Centers for Disease Control and Prevention

COVID-19

COVID-19 Forecasting and Mathematical Modeling

Updated Feb. 16, 2023

Why COVID-19 Forecasting and Mathematical Modeling Are Important

CDC is working closely with state, tribal, local, and territorial health departments, and other public health partners, to respond to the COVID-19 pandemic. Forecasts of deaths, hospitalizations, and cases help inform public health decision making by projecting the likely impact of COVID-19 in the next few weeks. These forecasts are generated using mathematical models by CDC partners in the COVID-19 Forecast Hub ↗ . Forecasts are used to inform public health decisions about pandemic planning, resource allocation, implementation of social distancing measures, and other interventions.

Bringing Together Forecasts for COVID-19 Deaths, Hospitalizations, and Cases in the United States

CDC works with partners to bring together weekly forecasts based on statistical or mathematical models that aim to predict:

- National and state numbers of new and total COVID-19 deaths per week for the next 4 weeks.
- National and state numbers of new COVID-19 hospitalizations per day for the next 4 weeks.

Previously, forecasts also predicted the number of new COVID-19 cases per week. However, case forecasts were discontinued in February 2022, after a period of low reliability, and due to uncertainty about fraction of cases captured in the data amid changing testing practices. Archives of past case forecasts are available here.

Ensemble forecasts

Forecasting teams in the COVID-19 Forecasting Hub ↗ predict numbers of deaths, hospitalizations, and cases using different modeling methods, types of data (e.g., COVID-19 data, demographic data, mobility data), and estimates of the impacts of interventions (e.g., social distancing, use of face coverings). These forecasts are developed independently and shared publicly here ↗ . It is important to bring these forecasts together to help understand how they compare with each other and how much uncertainty there is about what may happen in the near future.

An "ensemble" forecast combines each of the independently developed forecasts into one aggregate forecast to improve prediction over the next 4 weeks. This article, *Ensemble Forecasts of Coronavirus Disease 2019 (COVID-19) in the U.S.* ↗ describes the "ensemble" forecast methodology and its usefulness as a real-time tool to help guide policy and planning.

Weekly forecasts submitted to CDC are posted on these websites:

- COVID-19 Forecasts: Deaths
- COVID-19 Forecasts: Hospitalizations

CDC COVID Data Tracker houses an interactive tool to see previous forecasts. The tool also has forecasts on weekly reported COVID-19 cases and cumulative and incident COVID-19 deaths in the United States.

Other Resources

COVID-19 Surge Tool

COVID-19 Pandemic Planning Scenarios

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