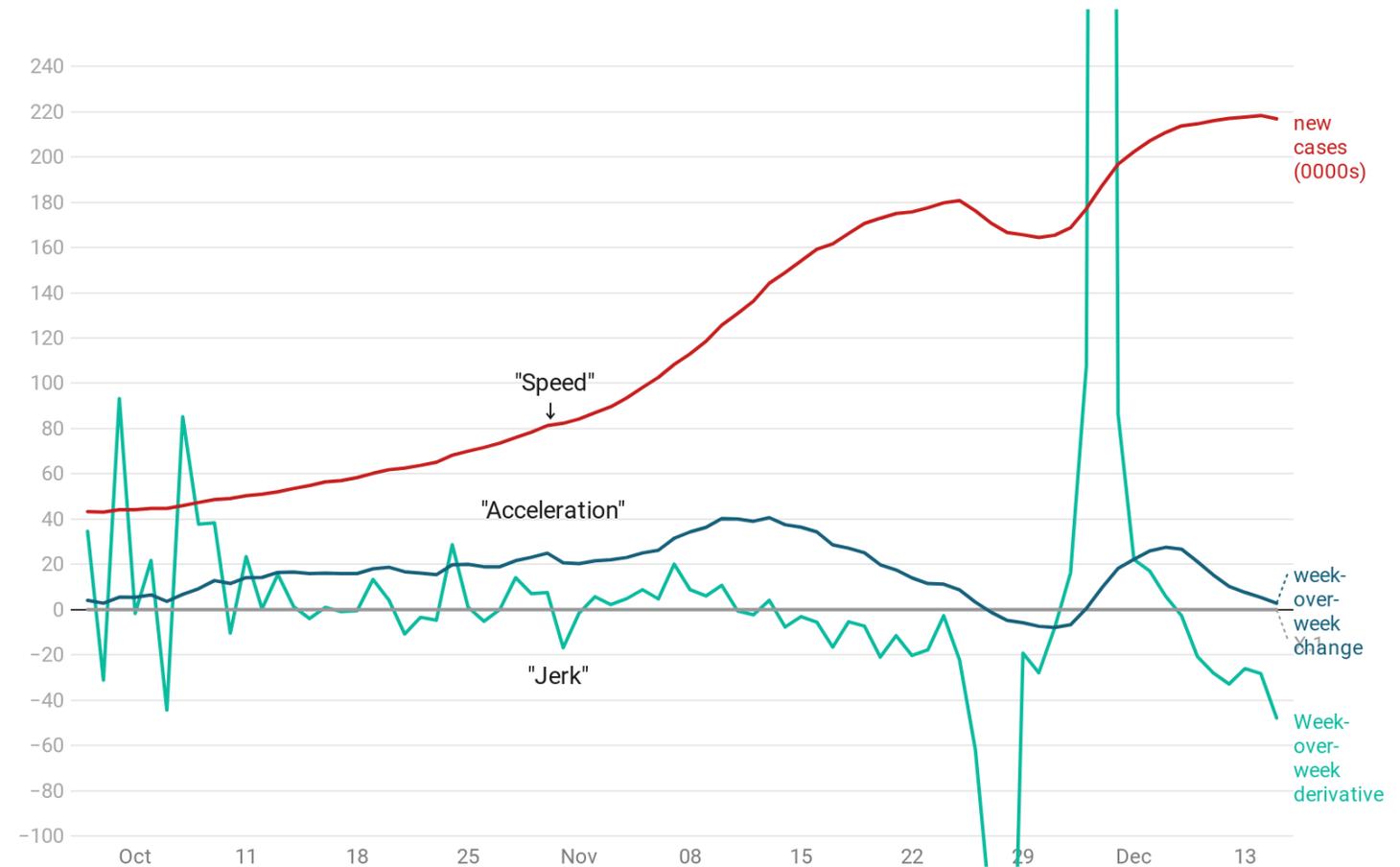


Chart: Health Industry Advisor LLC • Source: worlodmeters.info • Created with Datawrapper

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>
- Oliver Wyman Pandemic Navigator, <https://pandemicnavigator.oliverwyman.com/forecast?mode=country®ion=United%20States&panel=mortality>