

# Analysis of the IHME COVID 19 Forecasting Model – June 2<sup>nd</sup> Update

ALLEN M. FEATHERSTONE, JULIA MADDOCK, AND JONATHAN FEATHERSTONE

KANSAS STATE UNIVERSITY



KANSAS STATE | Agricultural Economics  
UNIVERSITY

## Outline

- ❖ IHME revisions since May 26<sup>th</sup>
- ❖ A look at Kansas and United States mortality statistics
- ❖ Relaxing social distancing by State
- ❖ Changing model predictions
- ❖ Distribution of daily deaths compared to the March 26<sup>th</sup> model
- ❖ Cumulative deaths compared to the March 26<sup>th</sup> model



KANSAS STATE | Agricultural Economics  
UNIVERSITY

# Introduction

- The COVID 19 virus is having a major effect on the economy with the unemployment rate closing in on 20%
- Since the middle of March, more than 40 million U.S. workers filed for unemployment due to the shut down a significant share of the economy
- The Institute for Health Metrics and Evaluation (IHME) at the University of Washington is playing a large role in the formation of policy
  - The data used in this analysis is sourced from <http://www.healthdata.org/covid>
- It is important to document and understand the ex-post performance of the prediction model and the periodic revisions that are made in the predictive model
- This is an update of the May 26<sup>th</sup> discussion.



KANSAS STATE  
UNIVERSITY | Agricultural Economics

## Changes in the May 29<sup>th</sup> IHME Modeling Approach

- Revised the death model
- Use a spline function to log cumulative deaths versus log cumulative cases
- Death predictions made based on cases over time
- Unsmoothed daily deaths and the predicted daily deaths used to fit a spline
- Sample standard deviation developed using 1,000 drawn from the residuals
- Argued to be more robust for locations with smaller epidemics
- Paper is still in the peer review process



KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Kansas COVID Deaths by Age Group

| Age Group   | Number of Deaths | Percent of COVID Deaths | 2018 Mortality Rates |
|-------------|------------------|-------------------------|----------------------|
| 35-44 years | 6                | 2.8%                    | 2.5%                 |
| 45-54 years | 9                | 4.1%                    | 4.8%                 |
| 55-64 years | 31               | 14.3%                   | 12.8%                |
| 65-74 years | 41               | 18.9%                   | 18.2%                |
| 75-84 years | 48               | 22.1%                   | 23.4%                |
| 85+ years   | 82               | 37.8%                   | 34.2%                |
| Total       | 217              | 100%                    | 95.8%                |

<https://www.coronavirus.kdheks.gov/160/COVID-19-in-Kansas>, June 2, 2020

[https://www.kdheks.gov/phi/AS\\_Tables/AS\\_2018\\_Tables\\_and\\_Figures/general\\_mortality/Table\\_E4.pdf](https://www.kdheks.gov/phi/AS_Tables/AS_2018_Tables_and_Figures/general_mortality/Table_E4.pdf), June 2, 2020



**KANSAS STATE** | Agricultural Economics  
UNIVERSITY

# U.S. COVID Deaths by Age Group

| Age Group   | Number of Deaths | Percent of COVID Deaths | 2017 Mortality Rates |
|-------------|------------------|-------------------------|----------------------|
| 15-24 years | 93               | 0.1%                    | 0.2%                 |
| 25-34 years | 542              | 0.7%                    | 1.1%                 |
| 35-44 years | 1,403            | 1.7%                    | 2.1%                 |
| 45-54 years | 3,893            | 4.8%                    | 6.0%                 |
| 55-64 years | 9,776            | 12.0%                   | 13.2%                |
| 65-74 years | 16,981           | 20.9%                   | 18.9%                |
| 75-84 years | 21,822           | 26.8%                   | 23.4%                |
| 85+ years   | 26,843           | 33.0%                   | 31.2%                |
| Total       | 81,372           | 99.98%                  | 98.87%               |

<https://data.cdc.gov/NCHS/Provisional-COVID-19-Death-Counts-by-Sex-Age-and-S/9bhg-hcku>, June 2, 2020



**KANSAS STATE** | Agricultural Economics  
UNIVERSITY

# Kansas COVID and General Mortality by Age Group

| Age Group    | COVID Deaths | COVID Deaths per 1000 | 2018 Mortality Rate per 1000 |
|--------------|--------------|-----------------------|------------------------------|
| Under 1 year | 0            | 0.00                  | 6.3                          |
| 1-24 years   | 0            | 0.00                  | 1.2                          |
| 25-34 years  | 0            | 0.00                  | 1.3                          |
| 35-44 years  | 6            | 0.02                  | 1.9                          |
| 45-54 years  | 9            | 0.03                  | 3.9                          |
| 55-64 years  | 31           | 0.08                  | 9.3                          |
| 65-74 years  | 41           | 0.16                  | 18.9                         |
| 75-84 years  | 48           | 0.36                  | 47.5                         |
| 85+ years    | 82           | 1.25                  | 142.1                        |

<https://www.coronavirus.kdheks.gov/160/COVID-19-in-Kansas>, June 2, 2020

[https://www.kdheks.gov/phi/AS\\_Tables/AS\\_2018\\_Tables\\_and\\_Figures/general\\_mortality/](https://www.kdheks.gov/phi/AS_Tables/AS_2018_Tables_and_Figures/general_mortality/), June 2, 2020



**AgManager**.info

**KANSAS STATE**  
UNIVERSITY

Agricultural Economics

# U.S. COVID and General Mortality by Age Group

| Age Group    | COVID Deaths | COVID Deaths per 1000 | 2018 Mortality Rate per 1000 |
|--------------|--------------|-----------------------|------------------------------|
| Under 1 year | 5            | 0.00                  | 5.67                         |
| 1-14 years   | 14           | 0.00                  | 0.17                         |
| 15-24 years  | 93           | 0.00                  | 0.74                         |
| 25-34 years  | 542          | 0.01                  | 1.33                         |
| 35-44 years  | 1,403        | 0.03                  | 1.95                         |
| 45-54 years  | 3,893        | 0.09                  | 4.02                         |
| 55-64 years  | 9,776        | 0.23                  | 8.86                         |
| 65-74 years  | 16,981       | 0.57                  | 17.91                        |
| 75-84 years  | 21,822       | 1.48                  | 44.73                        |
| 85+ years    | 26,843       | 4.15                  | 135.74                       |

<https://data.cdc.gov/NCHS/Provisional-COVID-19-Death-Counts-by-Sex-Age-and-S/9bhg-hcku>, June 2, 2020



**AgManager**.info

**KANSAS STATE**  
UNIVERSITY

Agricultural Economics

# Relaxing of Social Distancing by State from the IHME

|             | Stay at Home | Business Closure | Gathering Restrictions |           | Stay at Home | Business Closure | Gathering Restrictions |
|-------------|--------------|------------------|------------------------|-----------|--------------|------------------|------------------------|
| Alabama     | April 30     |                  |                        | Hawaii    |              |                  |                        |
| Alaska      | April 24     | May 22           | May 22                 | Idaho     | May 1        |                  | May 1                  |
| Arizona     | May 16       | May 16           | May 16                 | Illinois  |              |                  |                        |
| Arkansas    | n/a          |                  |                        | Indiana   | May 18       |                  |                        |
| California  |              |                  |                        | Iowa      | n/a          |                  |                        |
| Colorado    | May 9        |                  |                        | Kansas    | May 4        |                  |                        |
| Connecticut | n/a          |                  |                        | Kentucky  | n/a          |                  |                        |
| Delaware    |              |                  |                        | Louisiana | May 15       |                  | May 15                 |
| Florida     | May 18       |                  |                        | Maine     |              |                  |                        |
| Georgia     | May 1        |                  |                        | Maryland  |              |                  |                        |



KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Relaxing of Social Distancing by State from the IHME

|               | Stay at Home | Business Closure | Gathering Restrictions |                | Stay at Home | Business Closure | Gathering Restrictions |
|---------------|--------------|------------------|------------------------|----------------|--------------|------------------|------------------------|
| Massachusetts | n/a          |                  |                        | New Mexico     | n/a          |                  |                        |
| Michigan      |              |                  |                        | New York       |              |                  |                        |
| Minnesota     | May 18       |                  |                        | North Carolina | May 8        |                  |                        |
| Mississippi   | April 27     |                  |                        | North Dakota   | n/a          |                  | n/a                    |
| Missouri      | May 15       |                  |                        | Ohio           |              |                  |                        |
| Montana       | April 26     |                  |                        | Oklahoma       | n/a          |                  | May 24                 |
| Nebraska      | n/a          |                  |                        | Oregon         |              |                  |                        |
| Nevada        | May 9        |                  |                        | Pennsylvania   | May 8        |                  |                        |
| New Hampshire |              |                  |                        | Rhode Island   | May 9        |                  |                        |
| New Jersey    |              |                  |                        | South Carolina | May 4        |                  |                        |



KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Relaxing of Social Distancing by State from the IHME

|              | Stay at Home | Business Closure | Gathering Restrictions |               | Stay at Home | Business Closure | Gathering Restrictions |
|--------------|--------------|------------------|------------------------|---------------|--------------|------------------|------------------------|
| South Dakota | n/a          | n/a              | April 28               | Virginia      |              |                  |                        |
| Tennessee    | April 29     |                  |                        | Washington    |              |                  |                        |
| Texas        | May 1        |                  |                        | West Virginia | May 4        |                  |                        |
| Utah         | n/a          |                  |                        | Wisconsin     | May 13       |                  |                        |
| Vermont      | May 15       |                  |                        | Wyoming       | n/a          | May 15           |                        |



KANSAS STATE | Agricultural Economics  
UNIVERSITY

## Cumulative Death Change from the Original Model to the May 4, May 18 and the May 29 Release

|             | % Change 5/4 | % Change 5/18 | % Change 5/29 |           | % Change 5/4 | % Change 5/18 | % Change 5/29 |
|-------------|--------------|---------------|---------------|-----------|--------------|---------------|---------------|
| Alabama     | 33.3%        | -30.2%        | -51.9%        | Hawaii    | -93.8%       | -95.1%        | -95.5%        |
| Alaska      | -96.1%       | -97.7%        | -91.9%        | Idaho     | -0.7%        | -3.2%         | 16.7%         |
| Arizona     | -35.4%       | 282.7%        | 65.2%         | Illinois  | 169.2%       | 272.0%        | 169.9%        |
| Arkansas    | -77.5%       | -84.9%        | -20.1%        | Indiana   | 564.9%       | 155.1%        | 150.1%        |
| California  | 8.4%         | 58.9%         | 200.8%        | Iowa      | 998.6%       | 657.1%        | 654.9%        |
| Colorado    | -37.9%       | 6.0%          | 60.7%         | Kansas    | -61.5%       | -52.4%        | -67.0%        |
| Connecticut | 970.6%       | 1,185.6%      | 1,024.6%      | Kentucky  | -11.2%       | -16.1%        | -10.8%        |
| Delaware    | -34.5%       | -34.7%        | -50.1%        | Louisiana | 48.7%        | 65.5%         | 55.3%         |
| Florida     | -41.3%       | -30.2%        | -45.2%        | Maine     | -97.2%       | -97.4%        | -94.4%        |
| Georgia     | 76.9%        | -14.3%        | -0.63%        | Maryland  | 87.0%        | 272.6%        | 146.3%        |



KANSAS STATE | Agricultural Economics  
UNIVERSITY

## Cumulative Death Change from the Original Model to the May 4, May 18 and the May 29 Release

|               | % Change<br>5/4 | % Change<br>5/18 | % Change<br>5/29 |                | % Change<br>5/4 | % Change<br>5/18 | % Change<br>5/29 |
|---------------|-----------------|------------------|------------------|----------------|-----------------|------------------|------------------|
| Massachusetts | 331.9%          | 402.1%           | 405.1%           | New Mexico     | -16.3%          | 1.1%             | 8.1%             |
| Michigan      | 147.4%          | 111.2%           | 109.2%           | New York       | 106.7%          | 106.7%           | 101.3%           |
| Minnesota     | 1.7%            | -15.5%           | -20.2%           | North Carolina | -32.1%          | 46.7%            | -12.6%           |
| Mississippi   | -78.9%          | -57.0%           | -58.7%           | North Dakota   | -77.9%          | -22.7%           | -43.9%           |
| Missouri      | 17.9%           | 42.8%            | -5.6%            | Ohio           | 112.1%          | 146.3%           | 168.3%           |
| Montana       | -95.3%          | -95.7%           | -94.3%           | Oklahoma       | -57.0%          | -68.0%           | -68.6%           |
| Nebraska      | -10.4%          | -42.7%           | 12.1%            | Oregon         | -58.9%          | -50.7%           | -62.3%           |
| Nevada        | -15.4%          | 7.3%             | 21.8%            | Pennsylvania   | 445.2%          | 509.6%           | 306.5%           |
| New Hampshire | -52.1%          | -10.2%           | -0.3%            | Rhode Island   | 58.6%           | 153.5%           | 278.9%           |
| New Jersey    | 665.3%          | 571.2%           | 499.9%           | South Carolina | 6.6%            | -53.5%           | -29.6%           |



KANSAS STATE | Agricultural Economics  
UNIVERSITY

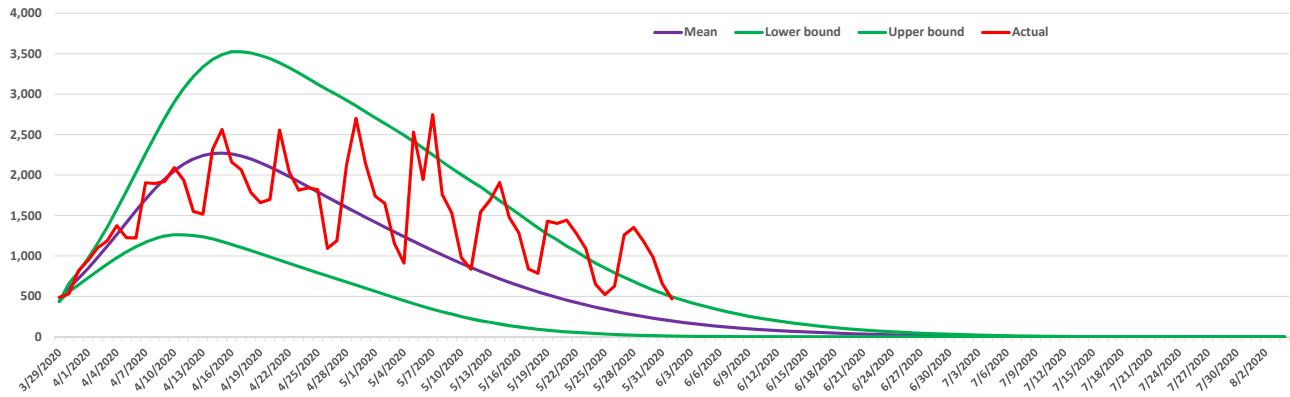
## Cumulative Death Change from the Original Model to the May 4, May 18 and the May 29 Release

|               | % Change<br>5/4 | % Change<br>5/18 | % Change<br>5/29 |               | % Change<br>5/4 | % Change<br>5/18 | % Change<br>5/29 |
|---------------|-----------------|------------------|------------------|---------------|-----------------|------------------|------------------|
| South Dakota  | 36.8%           | -38.3%           | -60.3%           | Virginia      | -41.7%          | -3.6%            | 25.4%            |
| Tennessee     | -47.3%          | -54.1%           | -31.2%           | Washington    | -30.6%          | -24.4%           | -28.1%           |
| Texas         | -12.5%          | -10.6%           | -51.2%           | West Virginia | -77.8%          | -80.4%           | -80.4%           |
| Utah          | -82.9%          | -70.1%           | -56.2%           | Wisconsin     | -45.2%          | -43.9%           | -39.0%           |
| Vermont       | -43.4%          | -48.2%           | -40.3%           | Wyoming       | -95.4%          | -97.0%           | -70.9%           |
| United States | 63.7%           | 74.5%            | 64.5%            |               |                 |                  |                  |



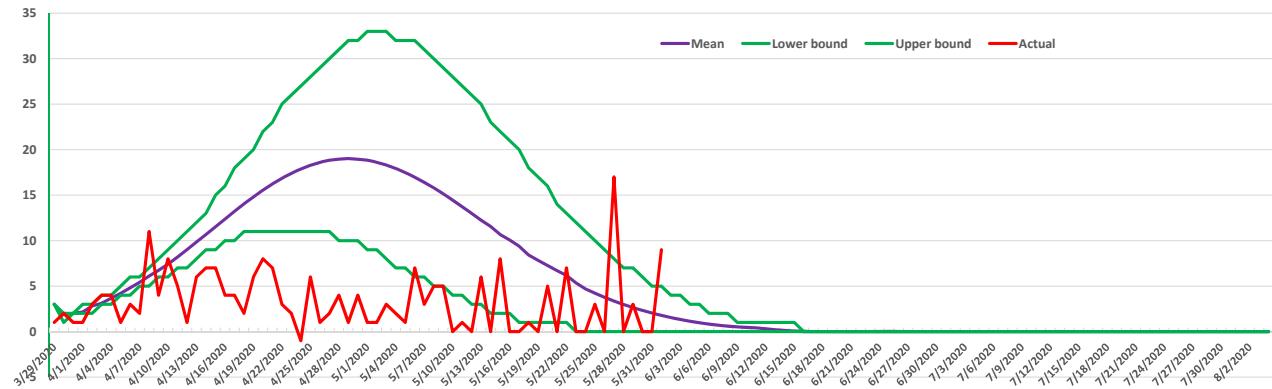
KANSAS STATE | Agricultural Economics  
UNIVERSITY

# U.S. COVID 19 Daily Death Projections March 26



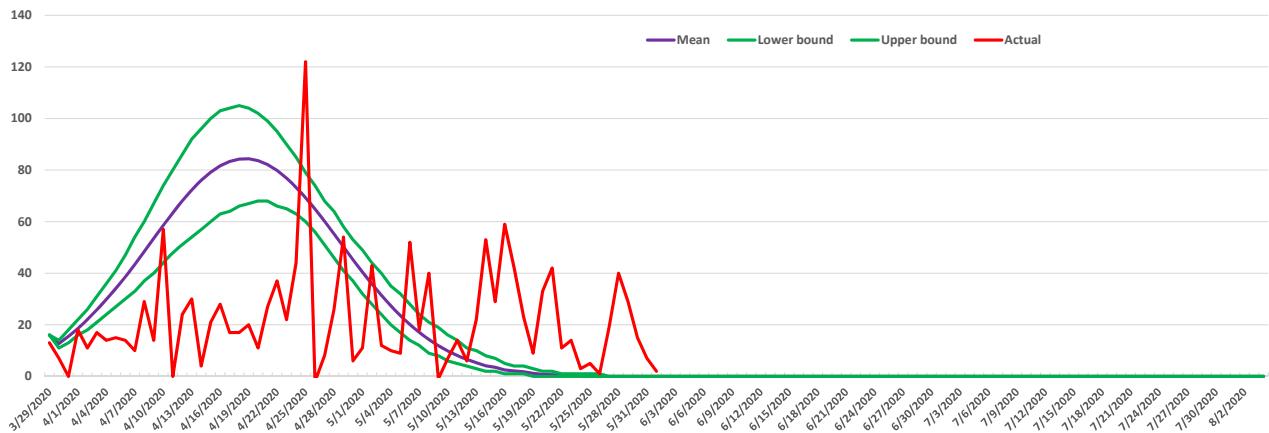
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Kansas COVID 19 Daily Death Projections March 26



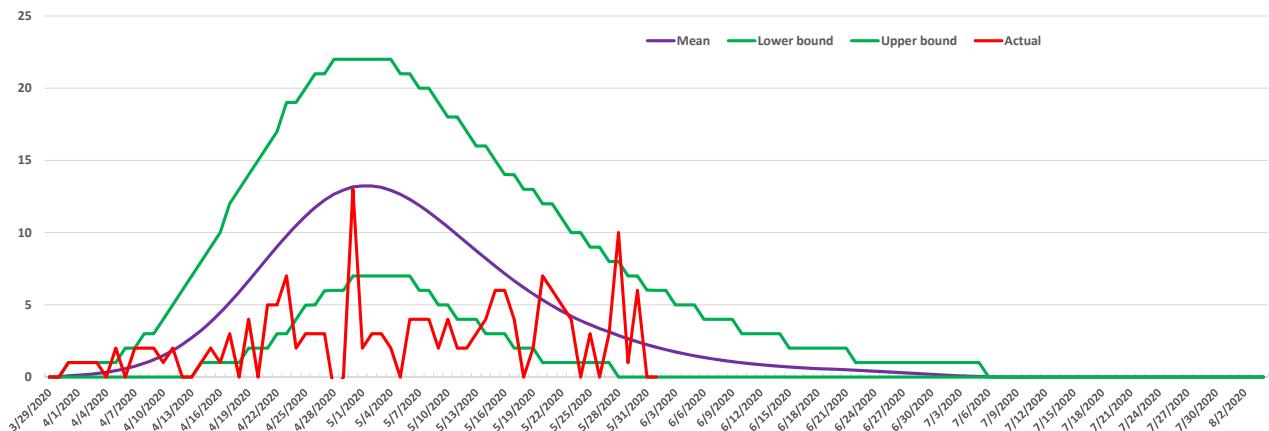
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Colorado COVID 19 Daily Death Projections March 26



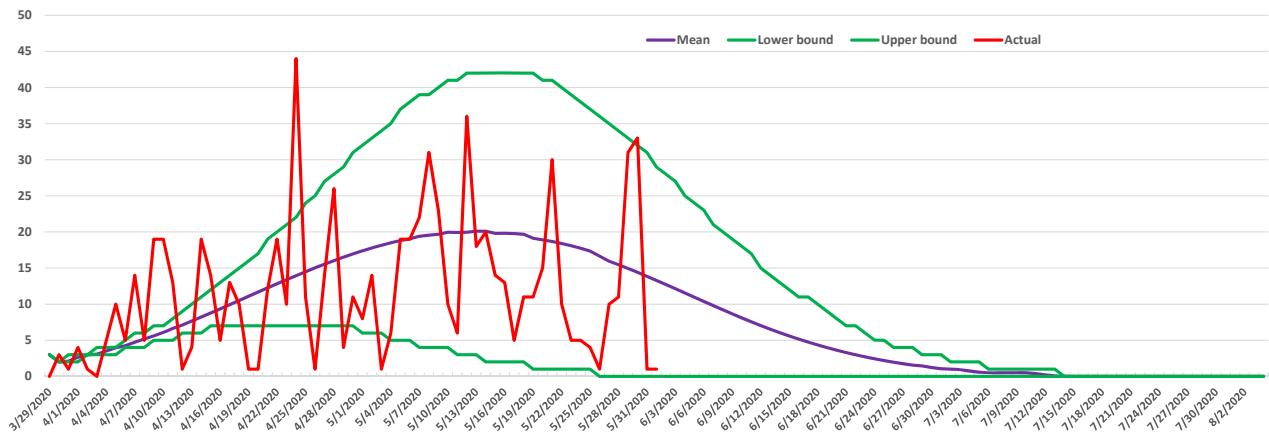
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Nebraska COVID 19 Daily Death Projections March 26



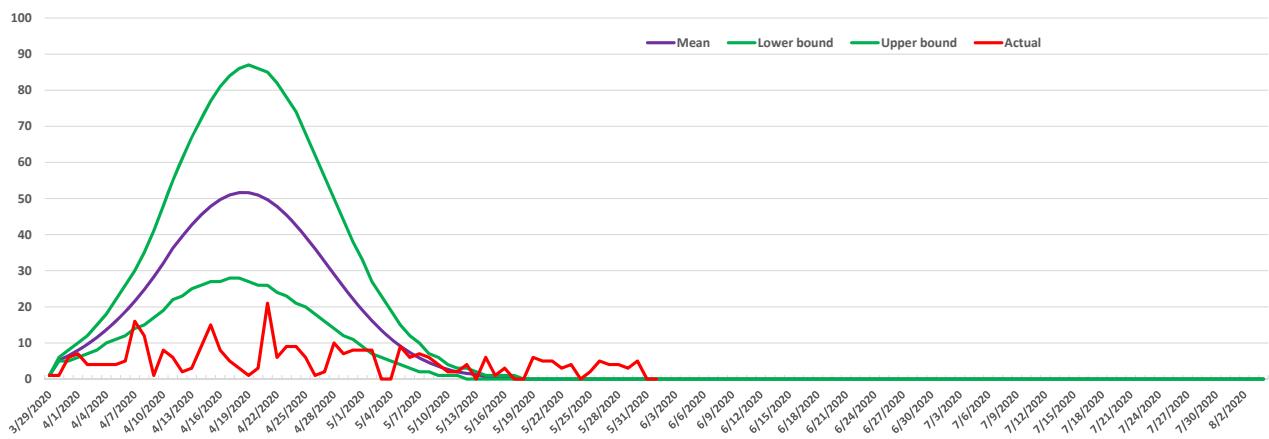
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Missouri COVID 19 Daily Death Projections March 26



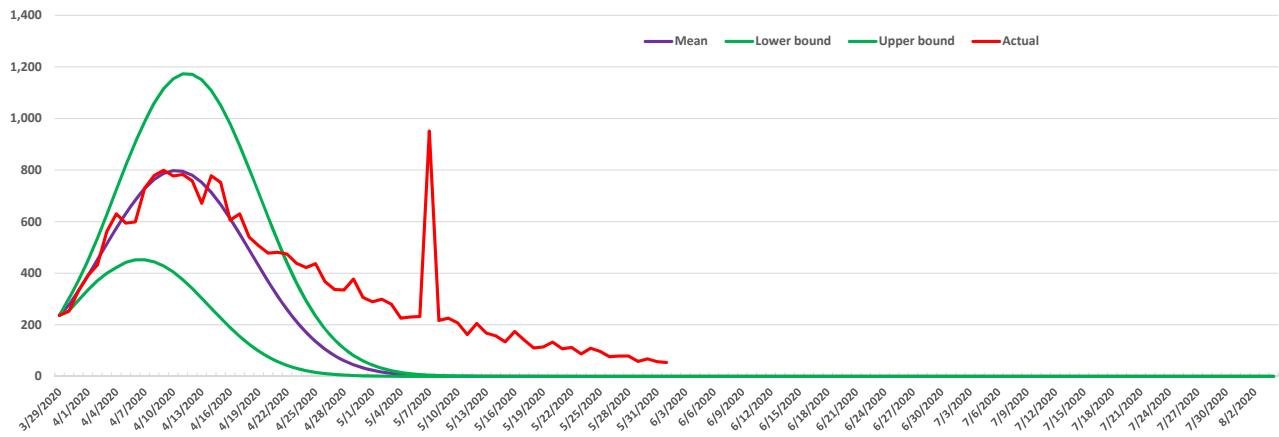
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Oklahoma COVID 19 Daily Death Projections March 26



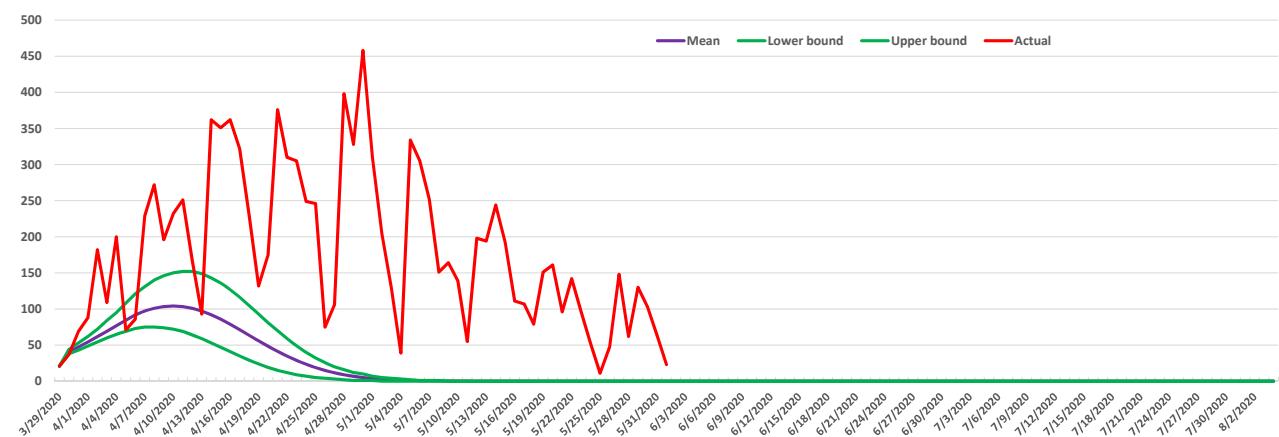
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# New York COVID 19 Daily Death Projections March 26



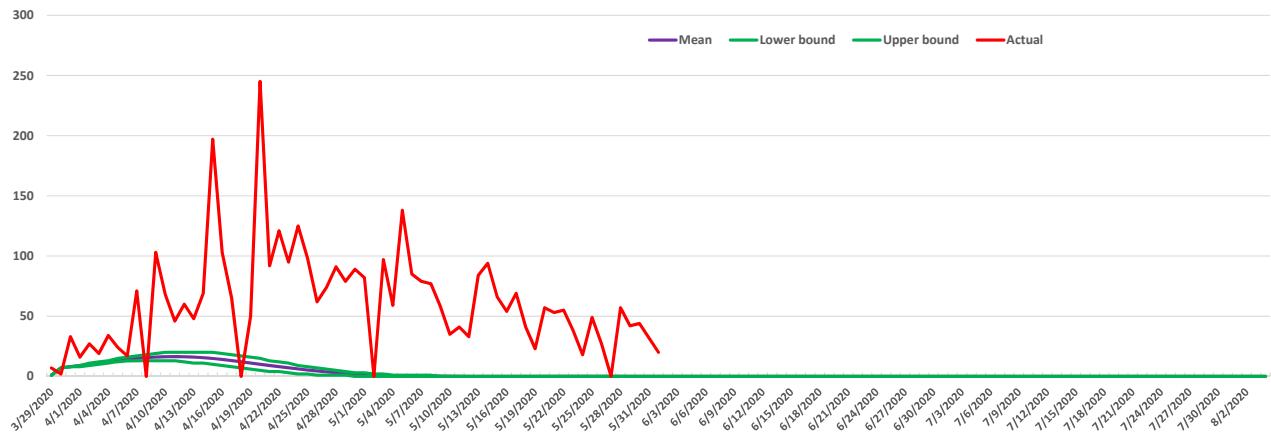
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# New Jersey COVID 19 Daily Death Projections March 26



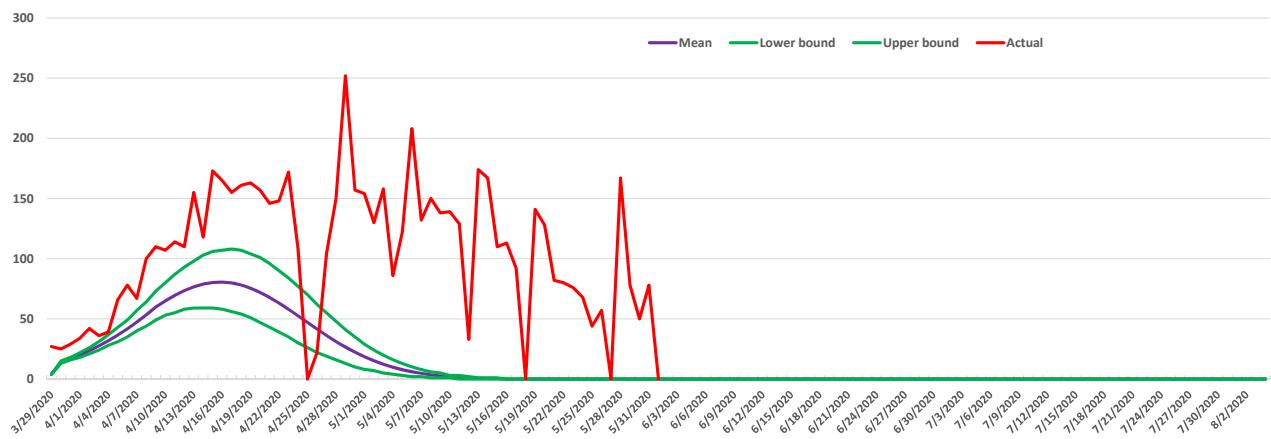
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Connecticut COVID 19 Daily Death Projections March 26



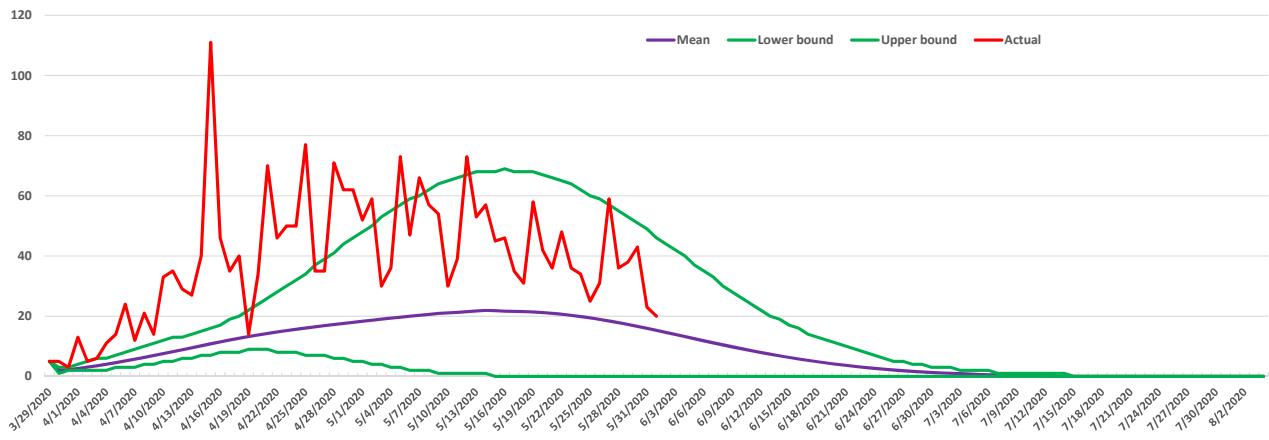
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Massachusetts COVID 19 Daily Death Projections March 26



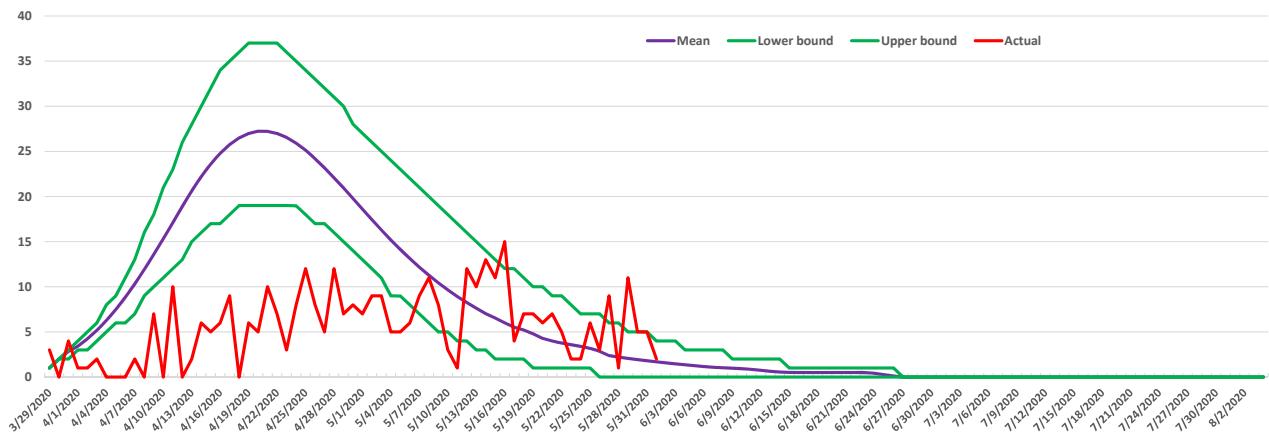
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Maryland COVID 19 Daily Death Projections March 26



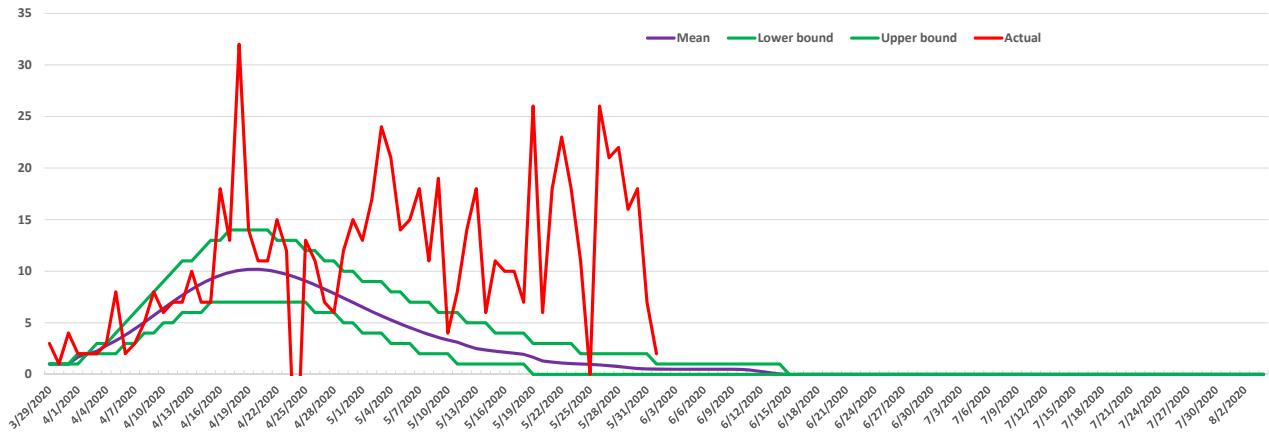
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Delaware COVID 19 Daily Death Projections March 26



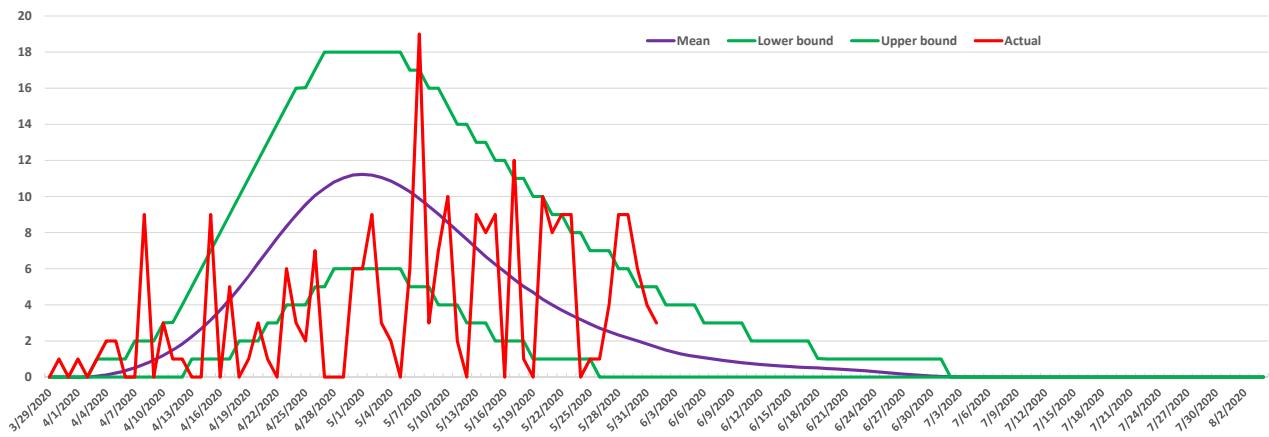
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Rhode Island COVID 19 Daily Death Projections March 26



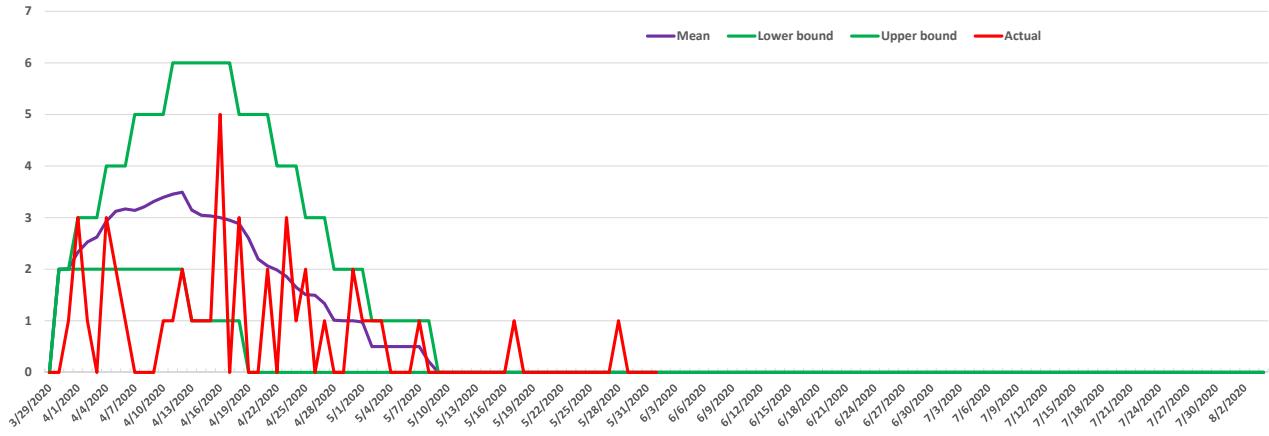
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# New Hampshire COVID 19 Daily Death Projections March 26



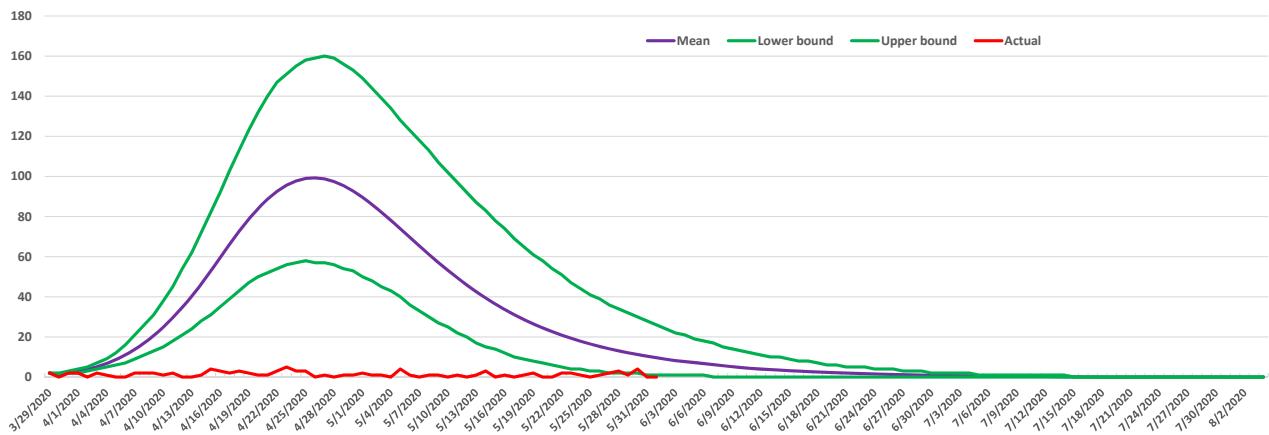
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Vermont COVID 19 Daily Death Projections March 26



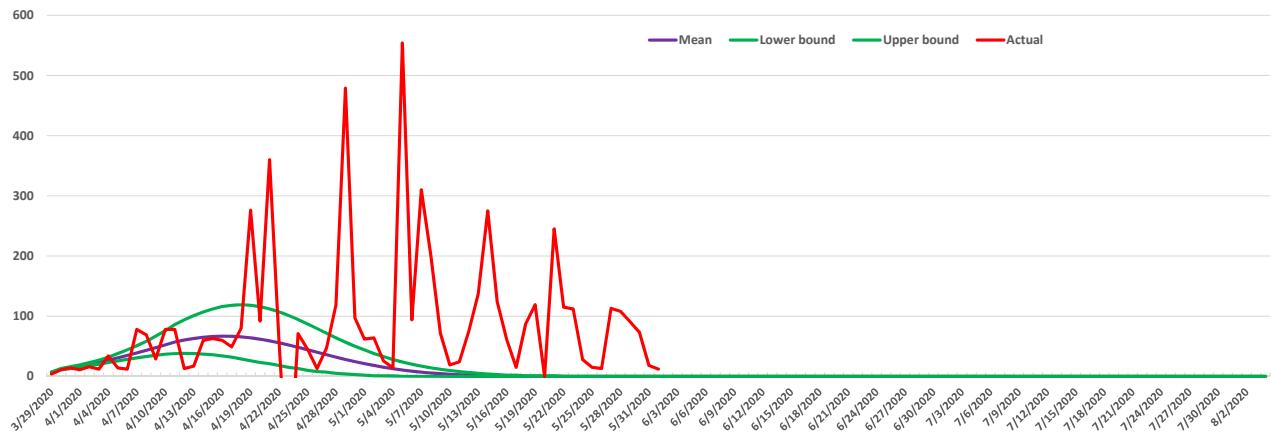
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Maine COVID 19 Daily Death Projections March 26



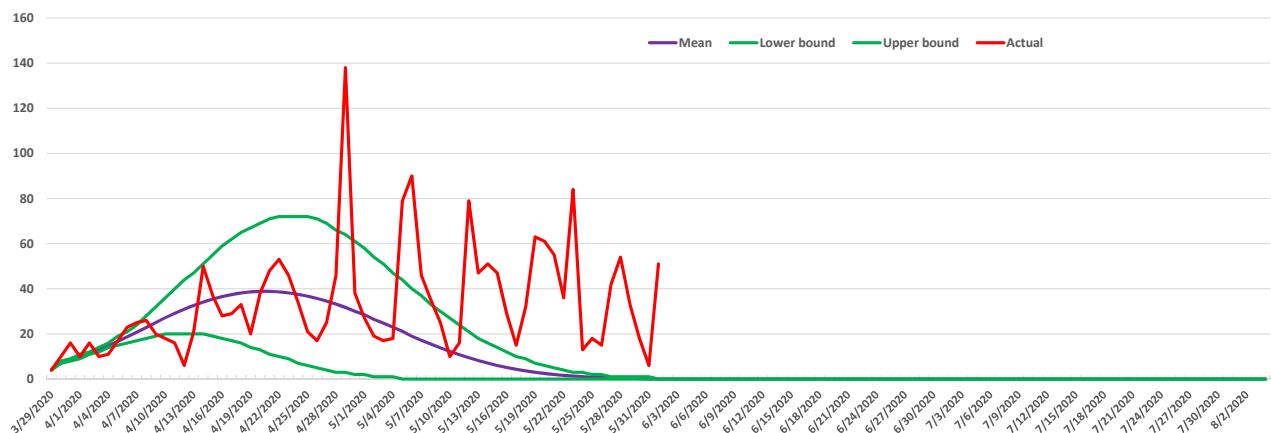
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Pennsylvania COVID 19 Daily Death Projections March 26



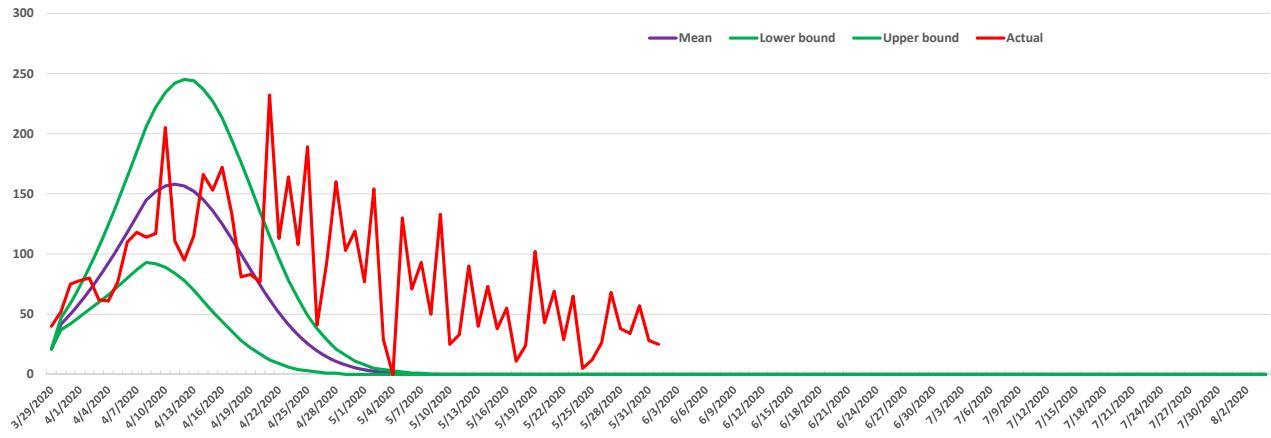
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Ohio COVID 19 Daily Death Projections March 26



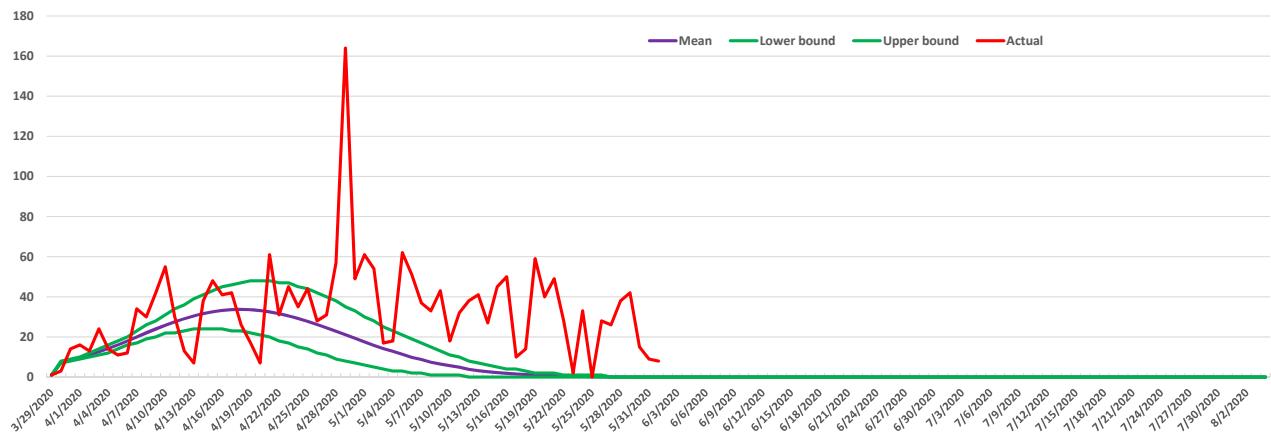
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Michigan COVID 19 Daily Death Projections March 26



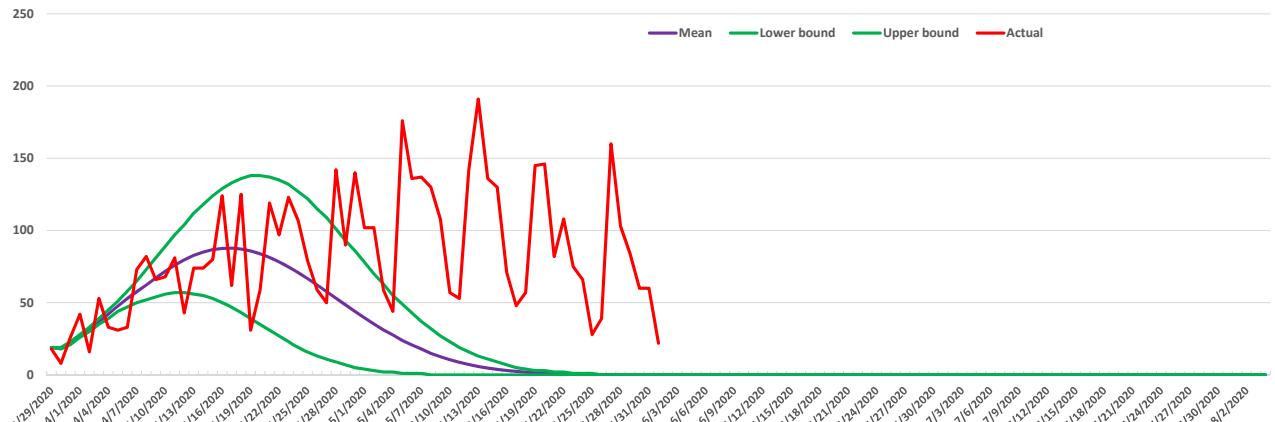
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Indiana COVID 19 Daily Death Projections March 26



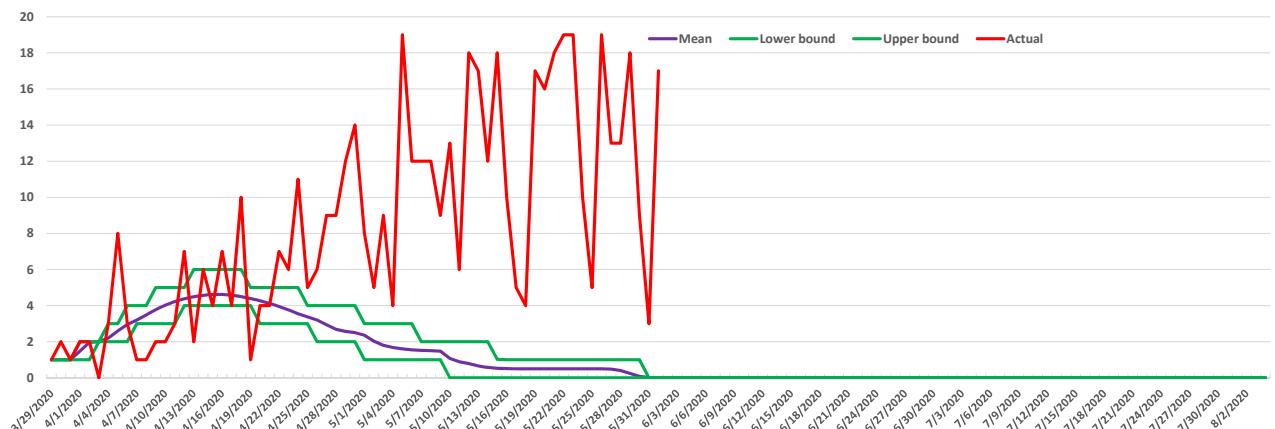
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Illinois COVID 19 Daily Death Projections March 26



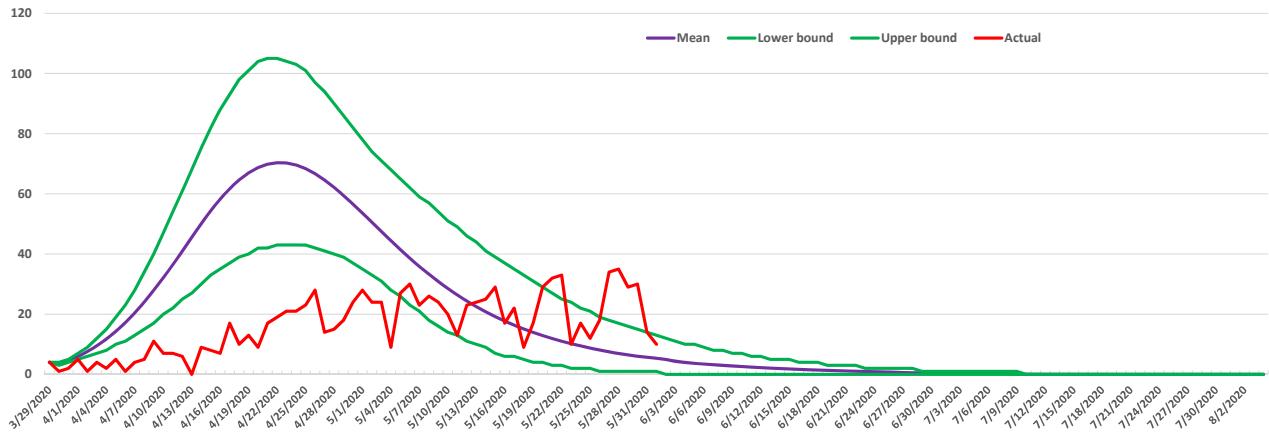
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Iowa COVID 19 Daily Death Projections March 26



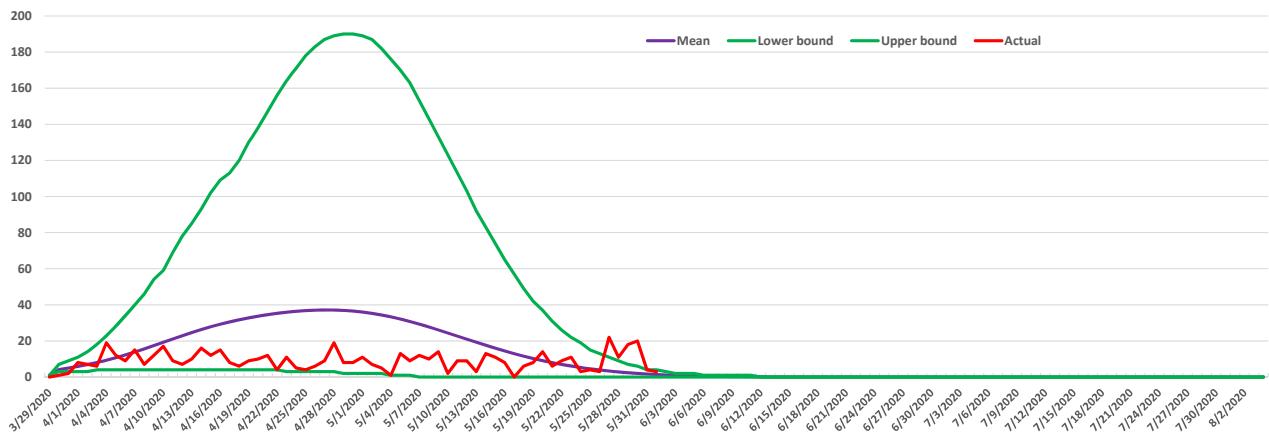
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Minnesota COVID 19 Daily Death Projections March 26



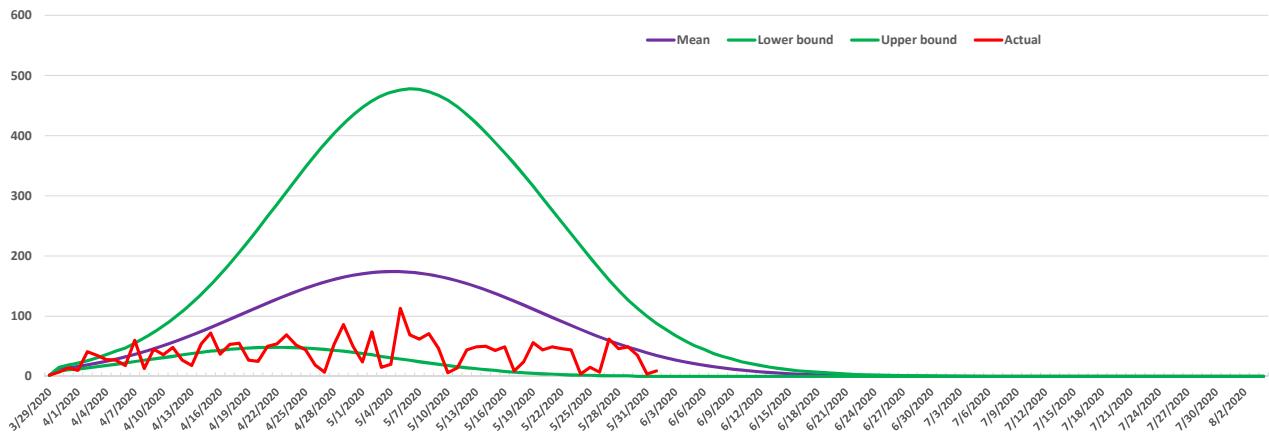
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Wisconsin COVID 19 Daily Death Projections March 26



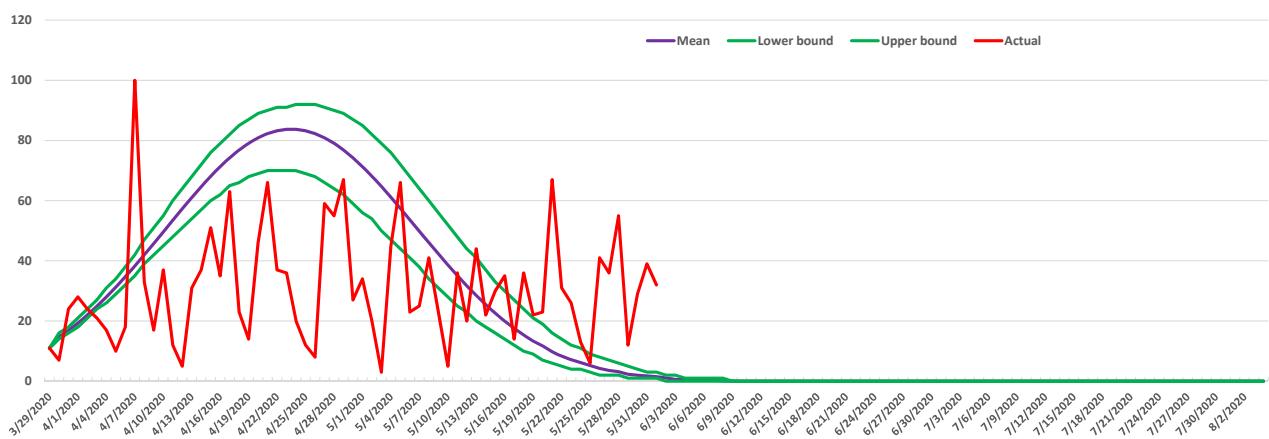
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Florida COVID 19 Daily Death Projections March 26



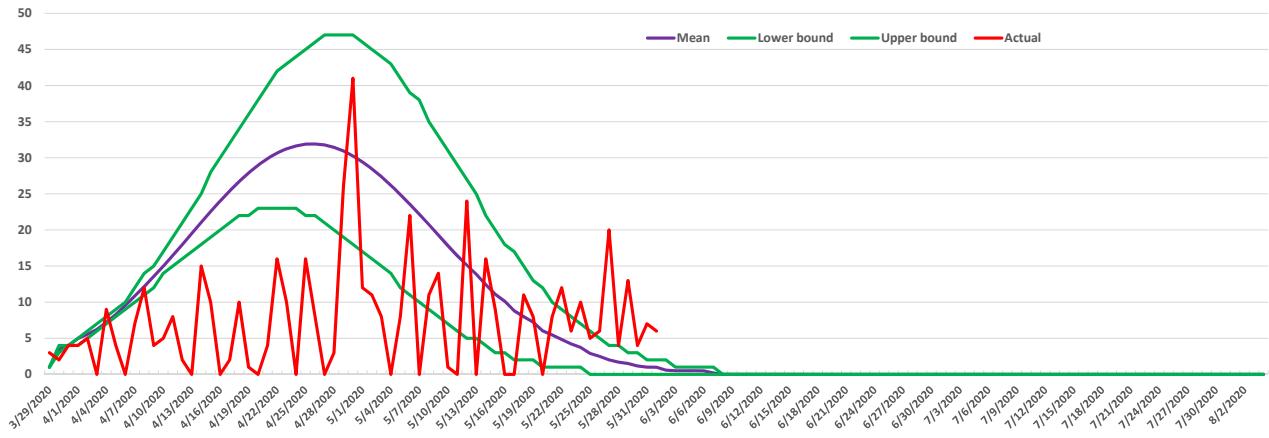
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Georgia COVID 19 Daily Death Projections March 26



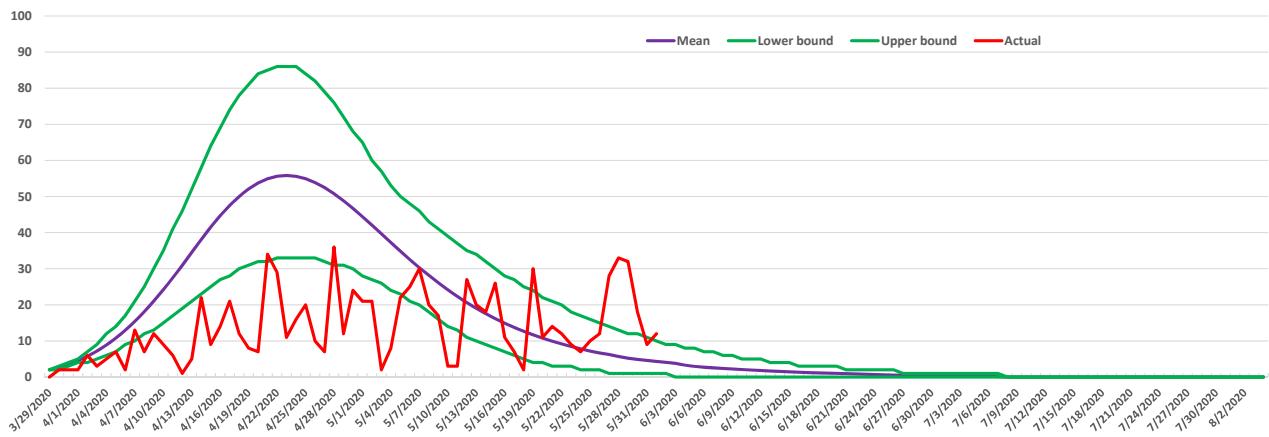
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# South Carolina COVID 19 Daily Death Projections March 26



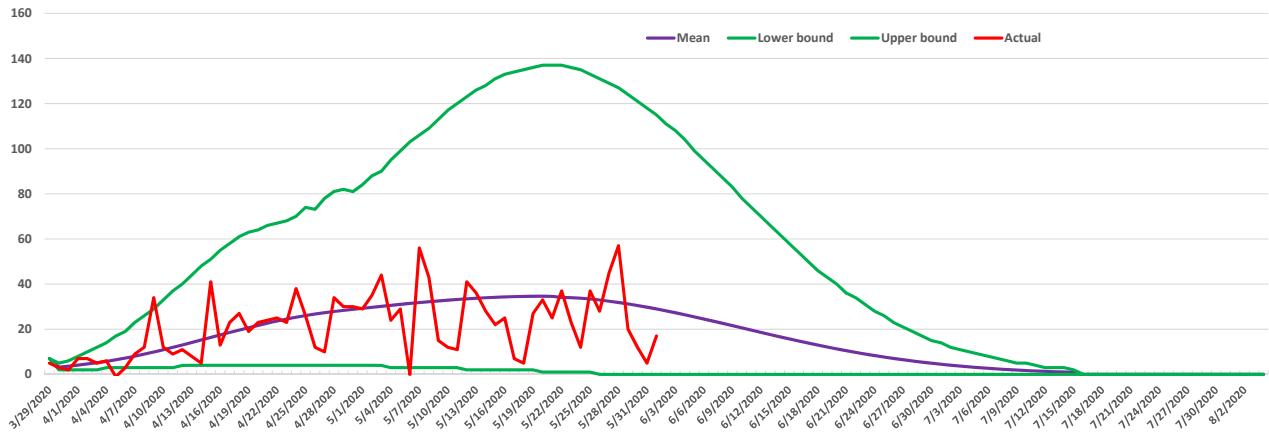
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# North Carolina COVID 19 Daily Death Projections March 26



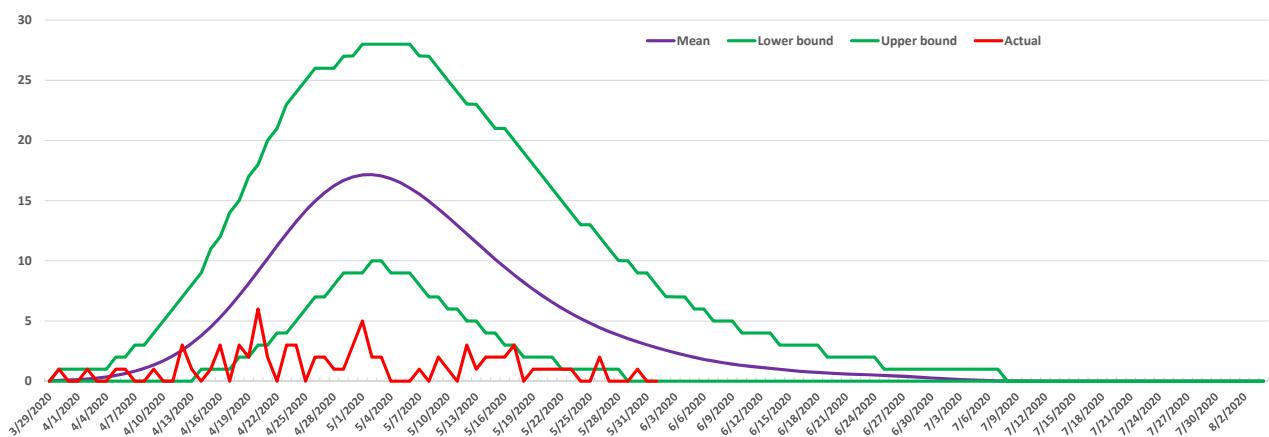
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Virginia COVID 19 Daily Death Projections March 26



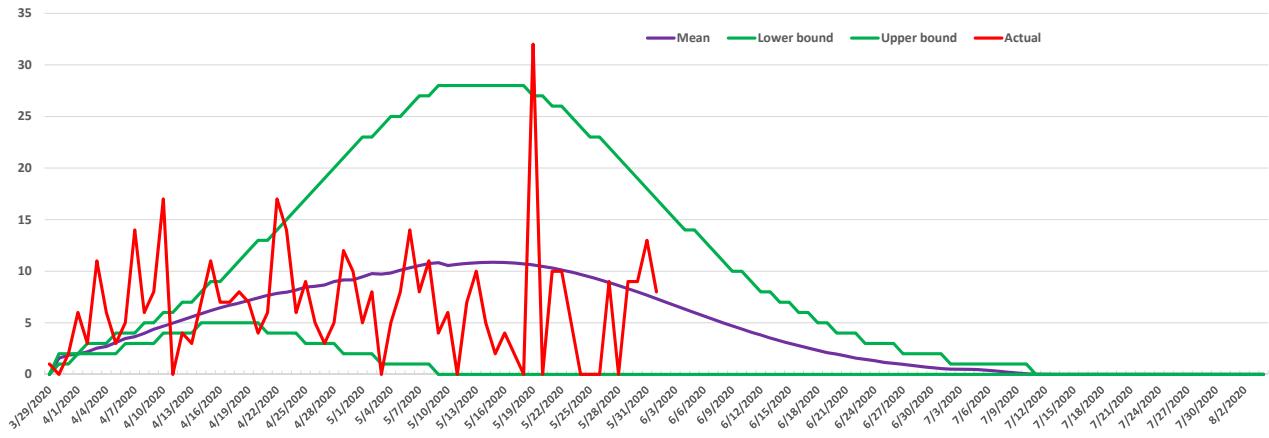
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# West Virginia COVID 19 Daily Death Projections March 26



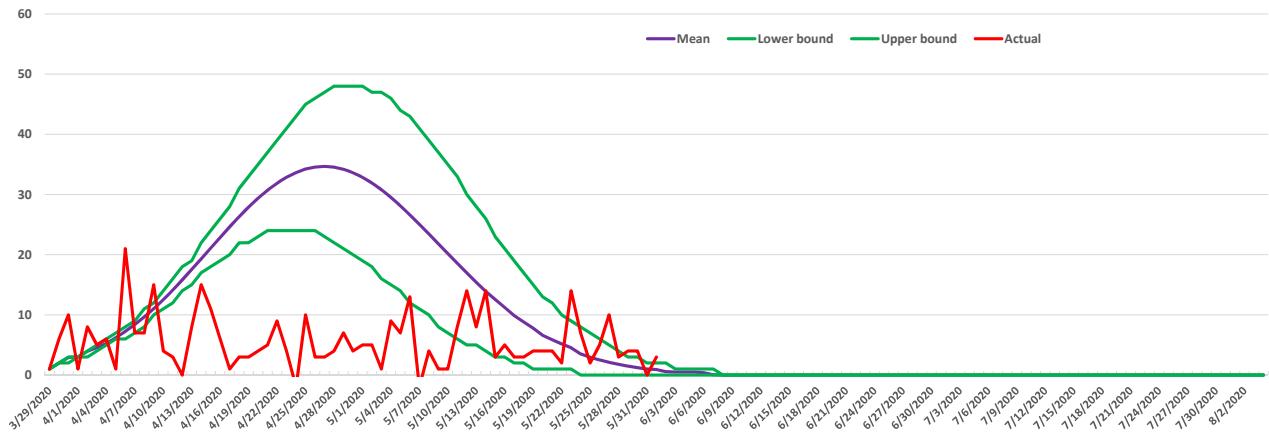
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Kentucky COVID 19 Daily Death Projections March 26



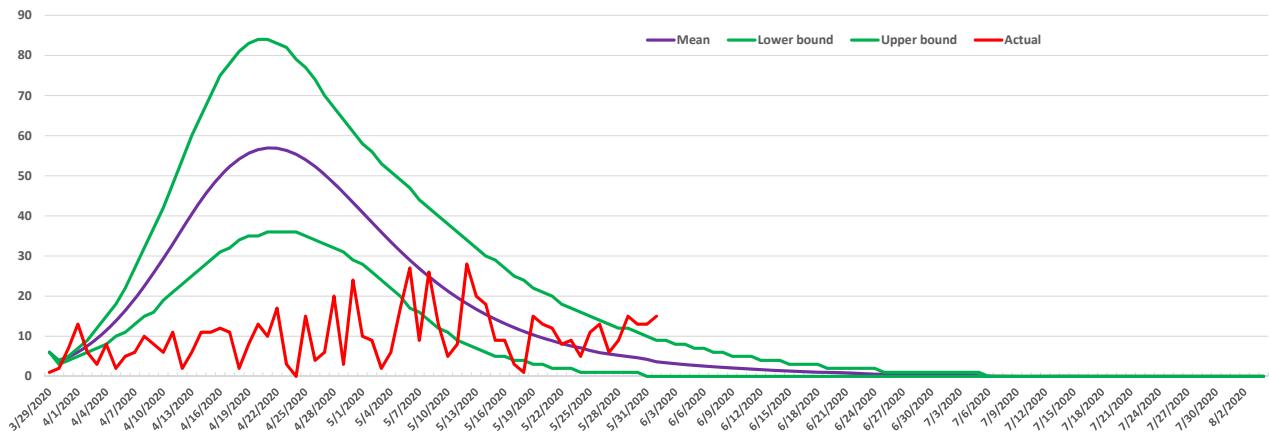
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Tennessee COVID 19 Daily Death Projections March 26



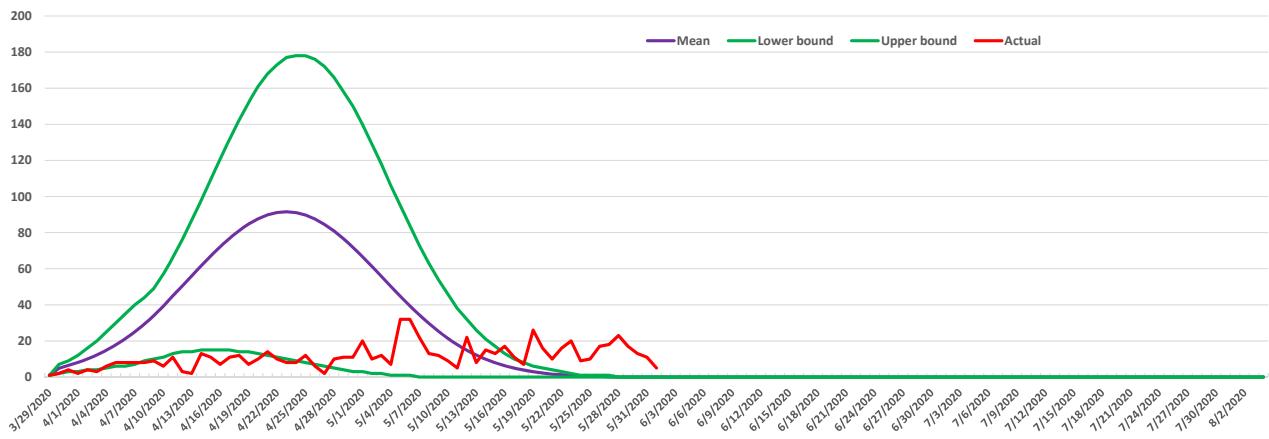
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Alabama COVID 19 Daily Death Projections March 26



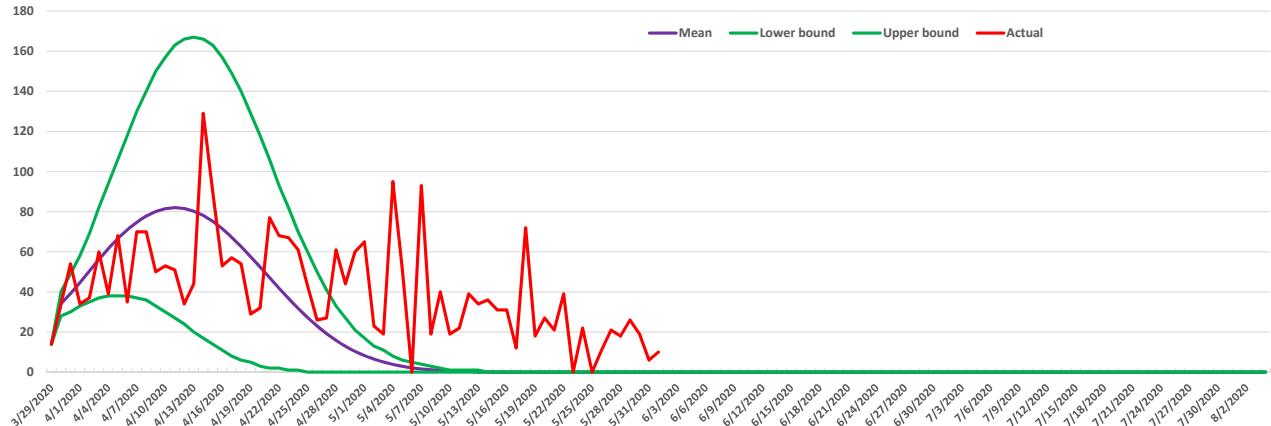
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Mississippi COVID 19 Daily Death Projections March 26



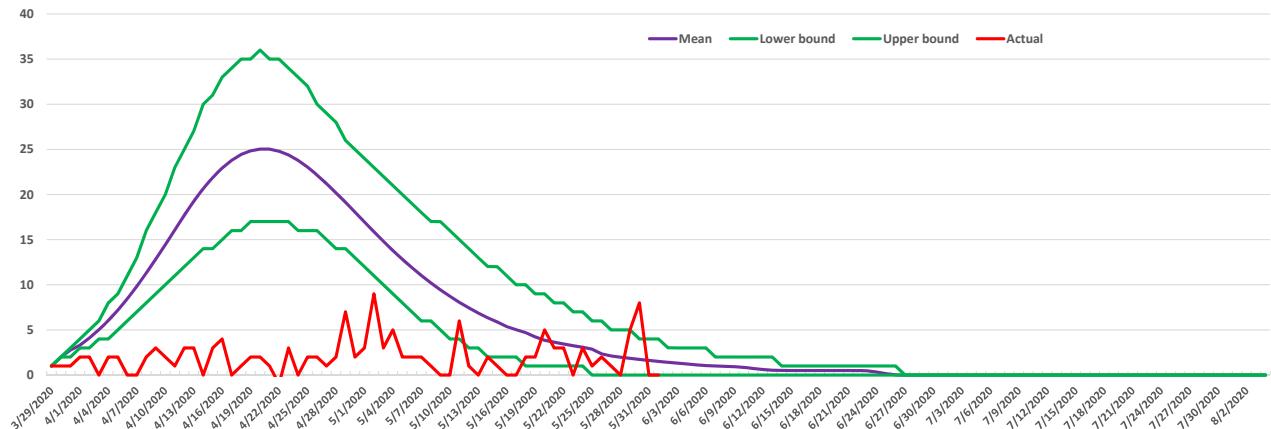
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Louisiana COVID 19 Daily Death Projections March 26



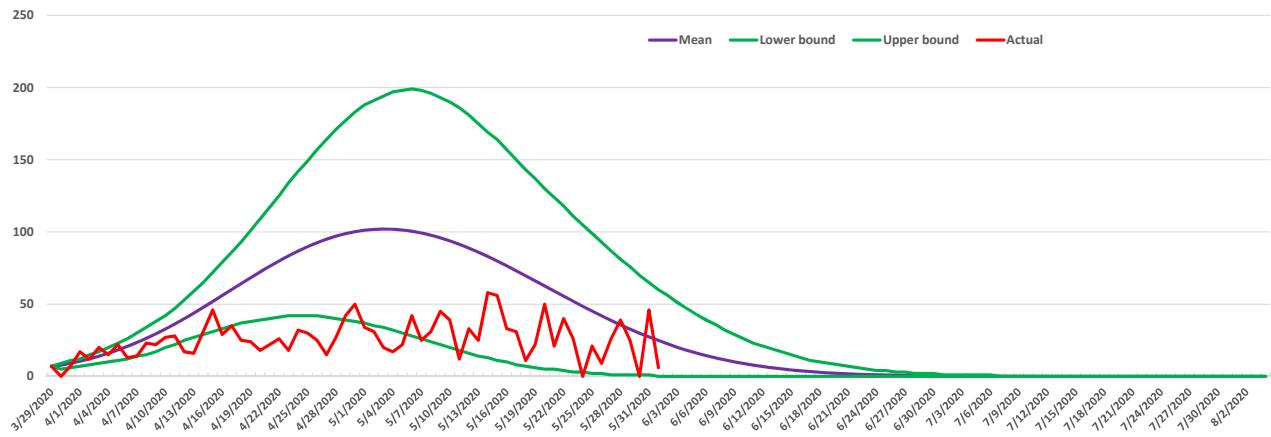
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Arkansas COVID 19 Daily Death Projections March 26



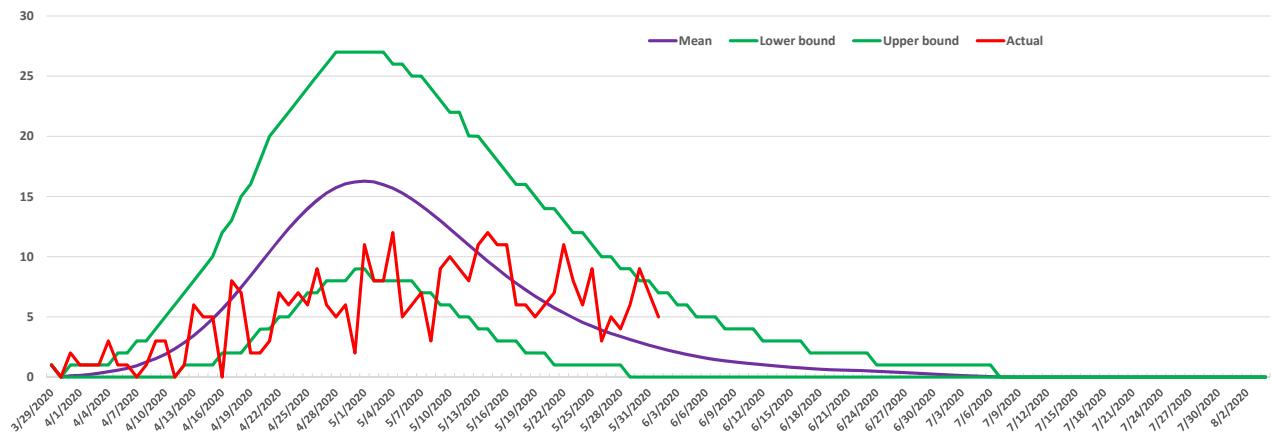
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Texas COVID 19 Daily Death Projections March 26



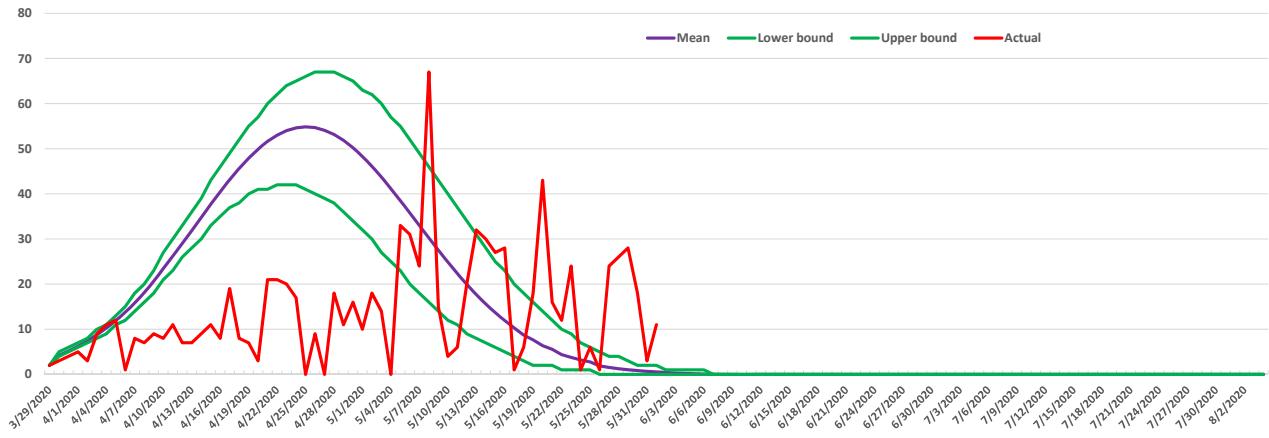
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# New Mexico COVID 19 Daily Death Projections March 26



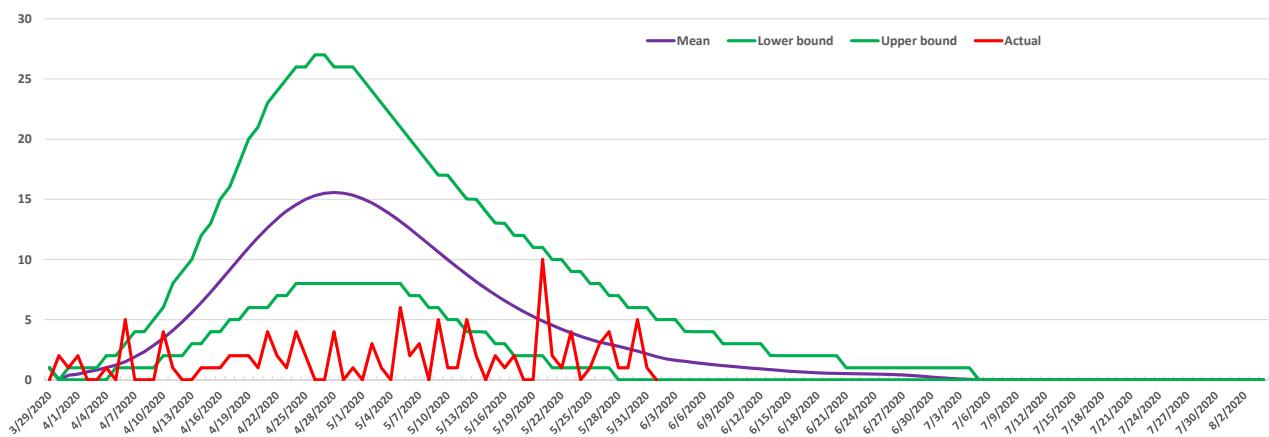
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Arizona COVID 19 Daily Death Projections March 26



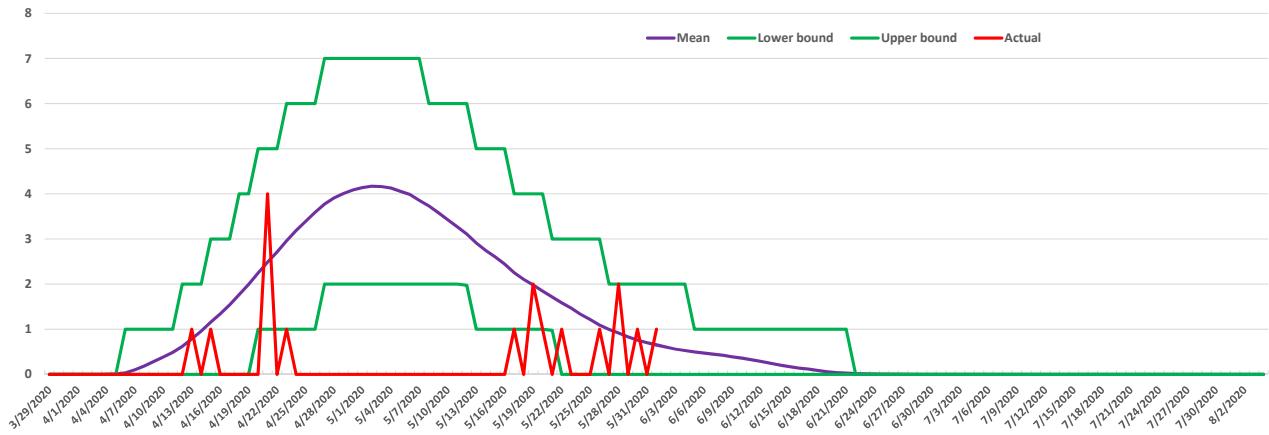
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Utah COVID 19 Daily Death Projections March 26



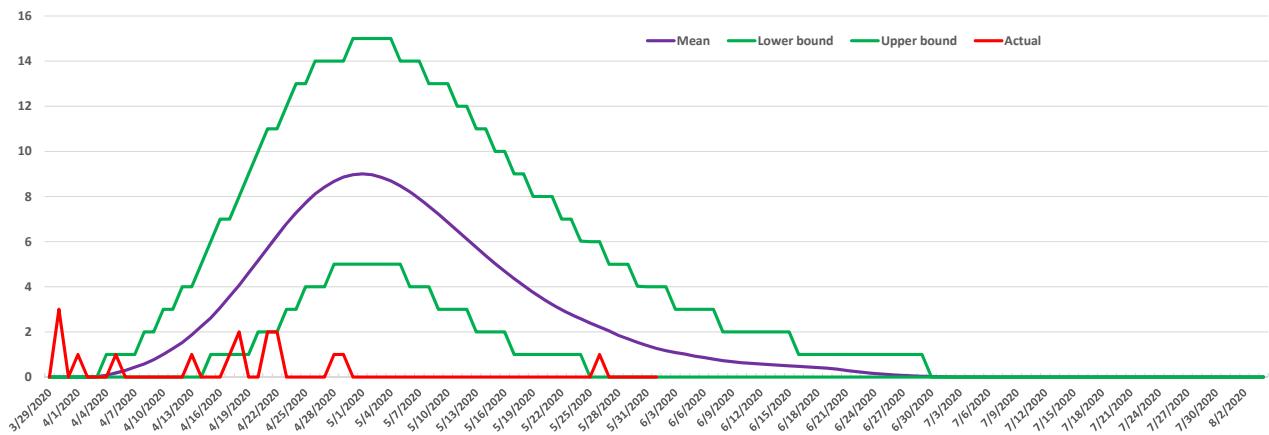
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Wyoming COVID 19 Daily Death Projections March 26



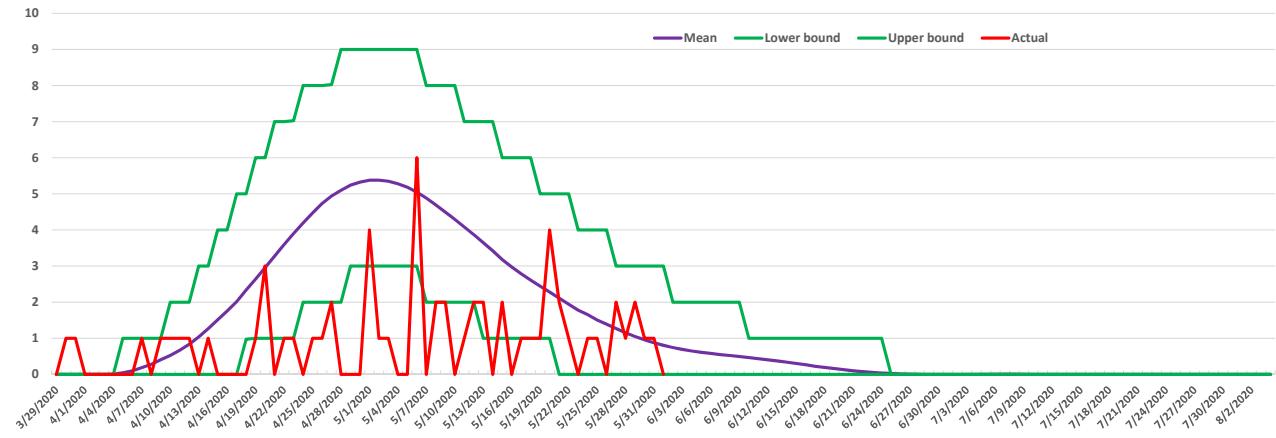
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Montana COVID 19 Daily Death Projections March 26



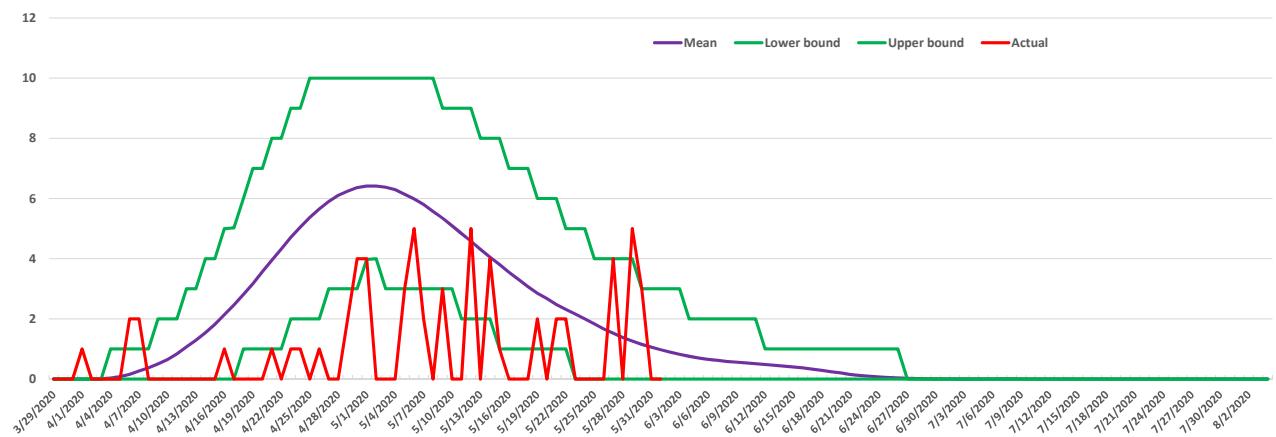
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# North Dakota COVID 19 Daily Death Projections March 26



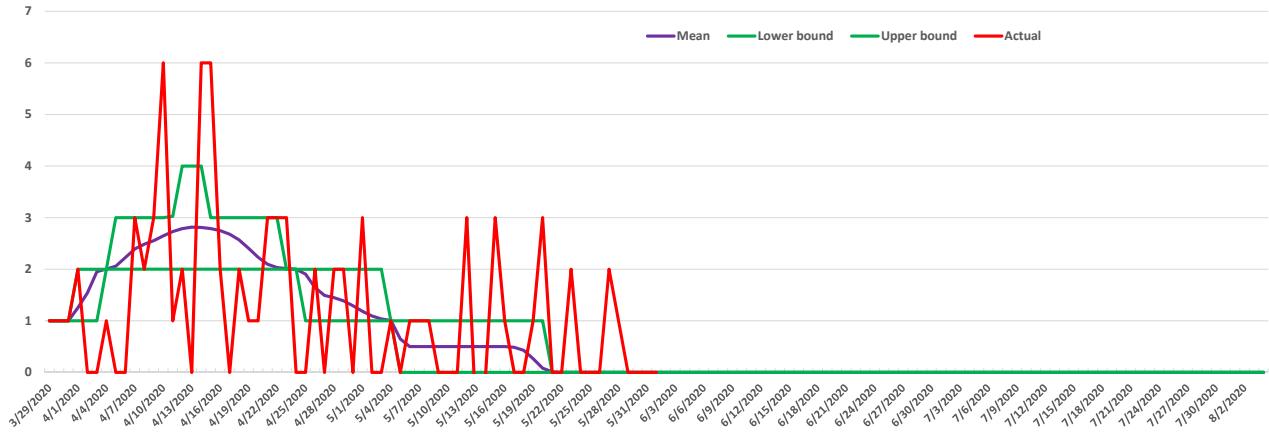
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# South Dakota COVID 19 Daily Death Projections March 26



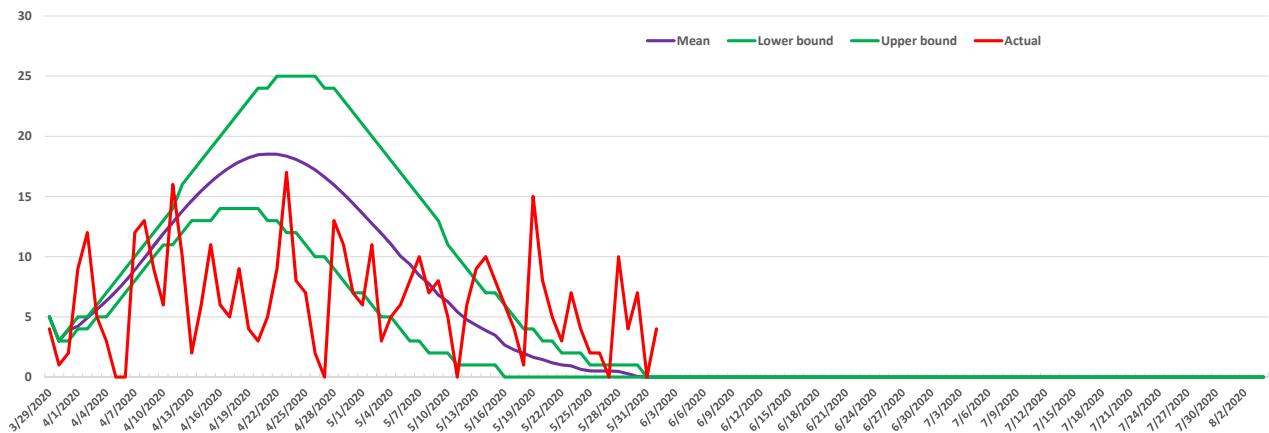
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Idaho COVID 19 Daily Death Projections March 26



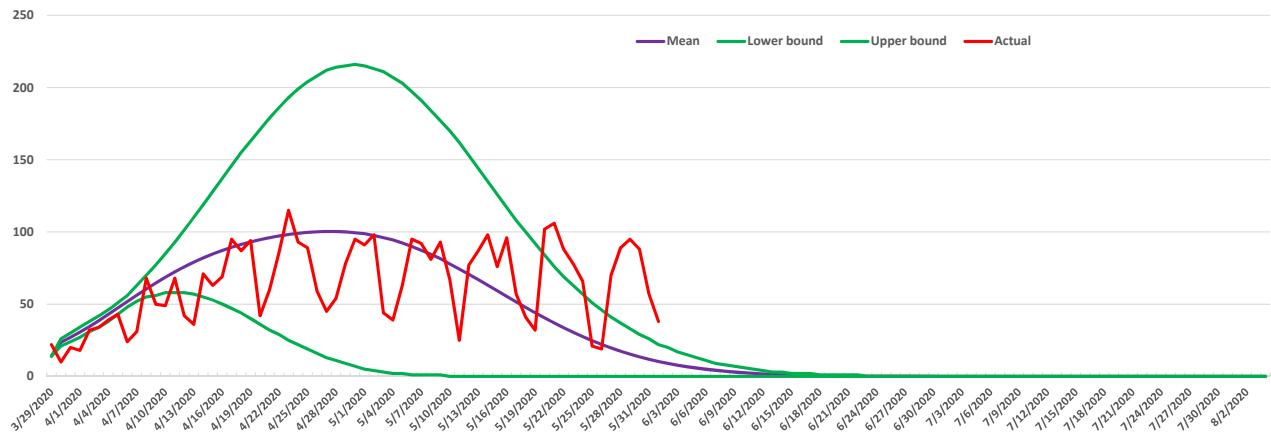
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Nevada COVID 19 Daily Death Projections March 26



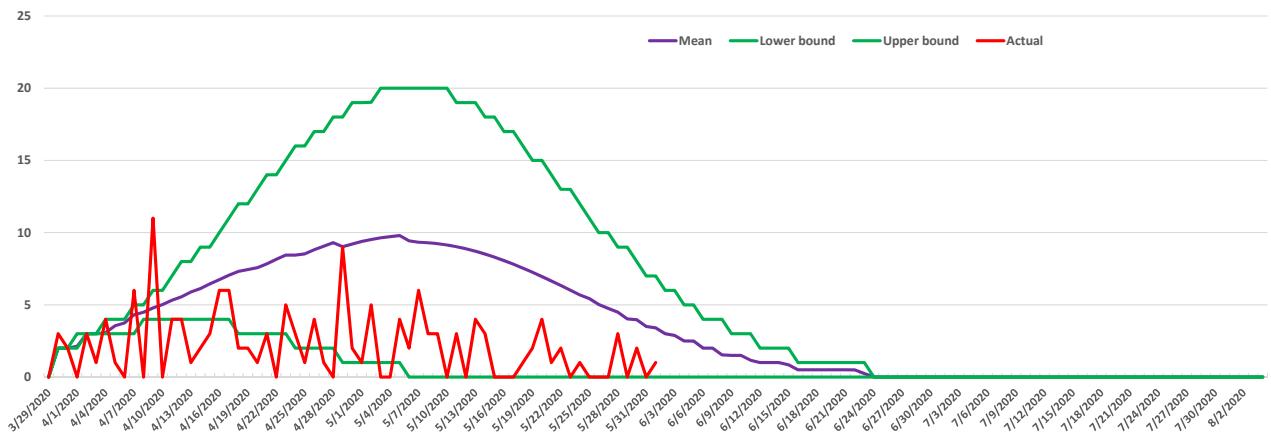
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# California COVID 19 Daily Death Projections March 26



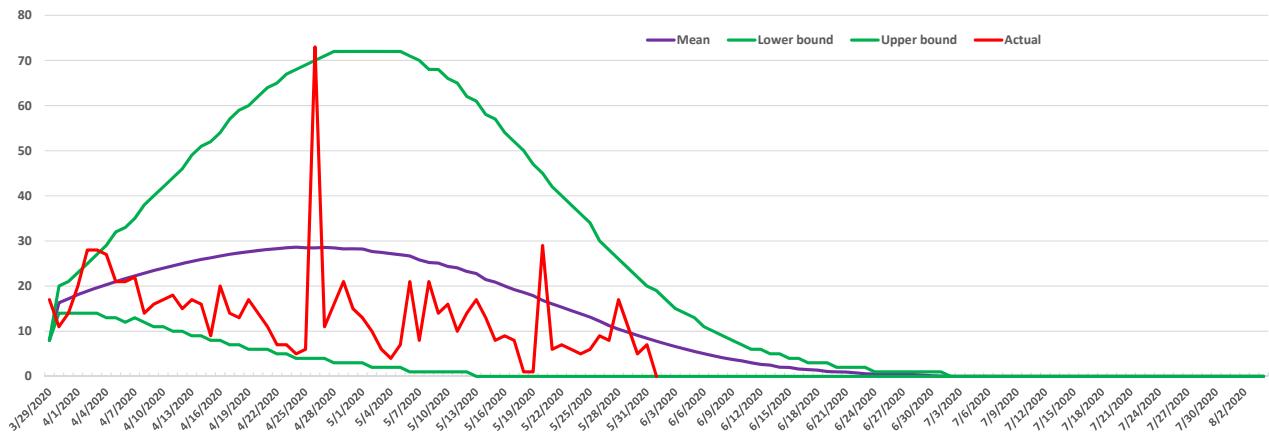
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Oregon COVID 19 Daily Death Projections March 26



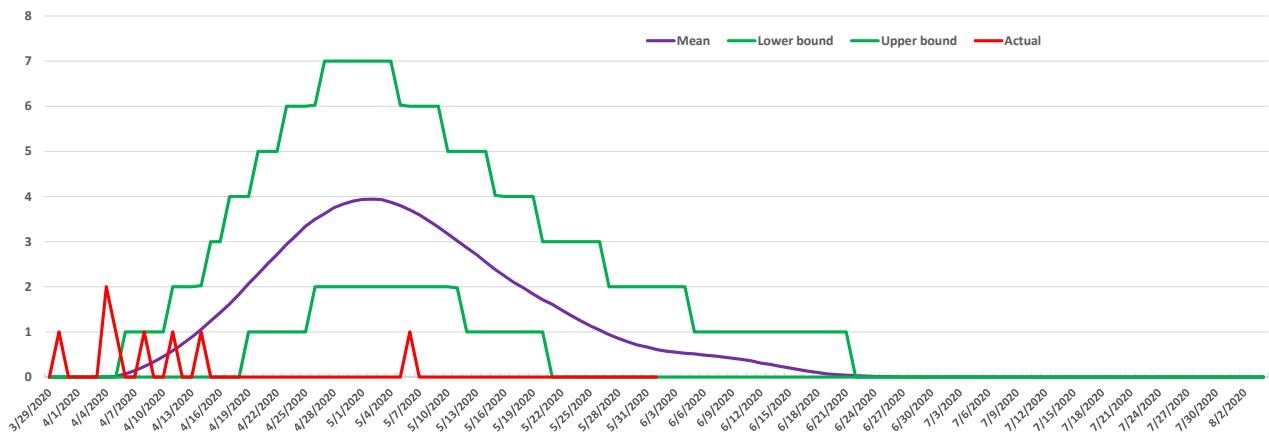
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Washington COVID 19 Daily Death Projections March 26



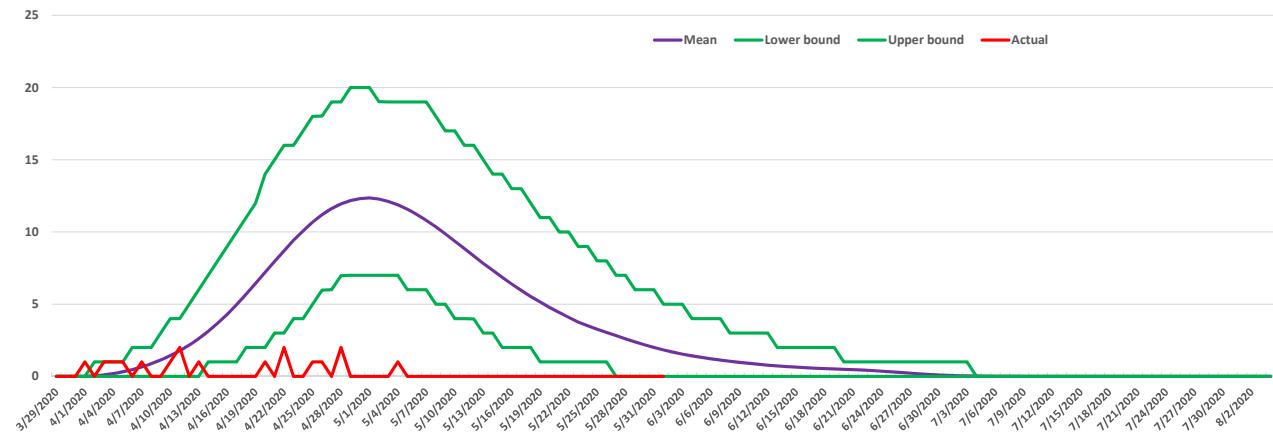
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Alaska COVID 19 Daily Death Projections March 26



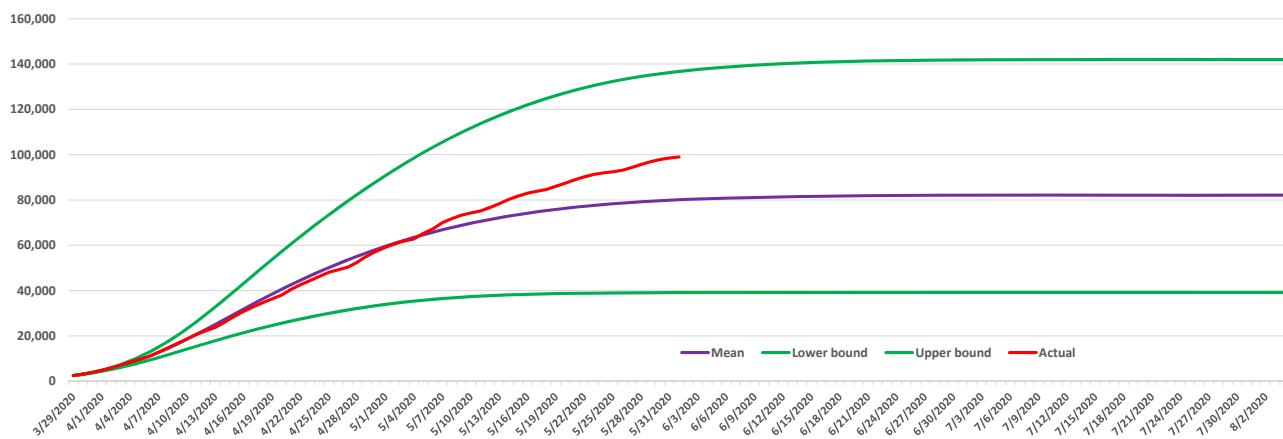
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Hawaii COVID 19 Daily Death Projections March 26



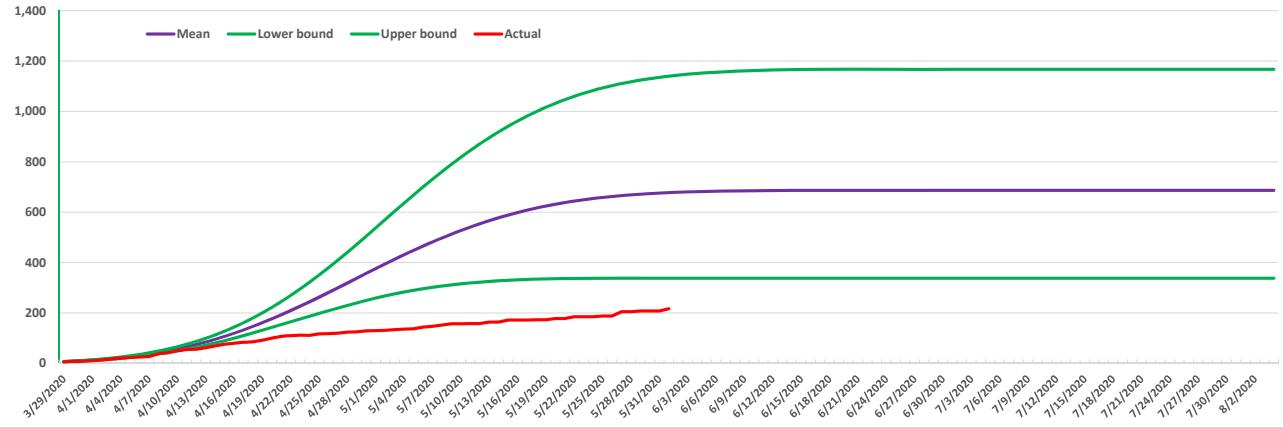
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# U.S. COVID 19 Cumulative Death Projections



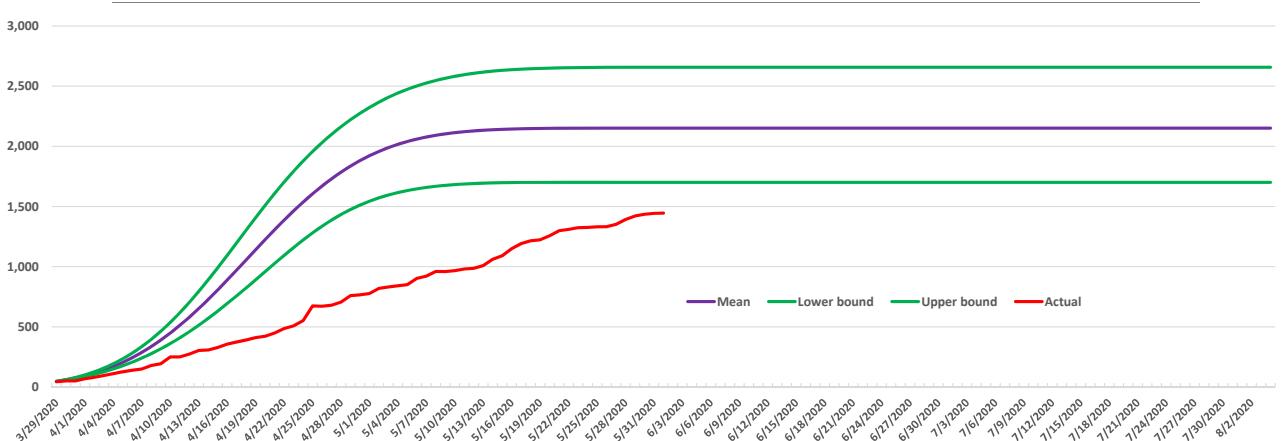
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Kansas COVID 19 Cumulative Death Projections



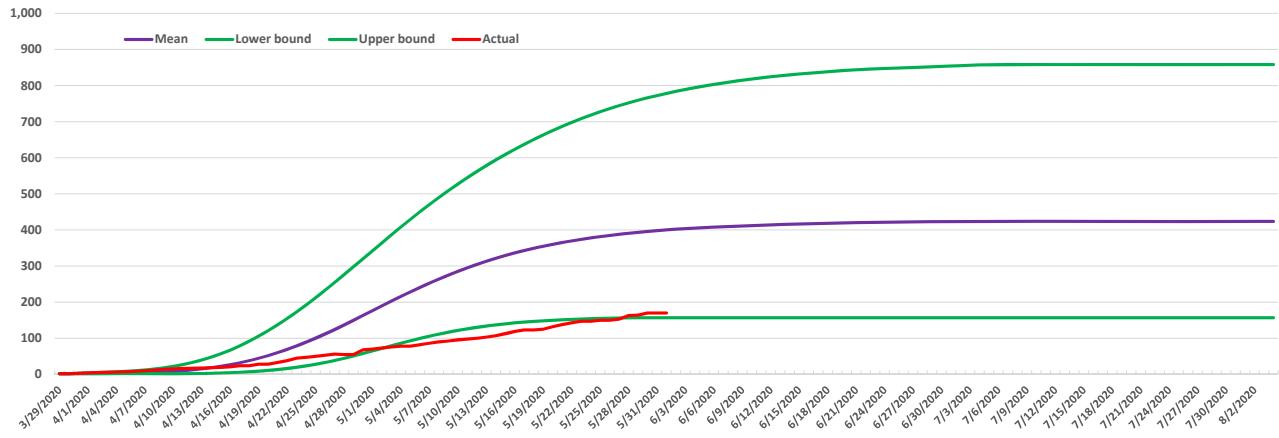
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Colorado COVID 19 Cumulative Death Projections March 26



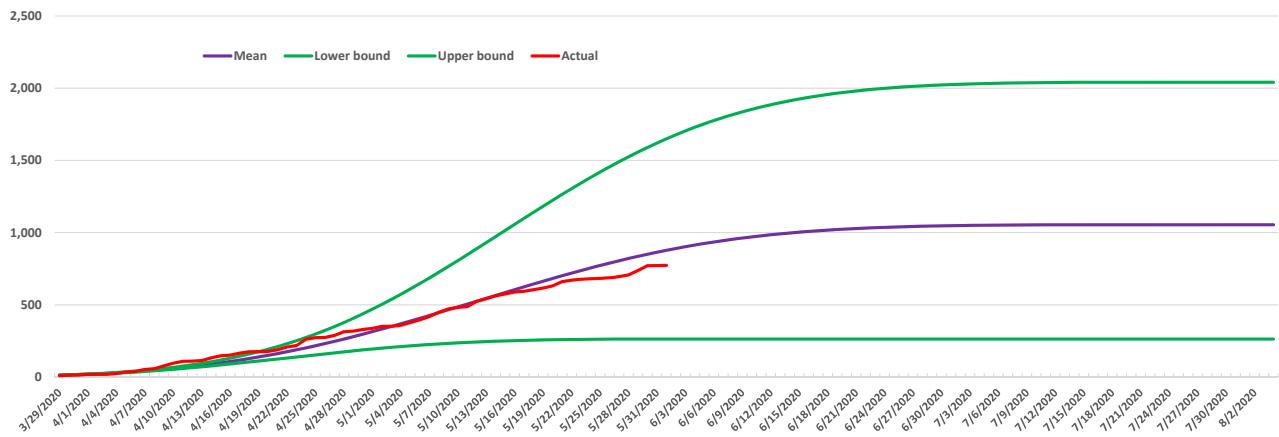
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Nebraska COVID 19 Daily Death Projections March 26



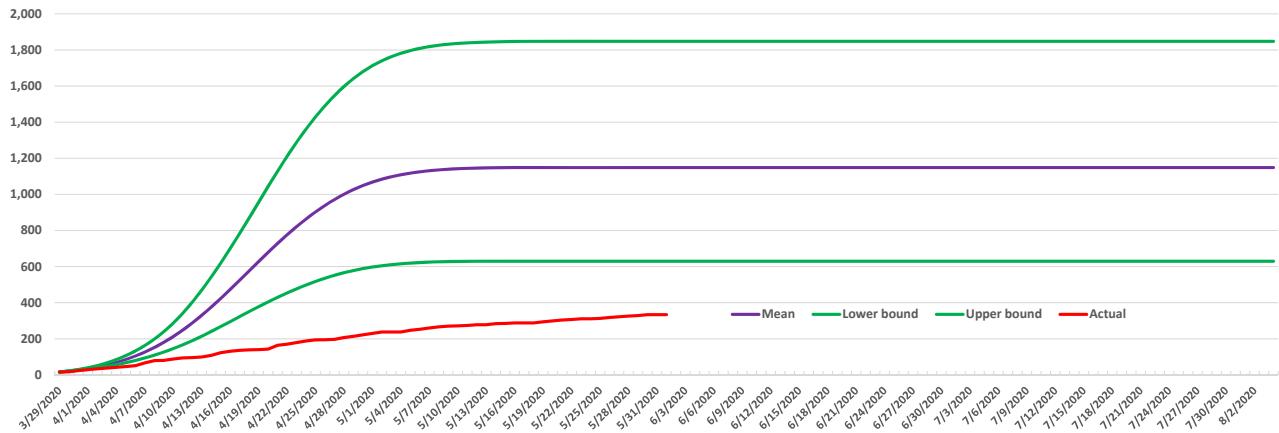
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Missouri COVID 19 Cumulative Death Projections March 26



KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Oklahoma COVID 19 Daily Death Projections March 26



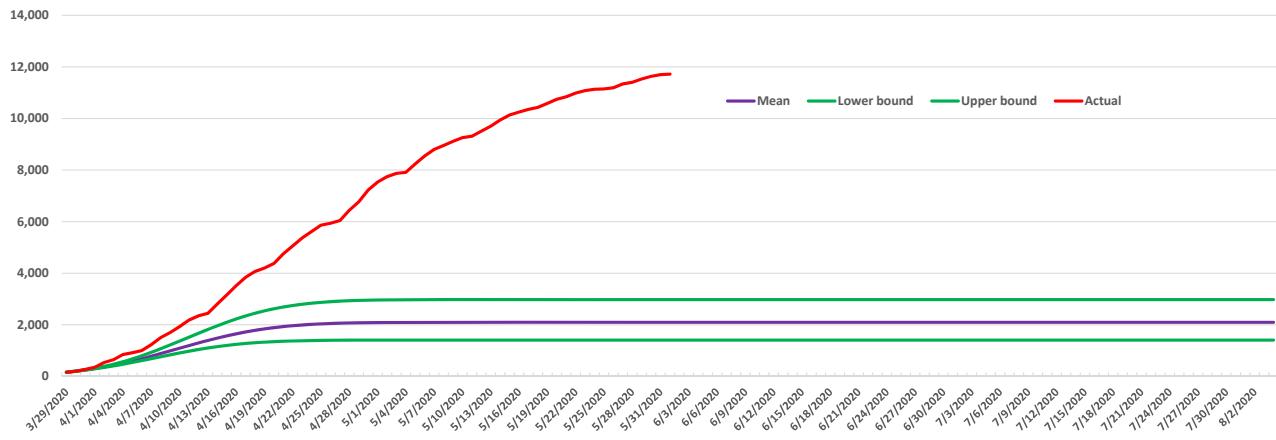
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# New York COVID 19 Cumulative Death Projections



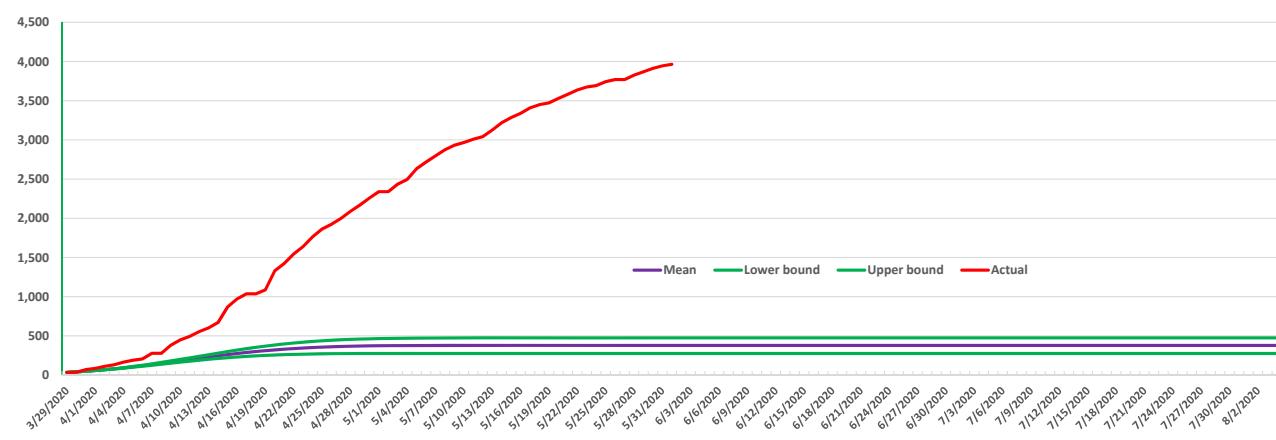
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# New Jersey COVID 19 Cumulative Death Projections



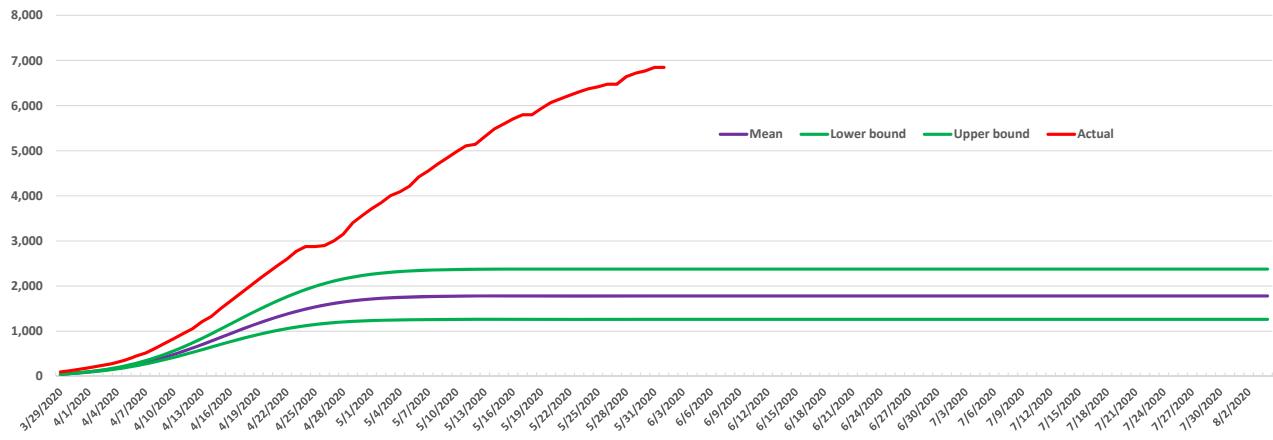
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Connecticut COVID 19 Cumulative Death Projections



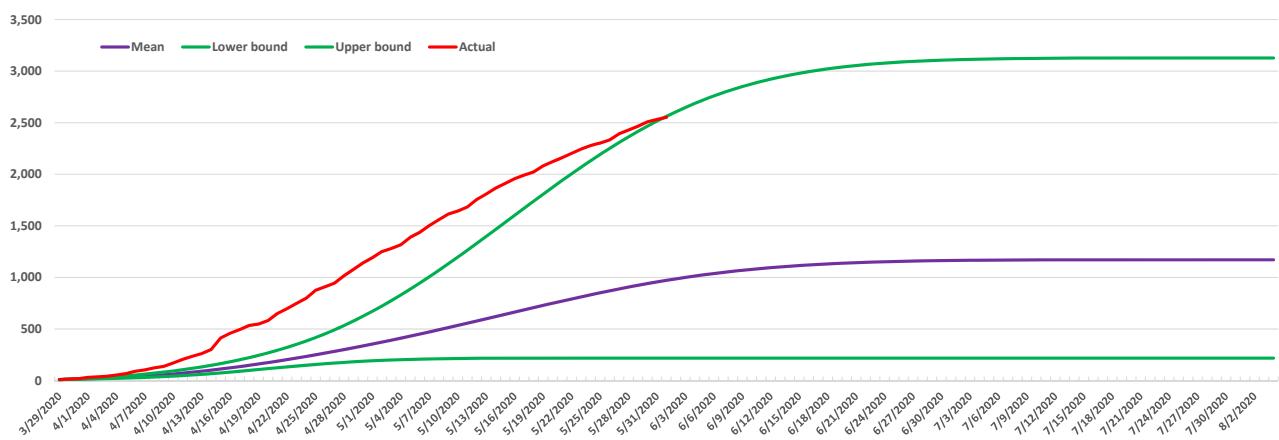
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Massachusetts COVID 19 Cumulative Death Projections



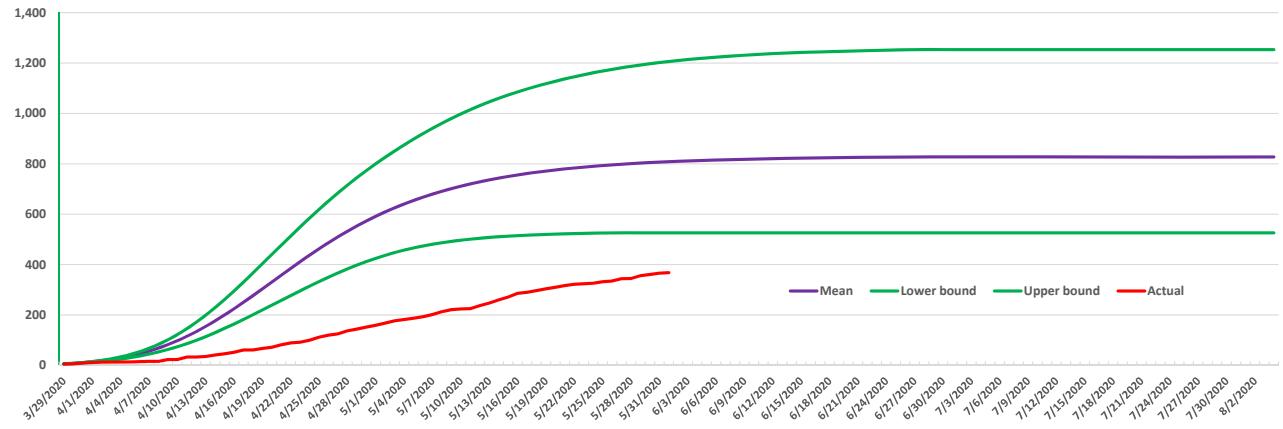
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Maryland COVID 19 Daily Death Projections March 26



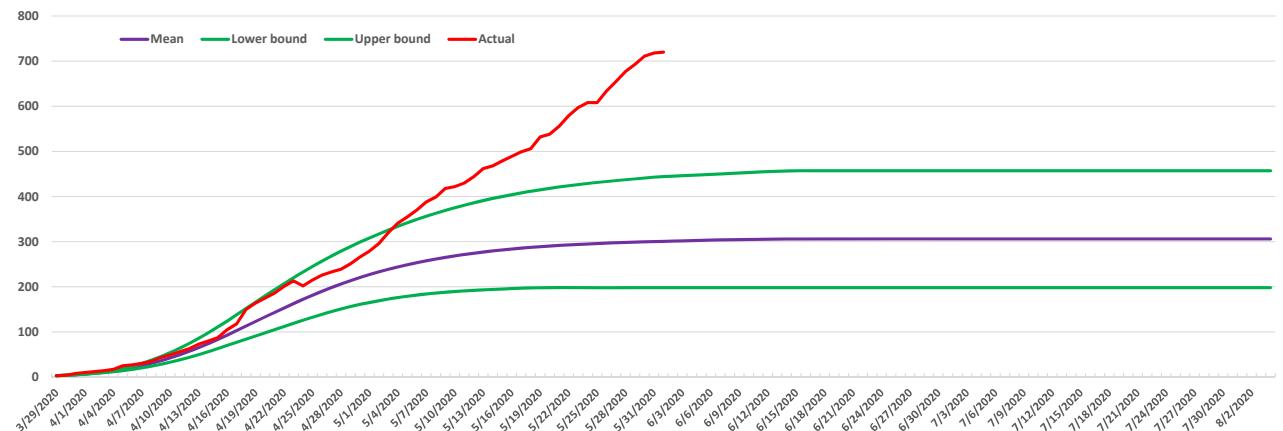
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Delaware COVID 19 Cumulative Death Projections



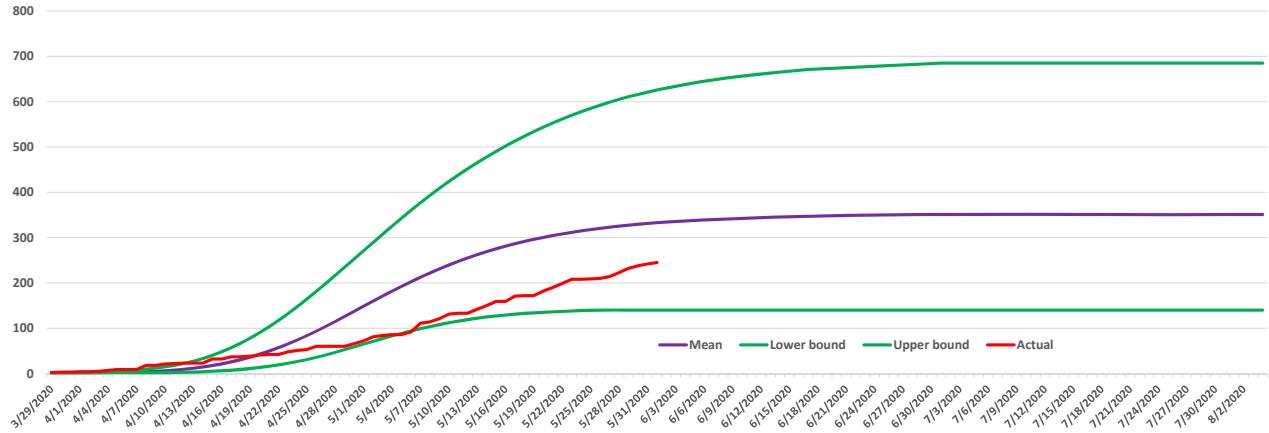
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Rhode Island COVID 19 Cumulative Death Projections March 26



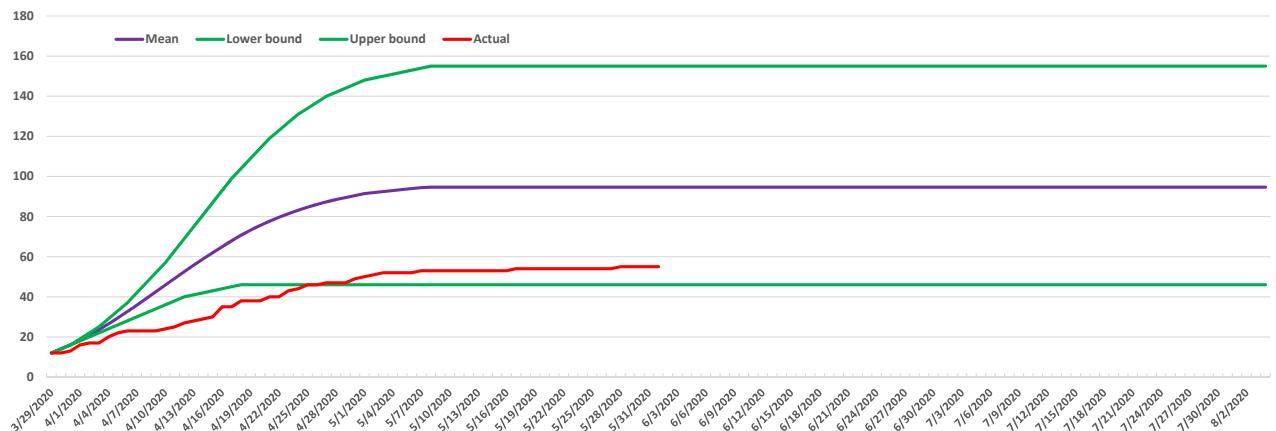
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# New Hampshire COVID 19 Cumulative Death Projections



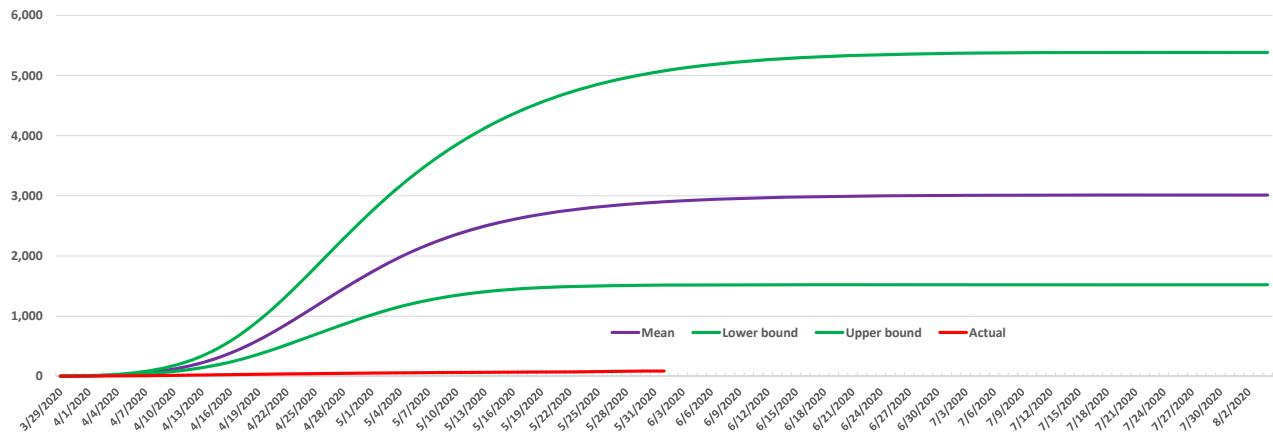
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Vermont COVID 19 Cumulative Death Projections March 26



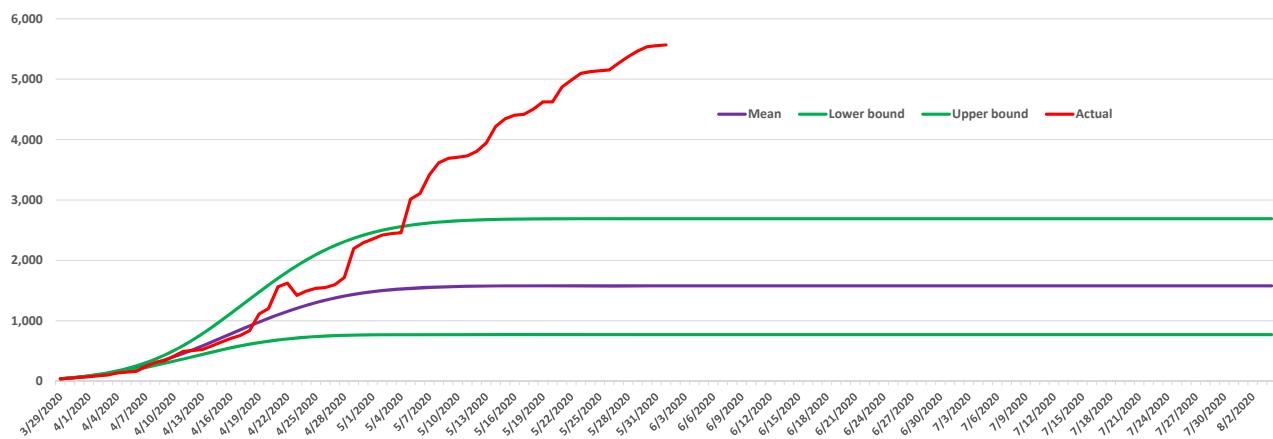
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Maine COVID 19 Cumulative Death Projections



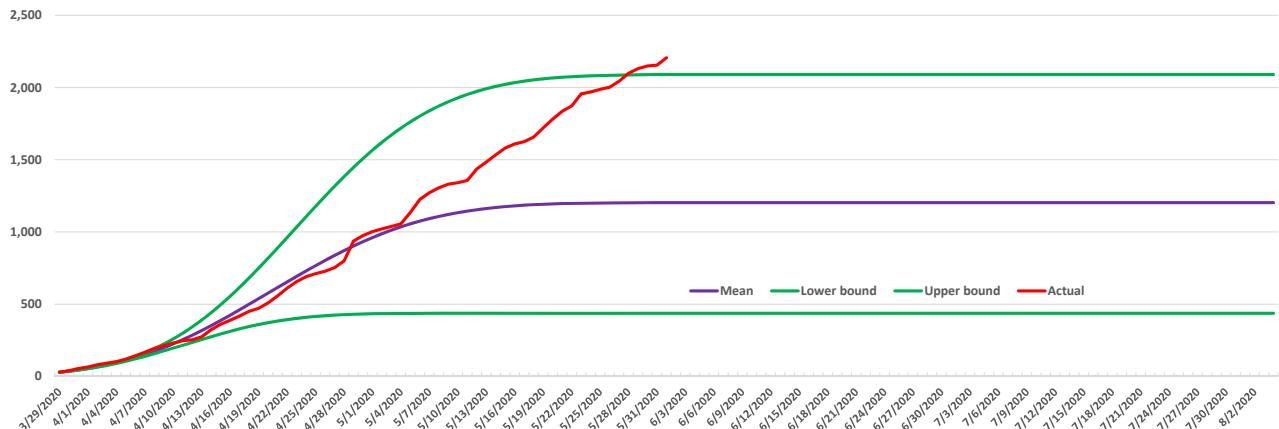
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Pennsylvania COVID 19 Cumulative Death Projections



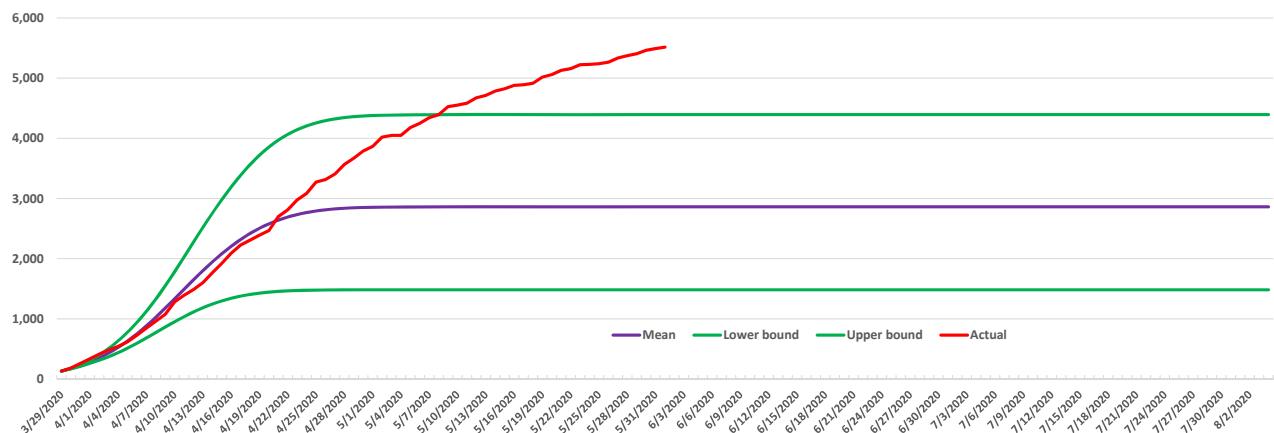
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Ohio COVID 19 Cumulative Death Projections March 26



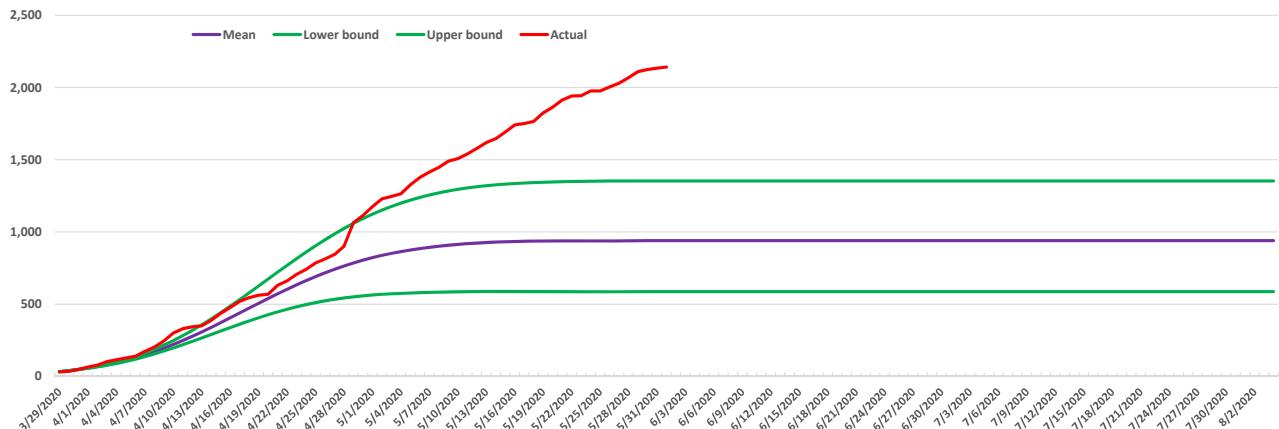
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Michigan COVID 19 Cumulative Death Projections



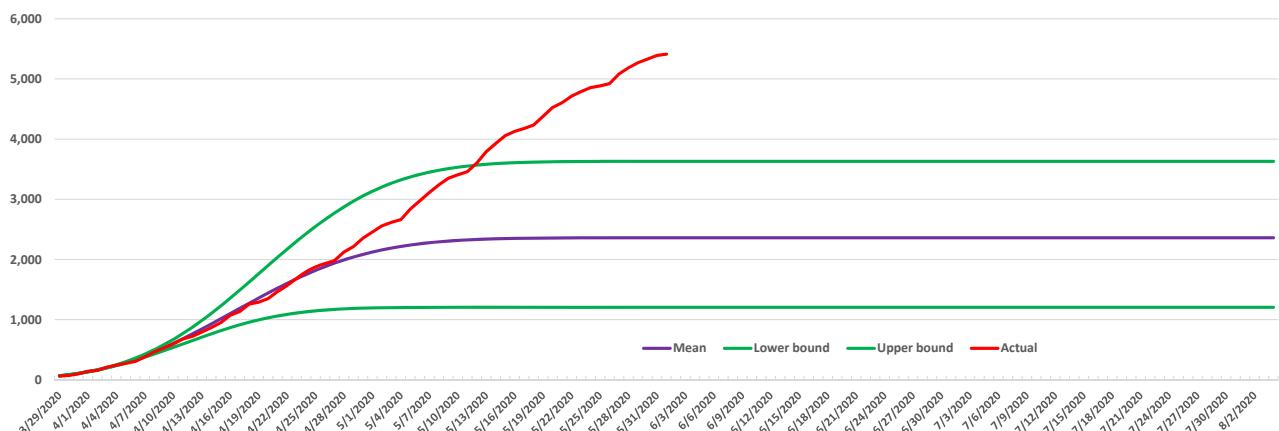
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Indiana COVID 19 Cumulative Death Projections March 26



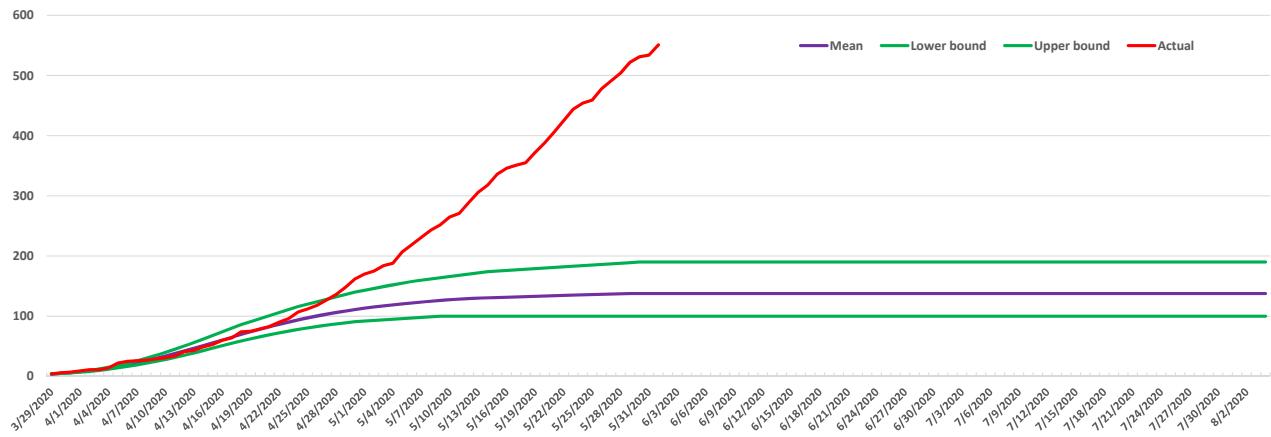
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Illinois COVID 19 Cumulative Death Projections March 26



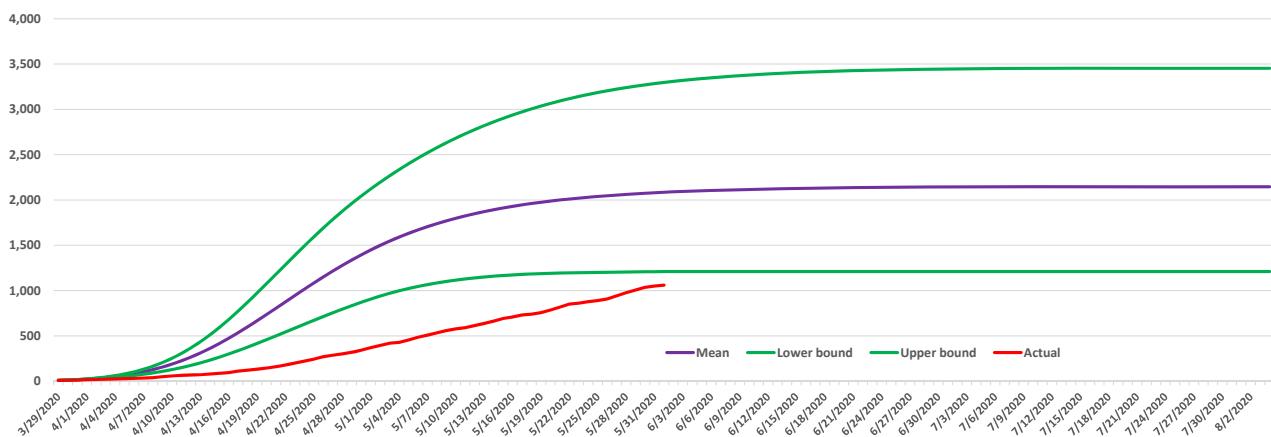
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Iowa COVID 19 Daily Death Projections March 26



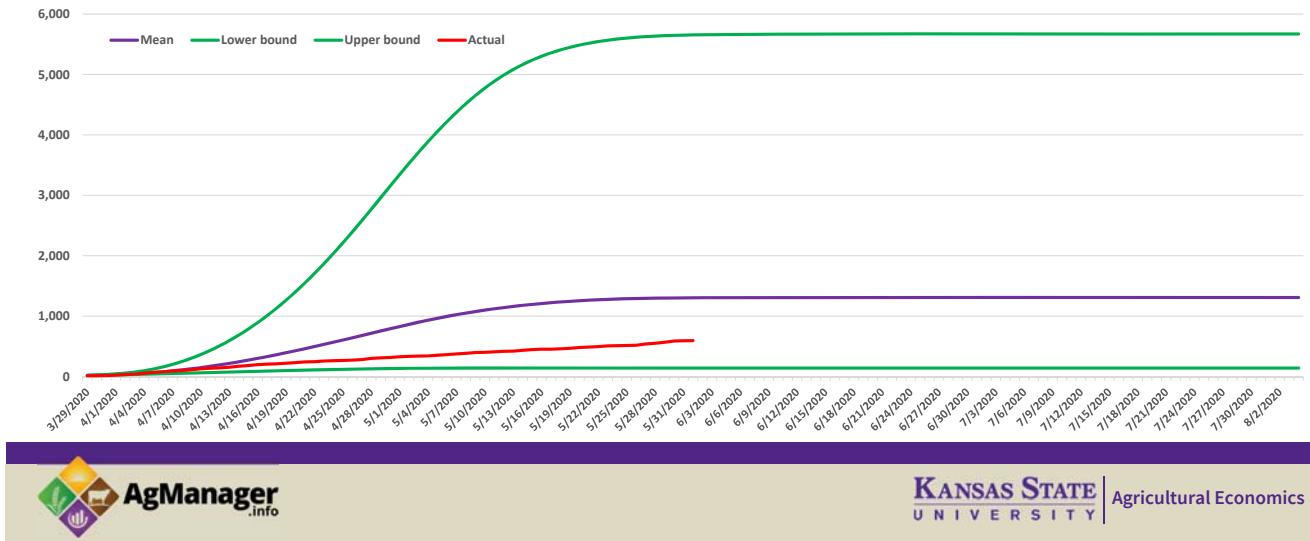
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Minnesota COVID 19 Cumulative Death Projections



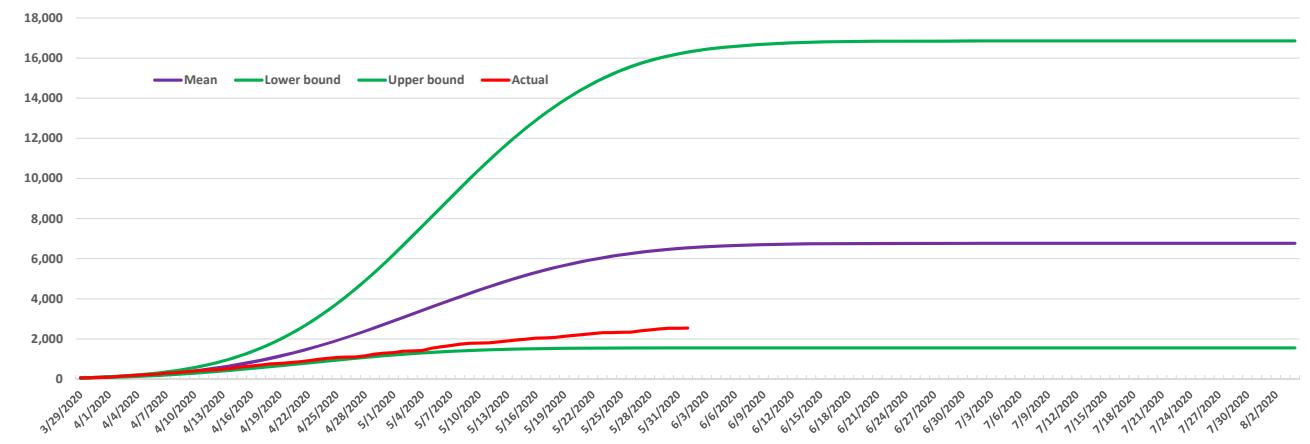
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Wisconsin COVID 19 Cumulative Death Projections



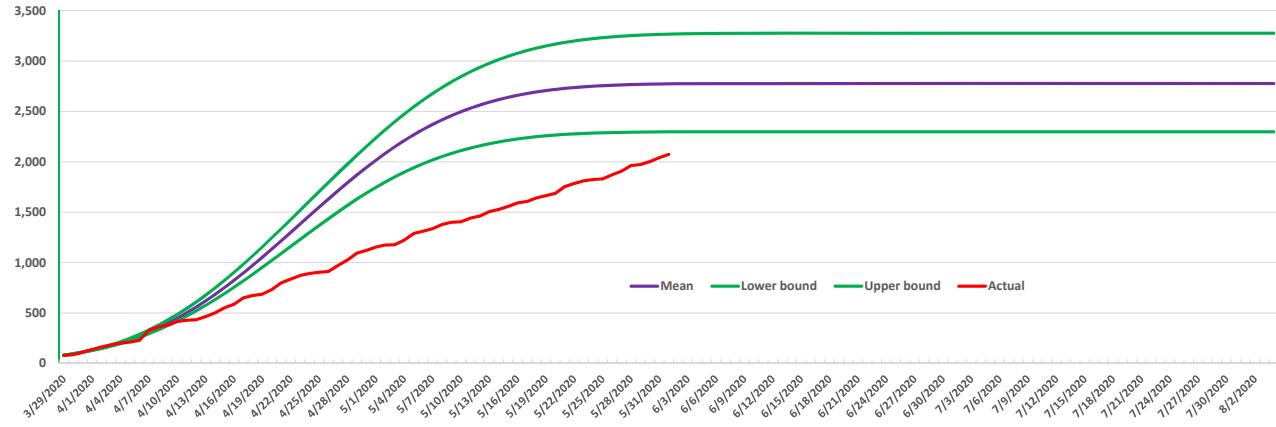
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Florida COVID 19 Cumulative Death Projections March 26



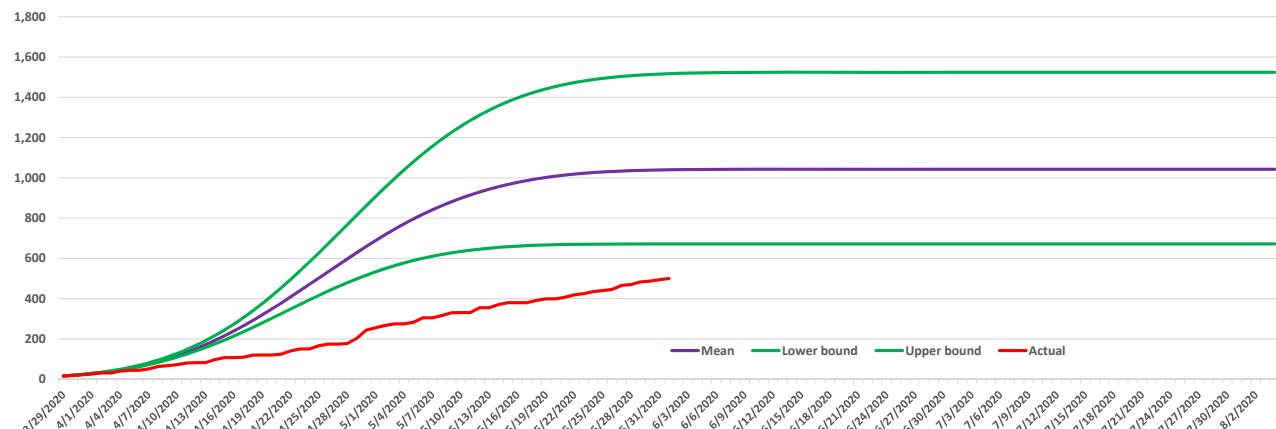
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Georgia COVID 19 Cumulative Death Projections



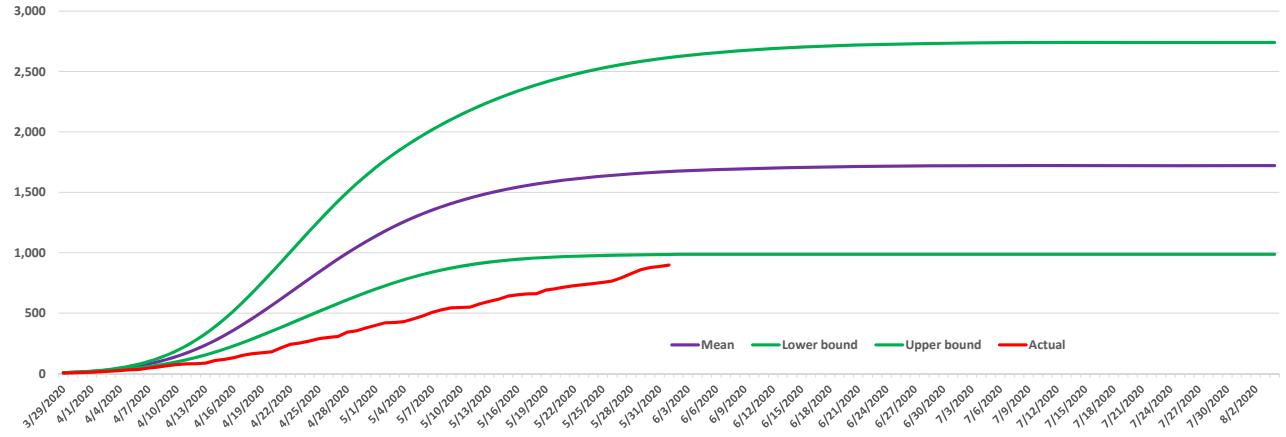
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# South Carolina COVID 19 Cumulative Death Projections



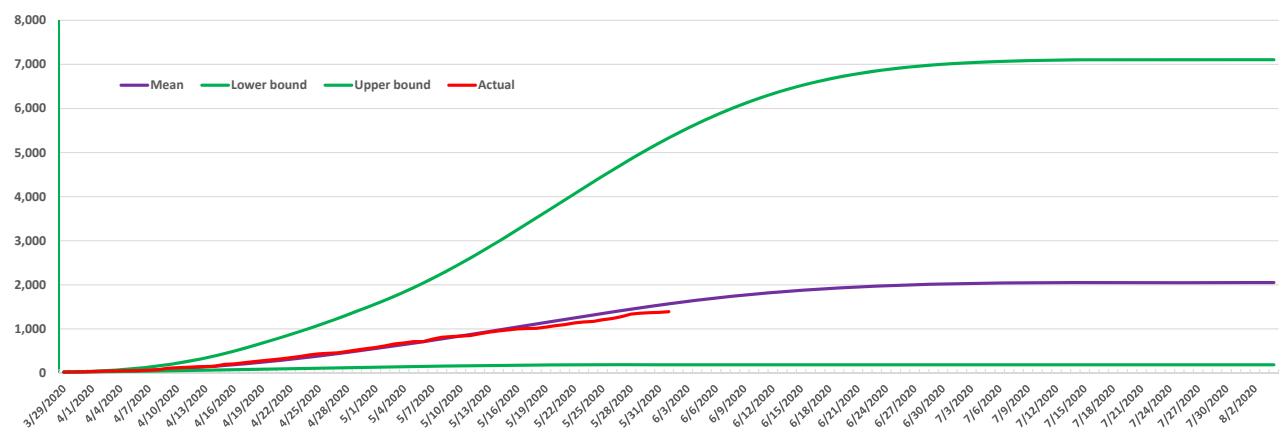
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# North Carolina COVID 19 Cumulative Death Projections



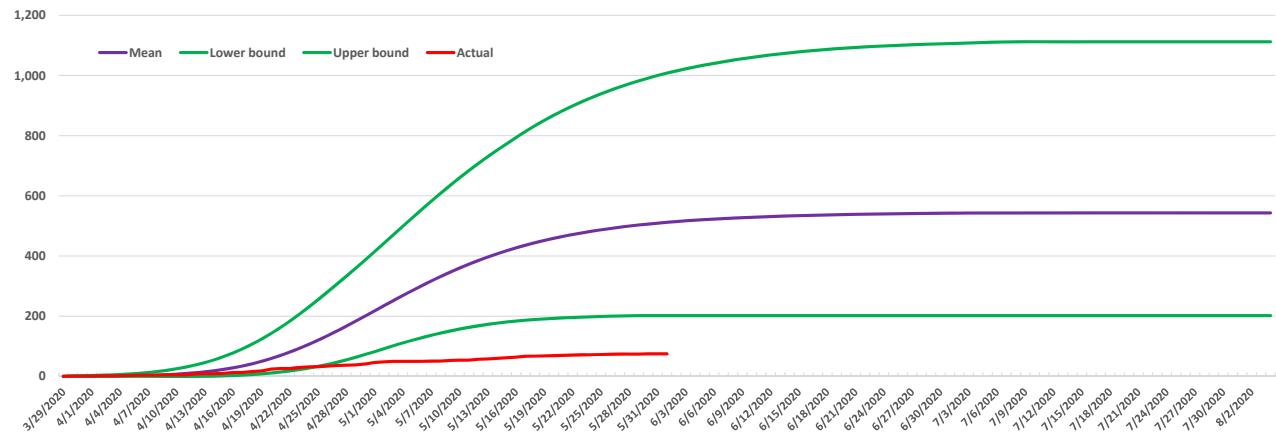
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Virginia COVID 19 Cumulative Death Projections



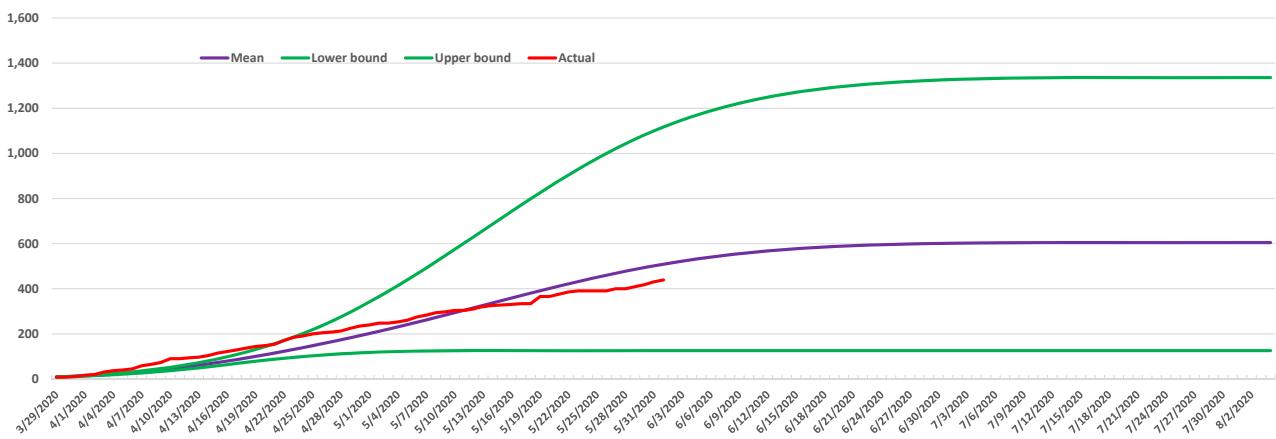
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# West Virginia COVID 19 Cumulative Death Projections



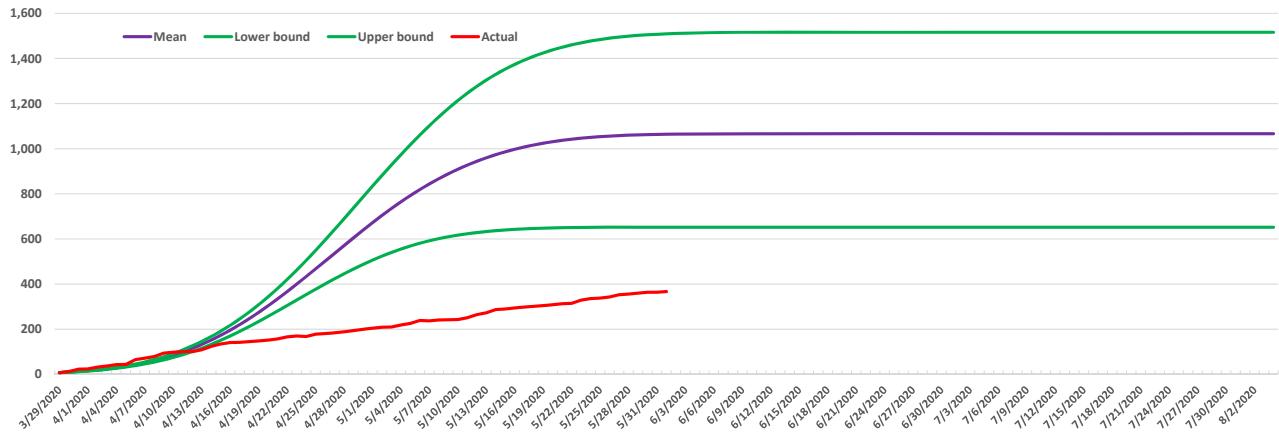
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Kentucky COVID 19 Cumulative Death Projections March 26



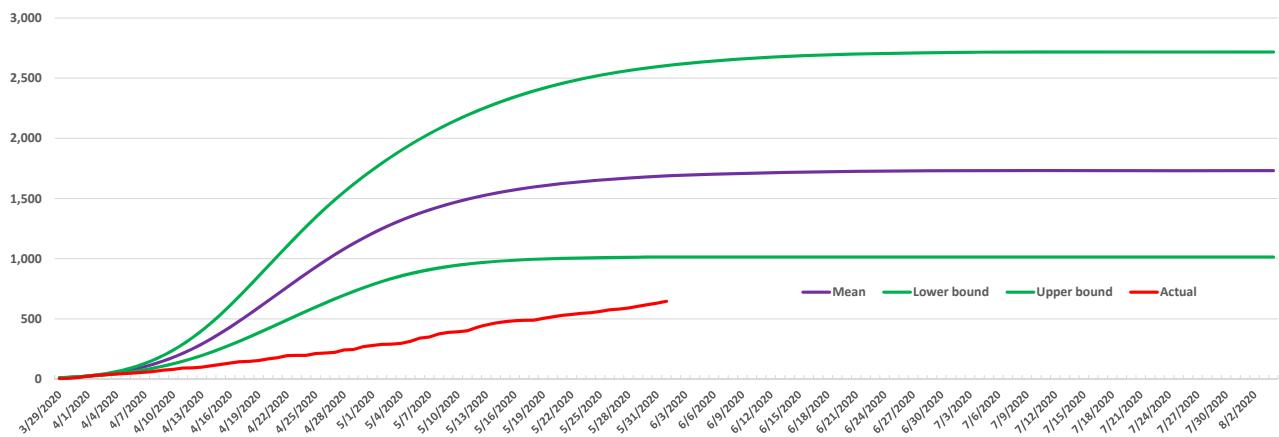
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Tennessee COVID 19 Cumulative Death Projections March 26



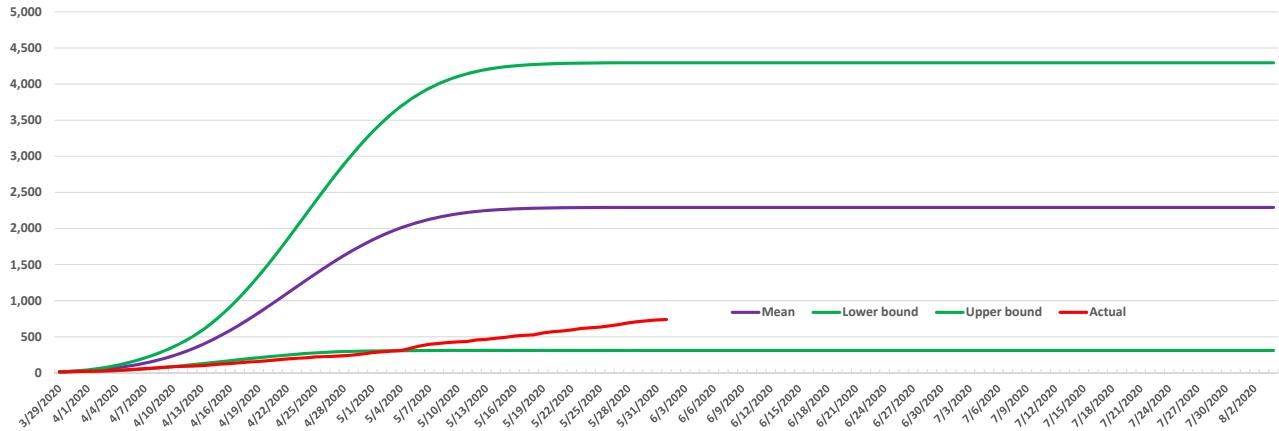
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Alabama COVID 19 Cumulative Death Projections March 26



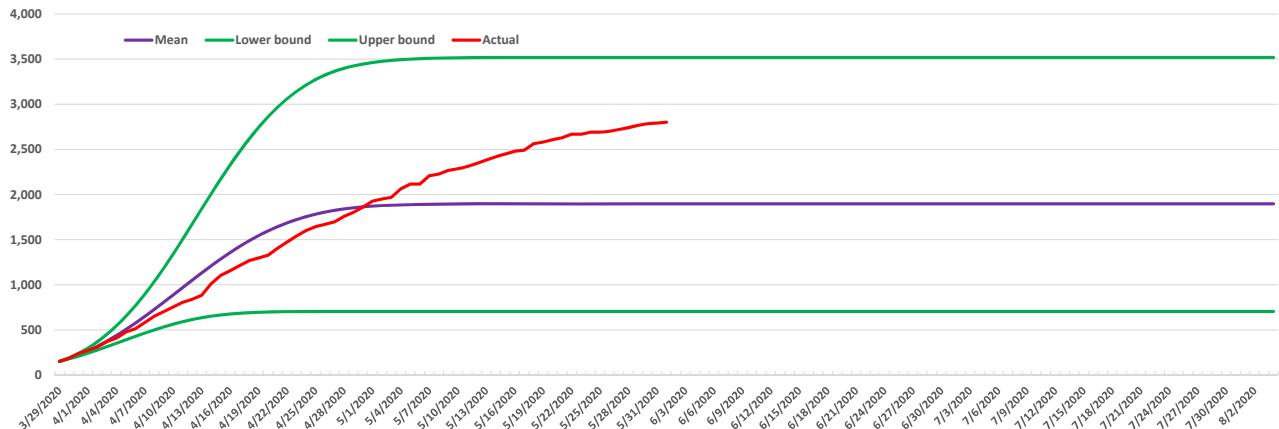
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Mississippi COVID 19 Daily Death Projections March 26



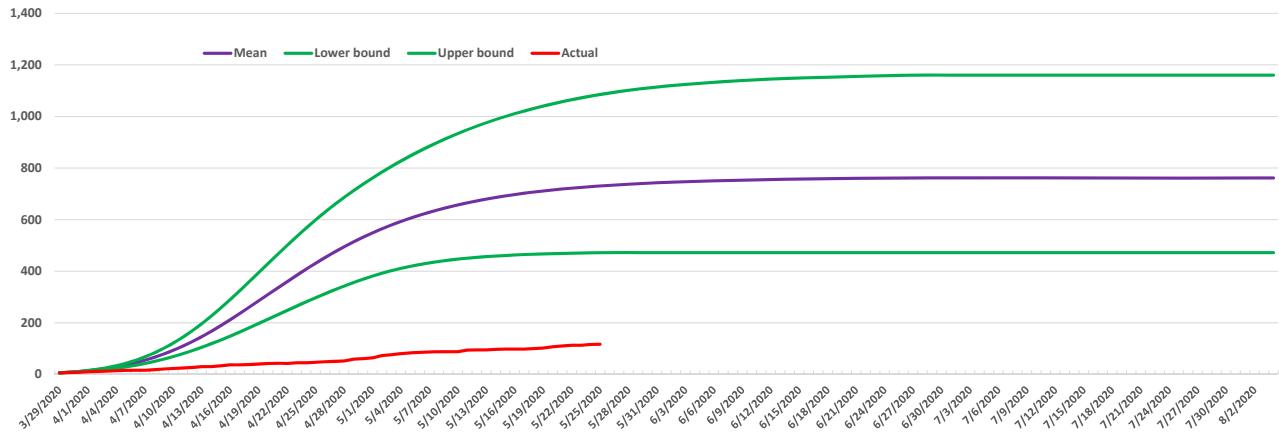
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Louisiana COVID 19 Daily Death Projections March 26



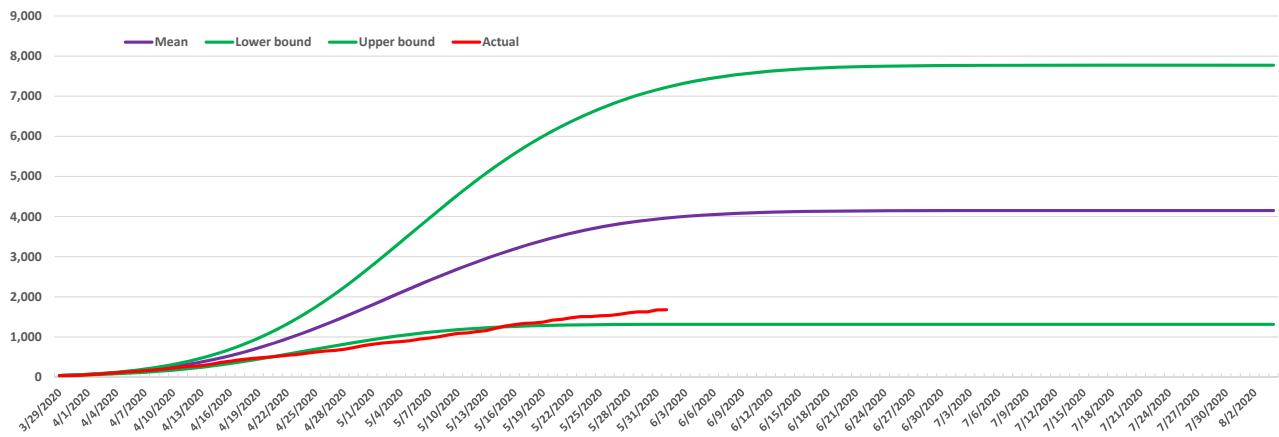
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Arkansas COVID 19 Cumulative Death Projections March 26



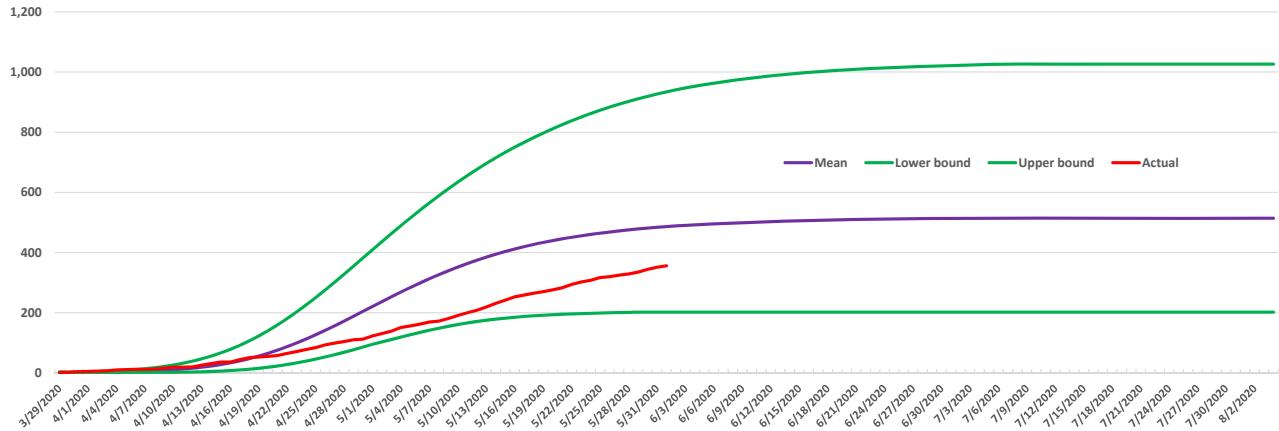
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Texas COVID 19 Daily Death Projections March 26



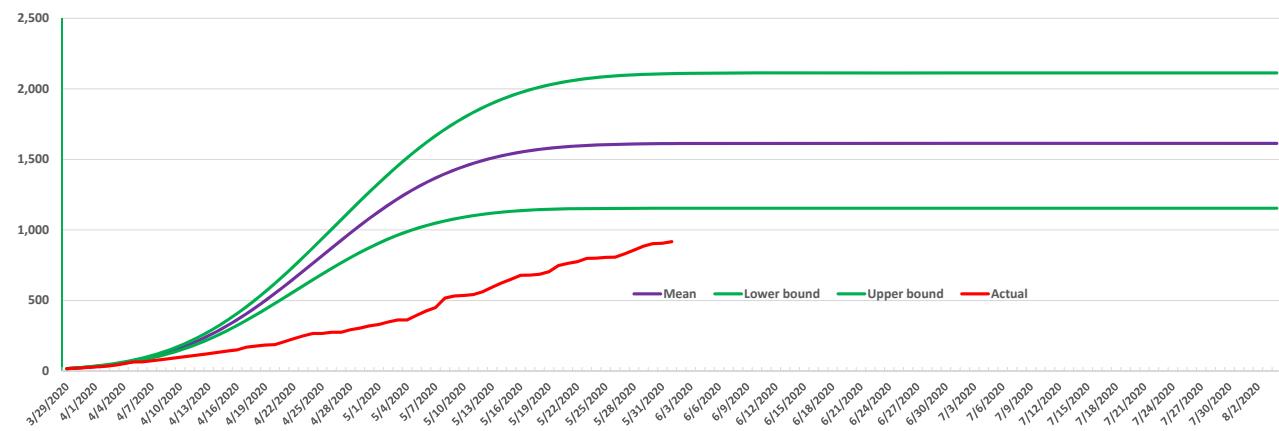
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# New Mexico COVID 19 Daily Death Projections March 26



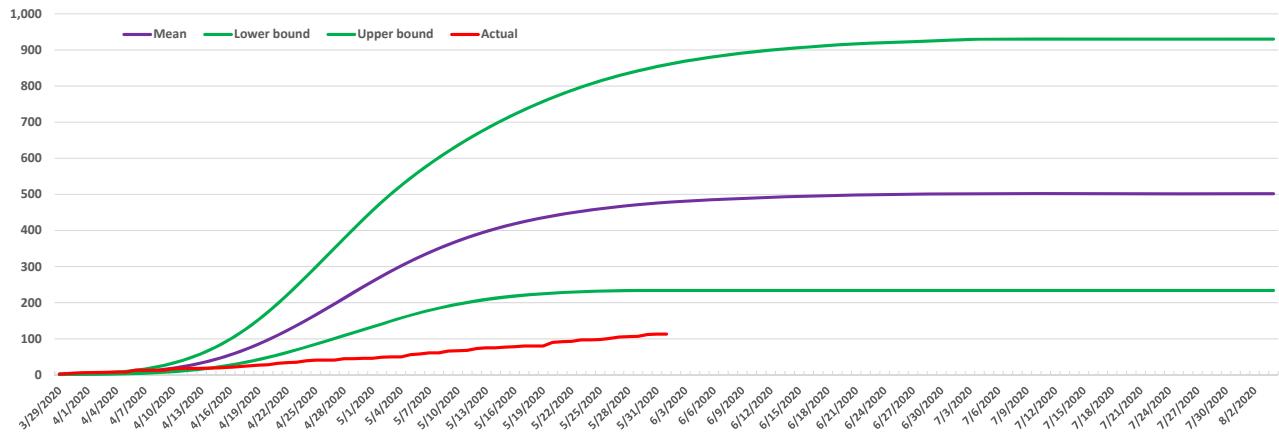
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Arizona COVID 19 Cumulative Death Projections



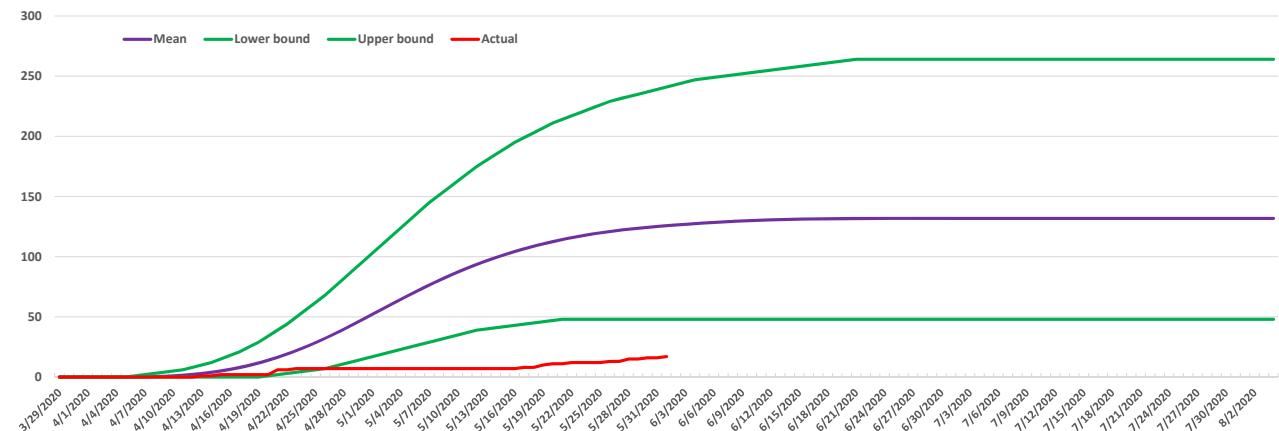
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Utah COVID 19 Daily Death Projections March 26



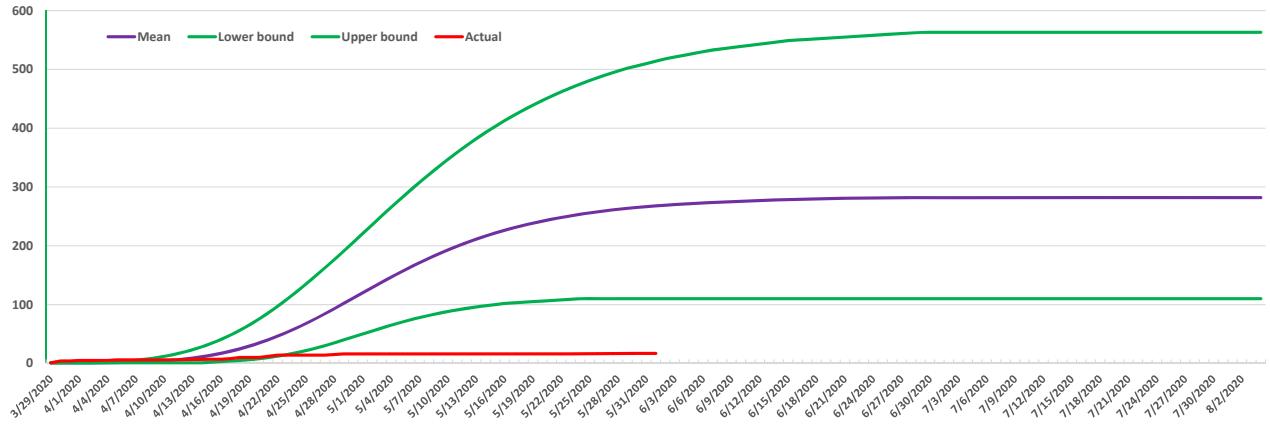
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Wyoming COVID 19 Cumulative Death Projections March 26



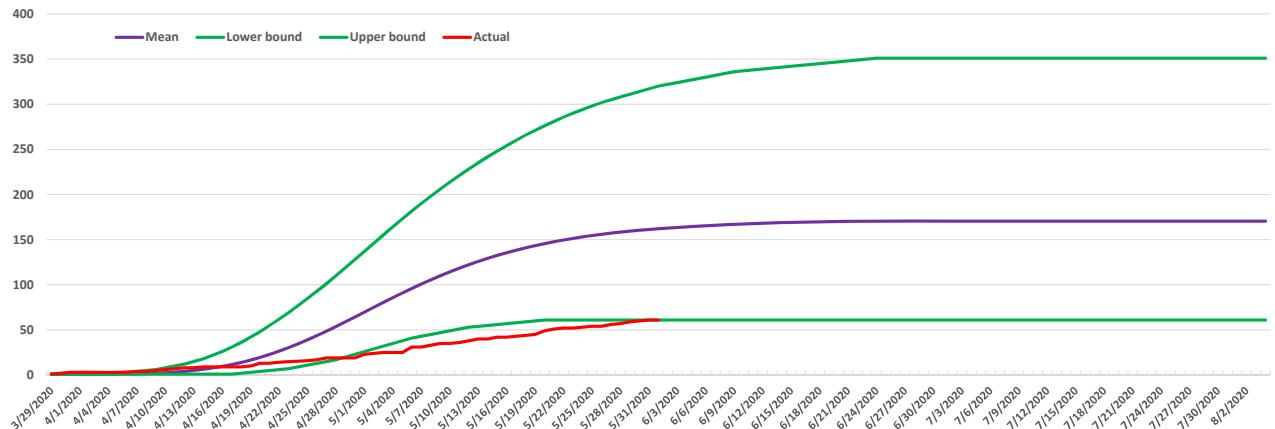
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Montana COVID 19 Cumulative Death Projections



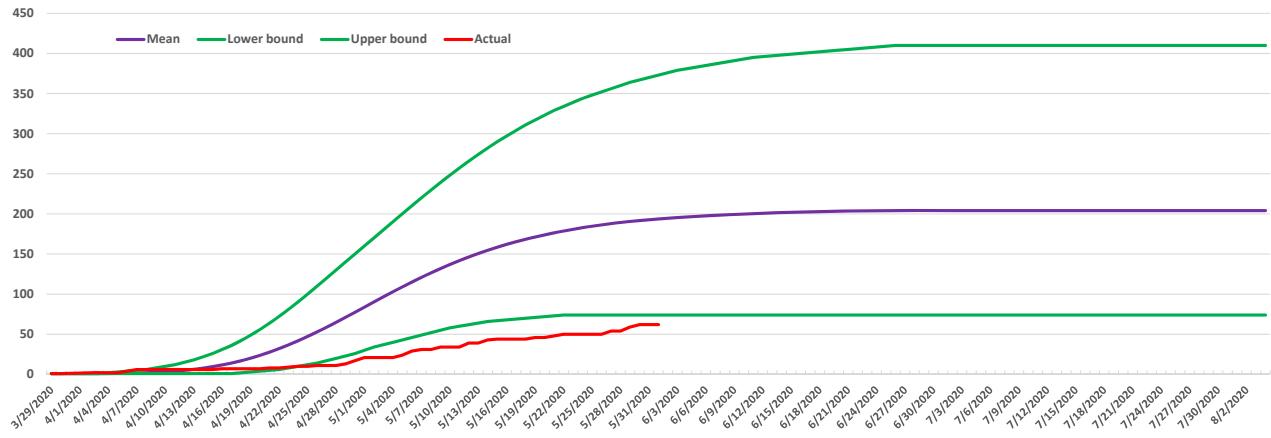
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# North Dakota COVID 19 Cumulative Death Projections March 26



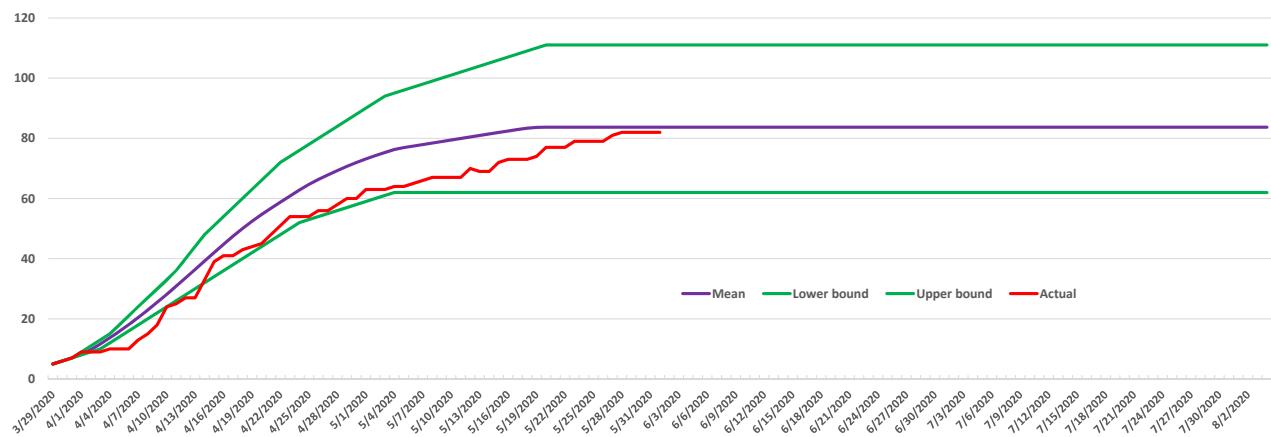
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# South Dakota COVID 19 Daily Death Projections March 26



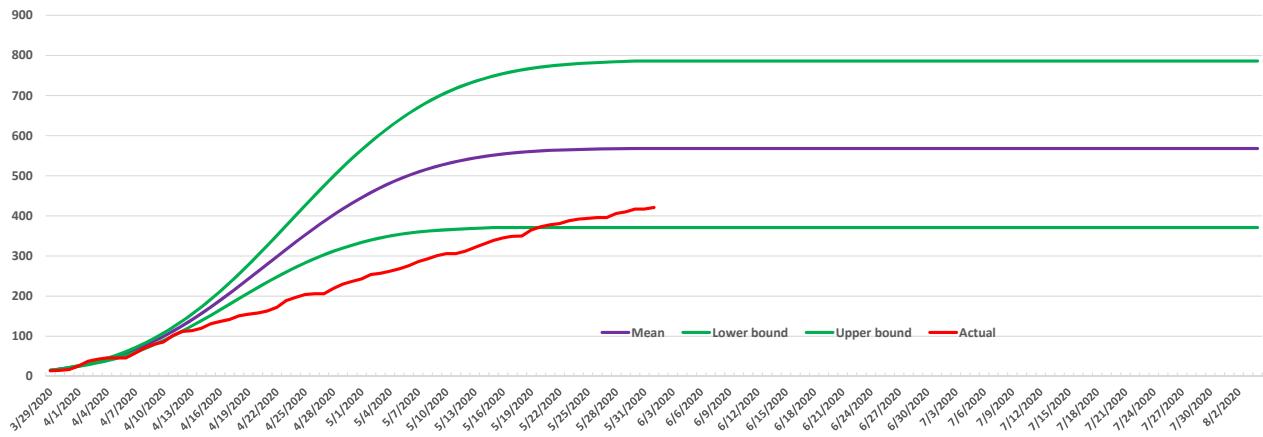
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Idaho COVID 19 Cumulative Death Projections March 26



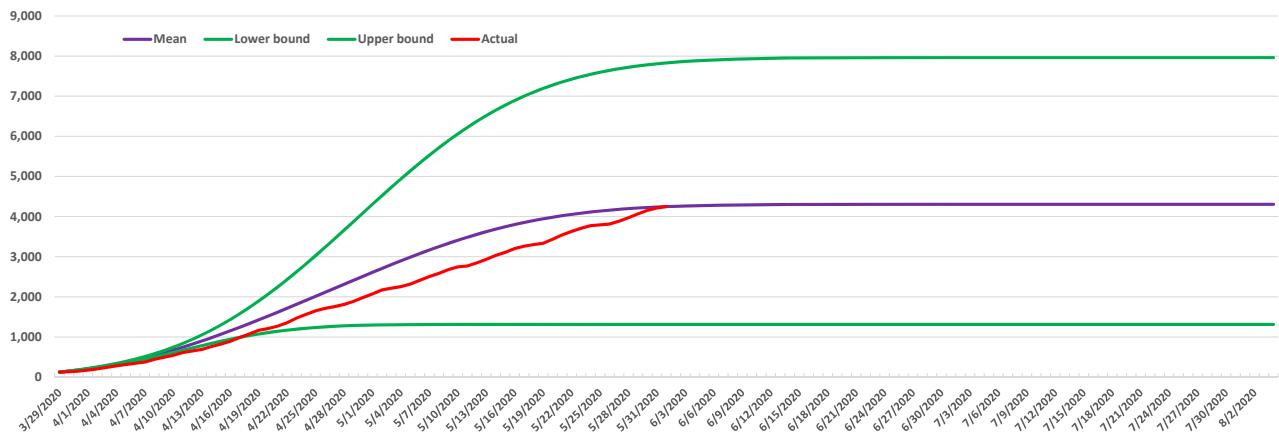
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Nevada COVID 19 Cumulative Death Projections



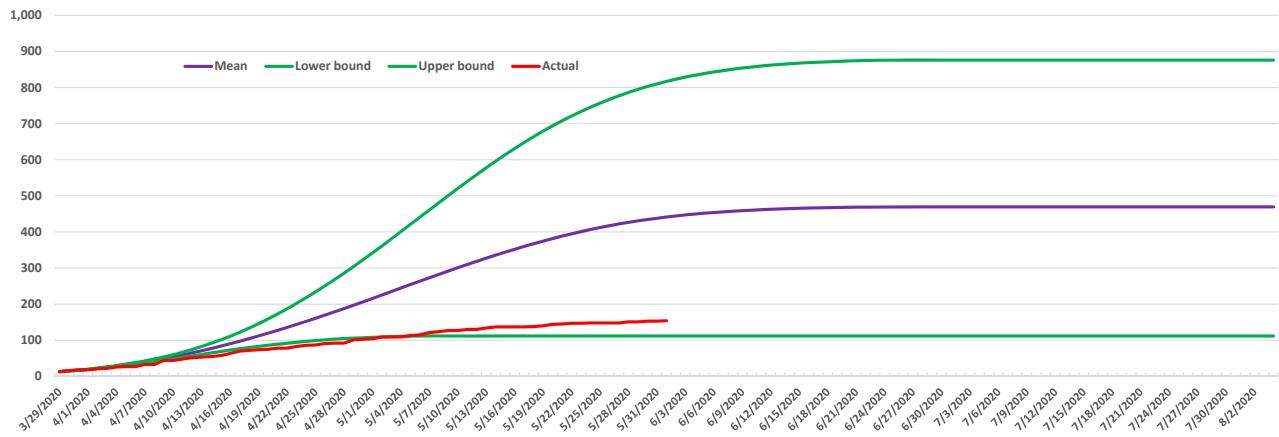
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# California COVID 19 Cumulative Death Projections March 26



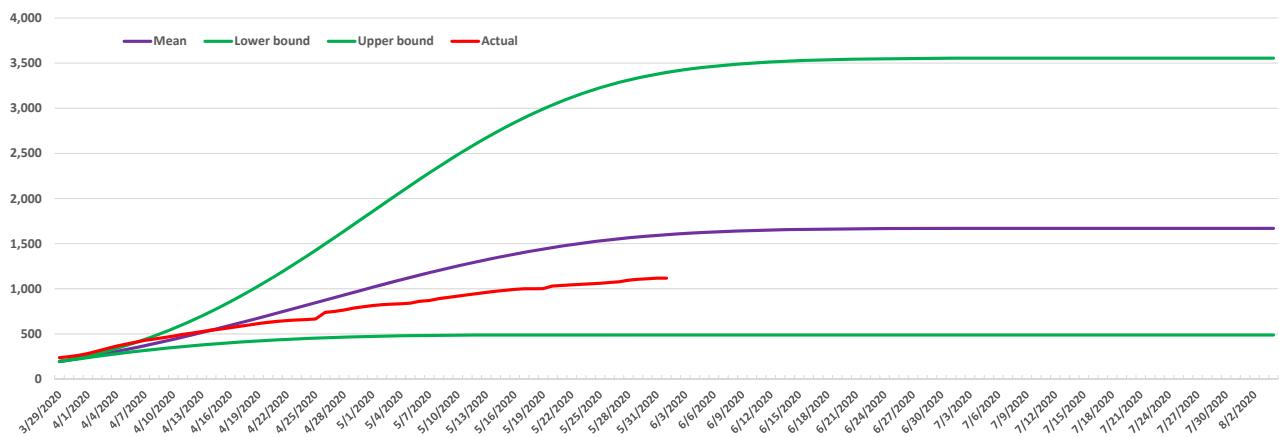
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Oregon COVID 19 Cumulative Death Projections March 26



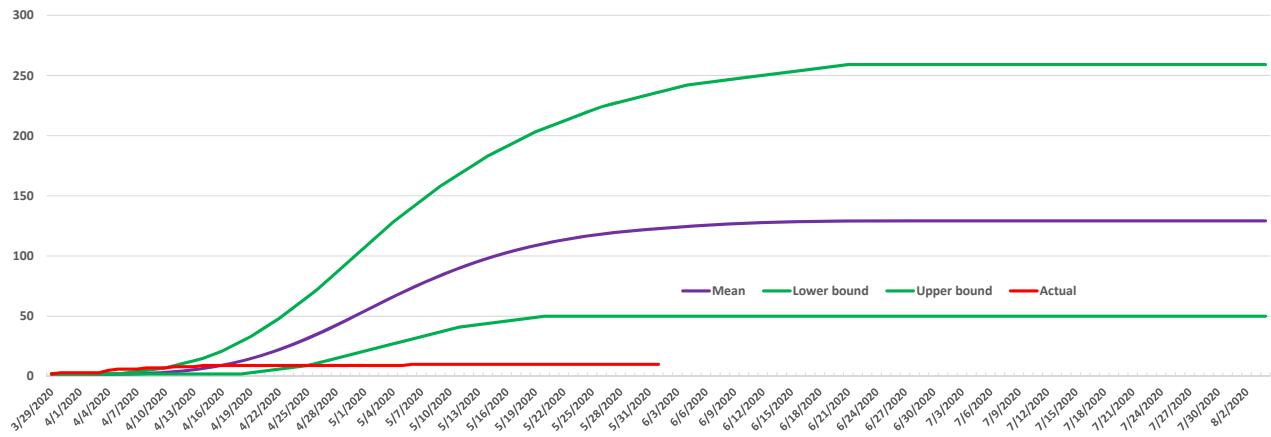
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Washington COVID 19 Cumulative Death Projections March 26



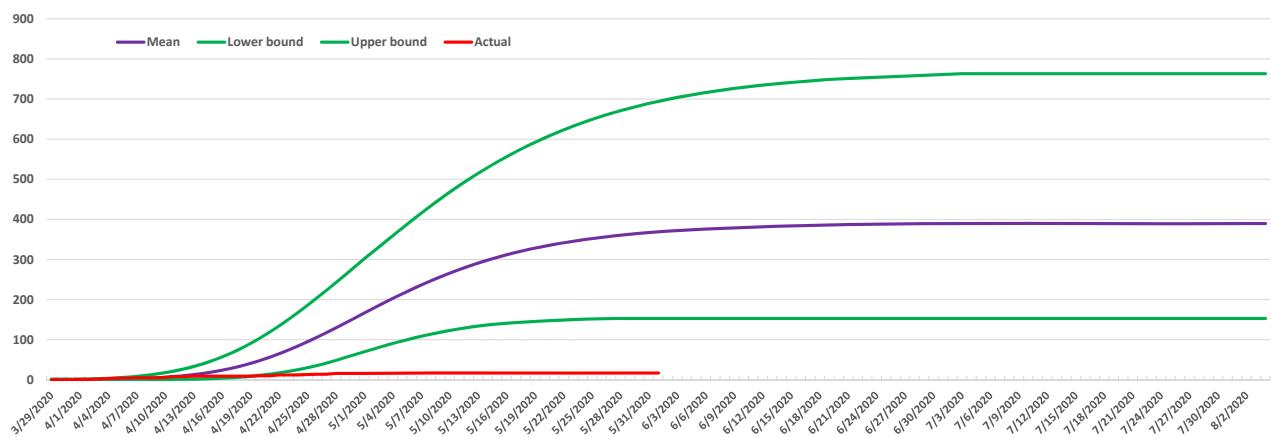
KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Alaska COVID 19 Cumulative Death Projections March 26



KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Hawaii COVID 19 Daily Death Projections March 26



KANSAS STATE  
UNIVERSITY | Agricultural Economics

# Concluding Thoughts

---

- The IMHE model has been used to drive policy decisions that have resulted in large negative economic effects for the U.S. in general and the agricultural economy specifically
- This is a first look at those states that began relaxing restrictions earlier
  - States that have relaxed earliest include Florida, Georgia, Tennessee and Texas
- Analysis indicates that these states have not experienced a large increase in deaths
- The model revision released on May 29<sup>th</sup> increased the cumulative expected death in 23 states and reduced it in 27 states
- The model revision released on May 29<sup>th</sup> has higher cumulative expected death in 21 states and lower cumulative expected death in 29 states compared to the original model



KANSAS STATE  
UNIVERSITY | Agricultural Economics