Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Coronavirus Disease 2019 (COVID-19)

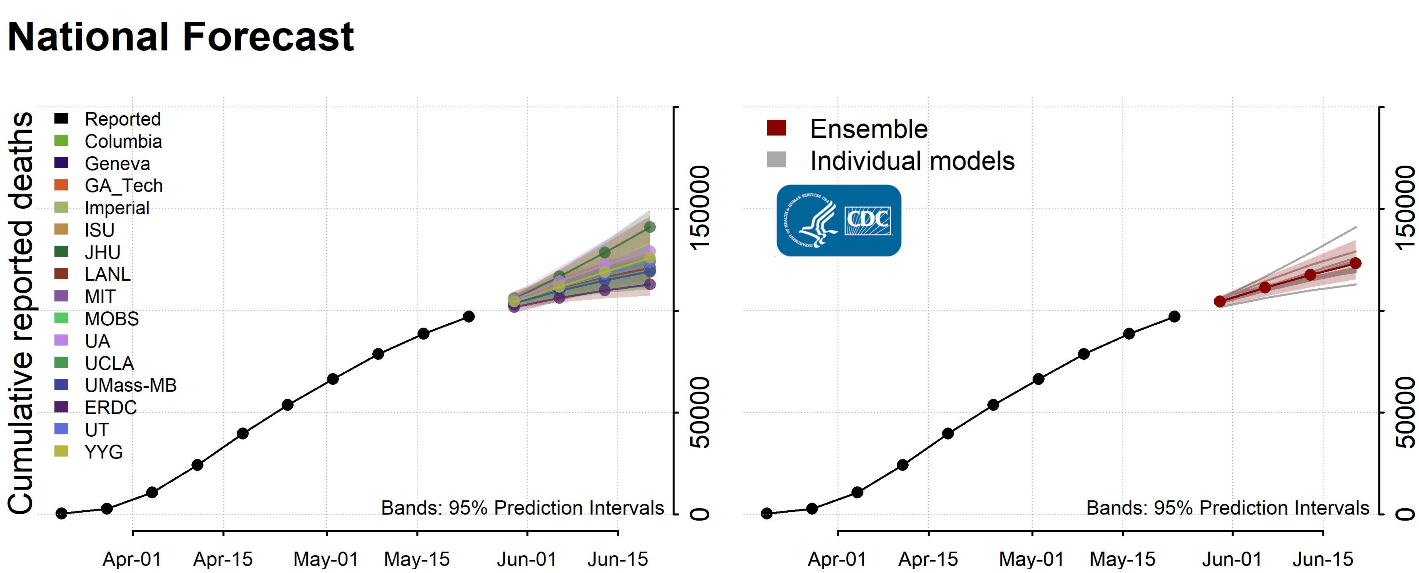
COVID-19 Forecasts: Cumulative Deaths

Updated May 28, 2020

Interpretation of Cumulative Death Forecasts

- This week CDC received 15 individual national forecasts.
- This week's national ensemble forecast indicates that the rate of increase in cumulative COVID-19 deaths is continuing to decline. Nevertheless, total COVID-19 deaths are likely to exceed 115,000 by June 20.
- Ensemble forecasts indicate that the rate of new deaths will vary among the states. In some states, cumulative deaths will increase at roughly the same rate as they have in recent weeks, while other states are likely to experience only a small number of additional deaths from COVID-19.

National Forecast



- These forecasts show cumulative reported COVID-19 deaths since February and forecasted deaths for the next four weeks in the United States.
- Models make various assumptions about the levels of social distancing and other interventions. See model descriptions below for details.

State Forecasts

State-level forecasts show observed and forecasted state-level cumulative COVID-19 deaths in the US. Each state forecast uses a different scale, due to differences in the numbers of COVID-19 deaths occurring in each state.

Forecasts fall into one of three categories

- The Auquan, CAN, ERDC, ISU, LANL and UMass-MB forecasts do not explicitly model the effects of individual social distancing measures but assume that implemented interventions will continue, resulting in decreased growth.
- The Geneva, GA_Tech, MIT, MOBS, UCLA, UA, and UT forecasts assume that existing social distancing measures will continue through the projected time period.
- The Columbia, JHU, and YYG forecasts forecasts make different assumptions about how levels of social distancing will change in the future.

Download state forecasts [12 pages]

Download forecast data [1 sheet]

Why Forecasting COVID-19 Deaths in the US is Critical

CDC is responding to a pandemic of coronavirus disease 2019 (COVID-19) caused by a novel coronavirus, SARS-CoV-2, that is spreading from person to person. The federal government is working closely with state, tribal, local, and territorial health departments, and other public health partners, to respond to this situation. Forecasts of deaths will help inform public health decision-making by projecting the likely impact in coming weeks.

What the Forecasts Aim to Predict

Forecasts based on statistical or mathematical models aim to predict changes in national- and state-level cumulative reported COVID-19 deaths for the next four weeks. Forecasting teams predict numbers of deaths using different types of data (e.g., COVID-19 data, demographic data, mobility data), methods (see below), and estimates of the impacts of interventions (e.g. social distancing, use of face coverings).

Working to Bring Together Forecasts for COVID-19 Deaths in the US

CDC works with partners to bring together weekly forecasts for COVID-19 deaths in one place. These forecasts have been developed independently and shared publicly. 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 upcoming four weeks.

Auquan Data Science (state-level forecasts only)

Model names: Auquan

Intervention assumptions: These projections do not make specific assumptions about which interventions have been implemented or will remain in place.

Methods: Fitted SEIR model

Columbia University

Model name: Columbia

Intervention assumptions: This model is based on assumptions about how levels of social distancing will change in the future. It assumes a 20% reduction in contact rates for each successive week that stay-at-home orders remain in place or are expected to remain in place. Once a state has re-opened, contact rates are assumed to increase by 5% each week.

Methods
Metapopulation SEIR model

COVID Act Now (state-level forecasts only)

Model name: CAN

Intervention assumptions: These projections do not make specific assumptions about which interventions have been implemented or will remain in place.

Methods: Fitted SEIR model

Georgia Institute of Technology

Model name: GA_Tech

Intervention Assumptions: This model assumes that the effects of interventions are reflected in the observed data and will continue going forward.

Methods: Deep learning

Imperial College, London (national-level forecasts only)

Model name: Imperial

Intervention Assumptions: These projections do not make specific assumptions about which interventions have been implemented or will remain in place.

Methods: Ensembles of mechanistic transmission models, fit to different parameter assumptions.

Iowa State University

Model name: ISU

Intervention Assumptions: These projections do not make specific assumptions about which interventions have been implemented or will remain in place.

Methods: Nonparametric spatiotemporal model

Johns Hopkins University

Model name: JHU

Intervention Assumptions: This model assumes that the effectiveness of interventions is reduced after shelter-in-place orders are lifted.

Methods: Stochastic metapopulation SEIR model

Los Alamos National Laboratory

Model name: LANL

Intervention assumptions: This model assumes that currently implemented interventions and corresponding reductions in transmission will continue, resulting in an overall decrease in the growth rate of COVID-19. Over the course of the forecast, the model assumes that the rate of growth will decrease over time.

Methods
Statistical dynamical growth model accounting for population susceptibility

Massachusetts Institute of Technology

Model name: MIT

Intervention Assumptions: The projections assume that current interventions will remain in place indefinitely.

Methods: SEIR model fit to reported death and case counts.

Northeastern University

Model name: MOBS (Laboratory for the Modeling of Biological and Socio-technical Systems)

Intervention assumptions: The projections assume that social distancing policies in place at the date of calibration are extended for the future weeks.

Methods: Metapopulation, age-structured SLIR model

University of Arizona

Model name: UA

Intervention assumptions: This model assumes that current interventions will remain in effect for at least four weeks after the forecasts are made.

Methods: Statistical Curve-Fitting Approach

University of California, Los Angeles

Model name: UCLA

Intervention assumptions: These projections assume that current interventions will not change during the forecasted period.

Methods: Modified SEIR model

University of Geneva / Swiss Data Science Center (national one-week ahead forecasts only)

Model name: Geneva

Intervention assumptions: The projections assume that social distancing policies in place at the date of calibration are extended for the future weeks.

Methods
Exponential and linear statistical models fit to the recent growth rate of cumulative deaths.

University of Massachusetts, Amherst

Model names: UMass-MB, Ensemble

Intervention assumptions:

- UMass-MB: These projections do not make specific assumptions about which interventions have been implemented or will remain in place.
- Ensemble: The national and state-level ensemble forecasts include models that assume certain social distancing measures will continue and models that assume those measures will not continue.

Methods:

- UMass-MB: Mechanistic Bayesian compartment model.
- Ensemble: Equal-weighted combination of 2 to 11 models, depending on the availability of national and state-level forecasts. To ensure consistency, the ensemble includes only models with 4 week-ahead forecasts and models that do not assign a significant probability to there being fewer cumulative deaths than have already been reported. Only one model was available for the forecasts for Guam and the Northern Mariana Islands.

University of Texas, Austin

Model name: UT

Intervention assumptions: This model estimates the extent of social distancing using geolocation data from mobile phones and assumes that the extent of social distancing does not change during the period of forecasting. The model is designed to predict confirmed COVID-19 deaths resulting from only a single wave of transmission.

Methods
Nonlinear Bayesian hierarchical regression with a negative-binomial model for daily variation in death rates.

US Army Engineer Research and Development Center

Model name: ERDC

Intervention assumptions: These projections assume that current interventions will not change during the forecasted period.

Methods: SEIR mechanistic model.

Youyang Gu (COVID-Projections)

Model name: YYG

Intervention assumptions: The model accounts for individual state-by-state re-openings and their impact on infections and deaths.

Methods
SEIS mechanistic model.

Additional Resources:

- Previous COVID-19 Forecasts
- FAQ: COVID-19 Data and Surveillance
- CDC COVID Data Tracker
- COVID-19 Mathematical Modeling

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