COVID-19 Forecasts: Hospitalizations

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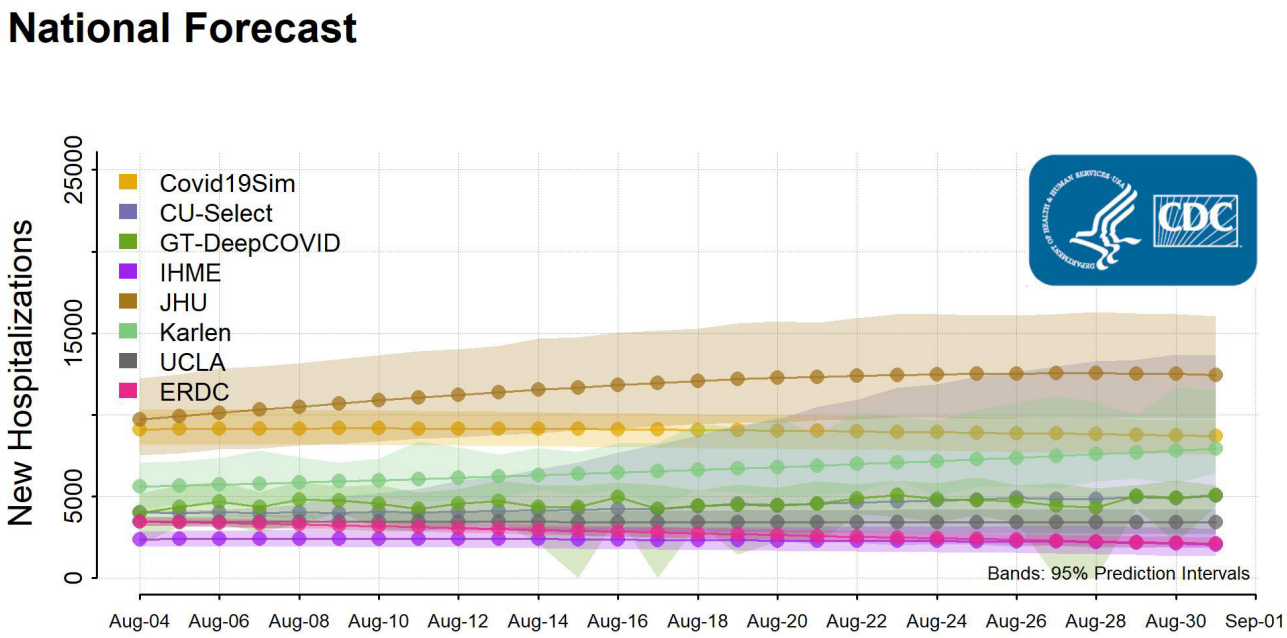
Interpretation of Forecasts of New Hospitalizations

- This week, three national forecasts predict a likely increase in the number of new hospitalizations per day over the next four weeks, two forecasts predict a likely decline, and three forecasts are either uncertain about the direction of the trend or predict stable numbers. For August 31, the forecasts estimate 2,000 to 12,000 new COVID-19 hospitalizations per day.
- State-level forecasts also show a high degree of variability, which results from multiple factors. Hospitalization forecasts use different sources of data for COVID-19 cases or deaths, with different limitations, and make different assumptions about social distancing.

National Forecasts



- The eight national forecasts show the predicted number of new COVID-19 hospitalizations per day for the next four weeks in the United States.
- The forecasts make different assumptions about hospitalization rates and levels of social distancing and other interventions and use different methods to estimate the number of new hospitalizations. See models below for details.

State Forecasts

Nine state-level models predicting the number of new hospitalizations were submitted this week. These forecasts show the predicted number of new COVID-19 hospitalizations per day for the next four weeks in each state. Each state forecast uses a different scale, due to differences in the number of new COVID-19 cases occurring per day in each state.

Download state forecasts [1 MB, 7 pages][1]

Download forecast data [2 MB]

Additional forecast data and information on forecast submission are available at the COVID-19 Forecasting Hub .

Forecast Assumptions

These forecasts make different assumptions about social distancing measures and use different methods and data sets to estimate the number of new hospitalizations. Individual models are described in more detail below.

Social distancing is incorporated into the forecasts in two different ways:

- The national and state-level forecasts from Columbia University, the COVID-19 Simulator Consortium, the Institute for Health Metrics and Evaluation (IHME), and the Johns Hopkins University Infectious Disease Dynamics Lab (JHU) make assumptions about how levels of social distancing will change in the future.
- The national and state-level forecasts from the Georgia Institute of Technology, College of Computing, the US Army Engineer Research and Development Center (ERDC), the Karlen Working Group, and the University of California, Los Angeles (UCLA), and state-level forecasts from the Los Alamos National Laboratory (LANL) assume that existing social distancing measures in each state will continue through the projected four-week time period.

The rate of new hospitalizations is estimated using four approaches:

- The forecasts from Columbia University, the COVID-19 Simulator Consortium, ERDC, JHU, LANL, and UCLA assume that a certain fraction of infected people will be hospitalized.
- The IHME forecast estimates hospitalizations based on numbers of forecasted deaths.
- The forecast from the Georgia Institute of Technology, College of Computing, uses COVID-19 hospitalization data reported by some states to forecast future hospitalizations.
- The Karlen Working Group uses the rate of reported infections to estimate the number of new hospitalizations in a given jurisdiction, unless the rates of reported infections and hospitalizations differ. In that case, the rate of reported hospitalizations is used to forecast new hospitalizations.

Modeling Groups

Forecasts were provided by these modeling groups:

Columbia University

Model name: CU-Select

Intervention assumptions:

- This model assumes that contact rates will increase 5% per week over the next two weeks. The reproductive number is then set to 1 for the remainder of the projection period.
- The model uses state-specific hospitalization data, when available. In states without hospitalization data, the model uses the national average value for hospitalization data.

Methods: Metapopulation SEIR model.

COVID-19 Simulator Consortium

Model name: Covid19Sim

Intervention assumptions:

- This model is based on assumptions about how levels of social distancing will change in the future.
- The number of new hospitalizations per day are estimated from the number of infections, using state-specific hospitalization rates.

Methods: SEIR model.

Georgia Institute of Technology, College of Computing

Model name: GA-DeepCOVID (formerly: GA_Tech)

Intervention assumptions:

- This model assumes that the effects of interventions are reflected in the observed data and will continue going forward.
- Daily hospitalizations are predicted from publicly available, state-level data sources.

Methods: Deep learning.

Institute of Health Metrics and Evaluation

Model name: IHME

Intervention assumptions:

- Projections are adjusted to reflect differences in aggregate population mobility and community mitigation policies.
- Daily hospitalizations are estimated from predictions of daily deaths, using state hospitalization rates, where available.

Methods: Combination of a mechanistic disease transmission model and a curve-fitting approach.

Johns Hopkins University, Infectious Disease Dynamics Lab

Model name: JHU

Intervention assumptions:

- This model assumes that the effectiveness of interventions is reduced after shelter-in-place orders are lifted.
- Daily hospitalizations are estimated from predictions of daily cases. A standard proportion is applied to all states.

Methods: Metapopulation SEIR model.

Karlen Working Group

Model name: Karlen

Intervention assumptions:

- This model assumes that the effects of interventions are reflected in the observed data and will continue going forward.
- The model uses state-specific hospitalization data. New hospitalizations are estimated from these data, or from the estimated number of new infections that will occur in each location.

Methods: Discrete time difference equations.

Los Alamos National Laboratory (state-level forecasts only)

Model name: LANL

Intervention assumptions:

- This model assumes interventions in place on the first day of the forecast will remain in place for the next four weeks.
- State demographics and age-group symptomatic case hospitalization rates are used to estimate the daily number of hospitalizations, based on estimates of the total number of infections.

Methods: Statistical dynamical growth model accounting for population susceptibility

US Army Engineer Research and Development Center

Model name: ERDC

Intervention assumptions:

- This model assumes that the effects of current interventions are reflected in the observed data and that those effects will continue going forward.
- The number of new hospitalizations per day are estimated from the number of infections, using state-specific hospitalization rates.

Methods: SEIR mechanistic model.

University of California, Los Angeles

Model name: UCLA

Intervention assumptions:

- This model assumes that contact rates will increase as states reopen. The increase in contact rates is calculated for each tate.
- The number of new hospitalizations per day are estimated from the number of infections, using state-specific hospitalization rates.

Methods: Modified SEIR model.

[1] The full range of the prediction intervals is not visible for all state plots. Please see the forecast data for the full range of state specific prediction intervals.

Additional Resources

Previous COVID-19 Hospitalization Forecasts

FAQ: COVID-19 Data and Surveillance

CDC COVID Data Tracker

COVID-19 Mathematical Modeling

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Content source: National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases