

Analysis of the IHME COVID 19 Forecasting Model – May 26th Update

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Outline

- ❖ IHME revisions since May 19th
- ❖ A look at Kansas and United States mortality statistics
- ❖ Relaxing social distancing by State
- ❖ Distribution of daily deaths compared to the March 26th model
- ❖ Cumulative deaths compared to:
 - ❖ The March 26th model and the May 4th model



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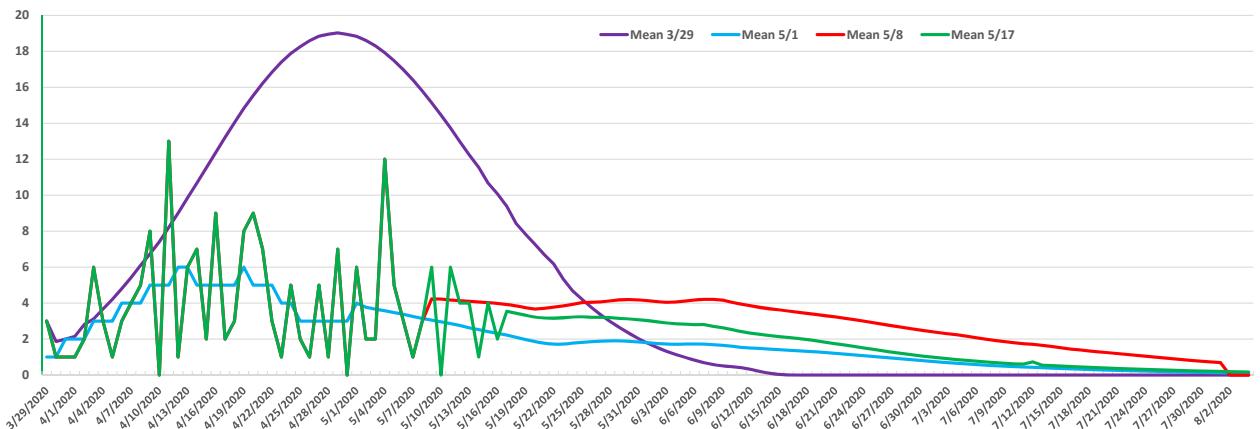
Introduction

- 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 39 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 19th discussion.
- A major change in the modeling approach occurred with the May 4th model release



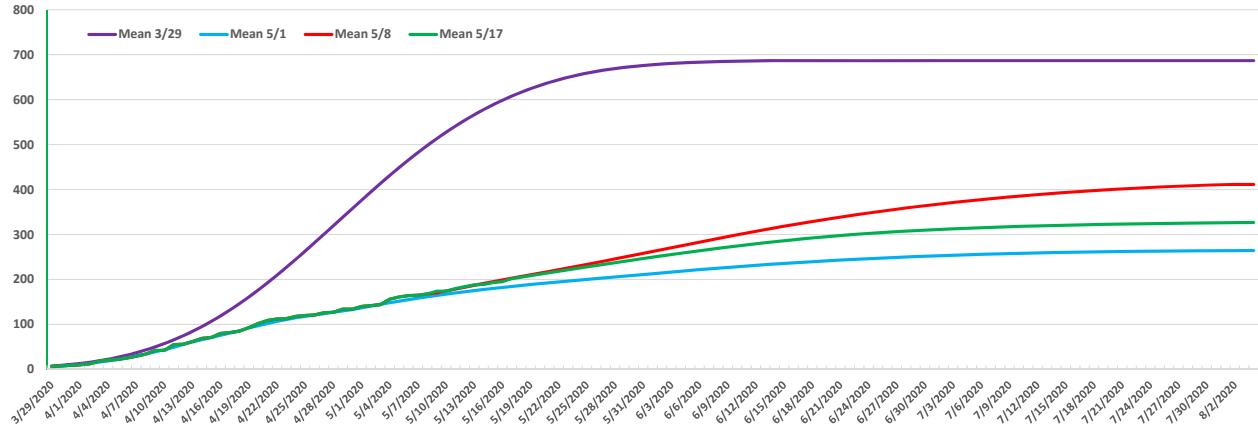
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Kansas COVID 19 Daily Death Projections Revised Forecasts



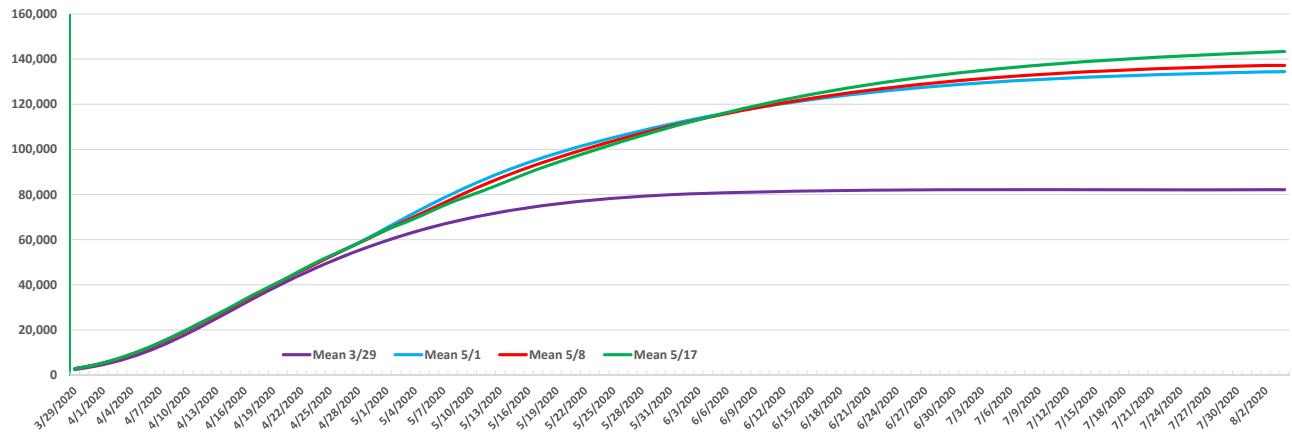
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Kansas COVID 19 Cumulative Death Projections Revised Forecasts



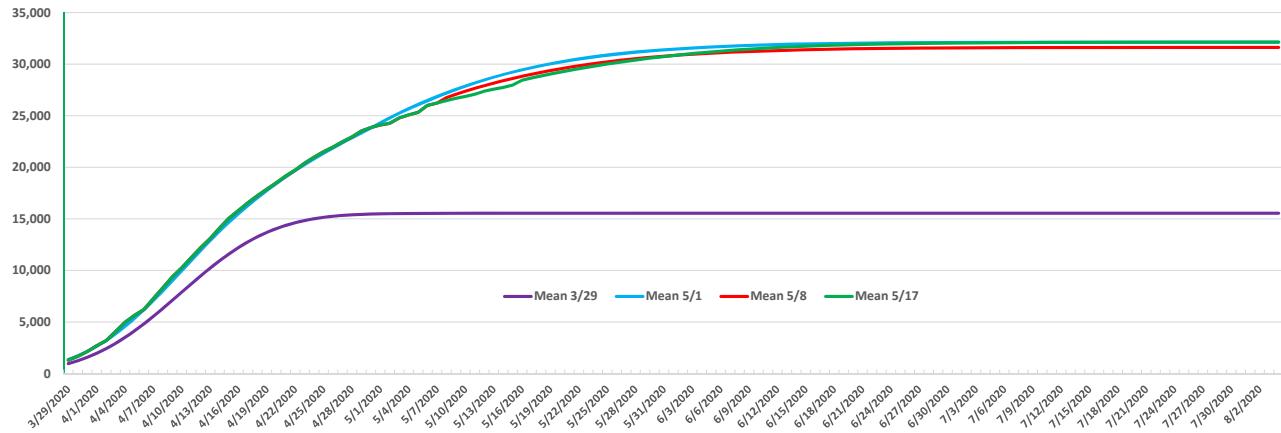
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U.S. COVID 19 Daily Cumulative Projections Revised Forecasts



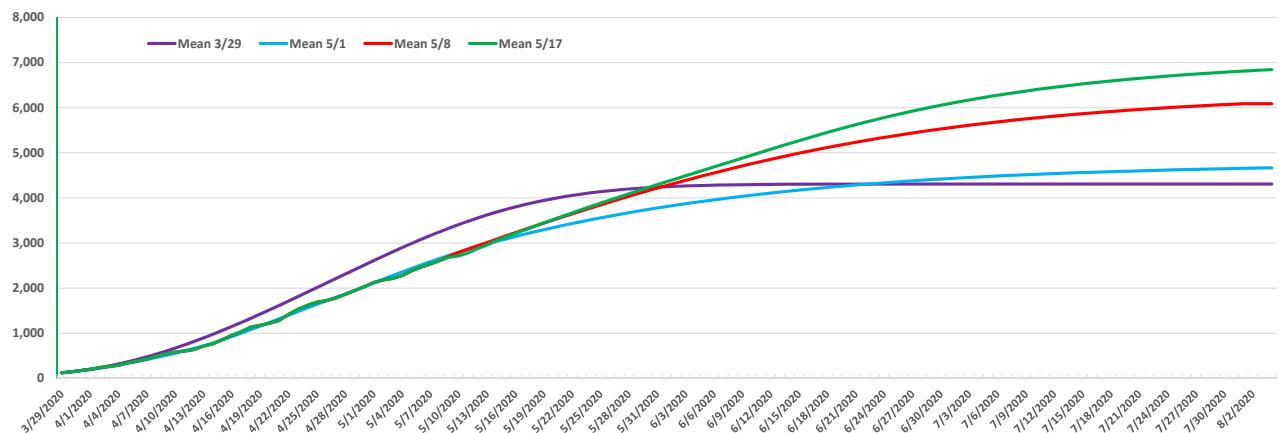
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New York COVID 19 Cumulative Death Projections Revised Forecasts



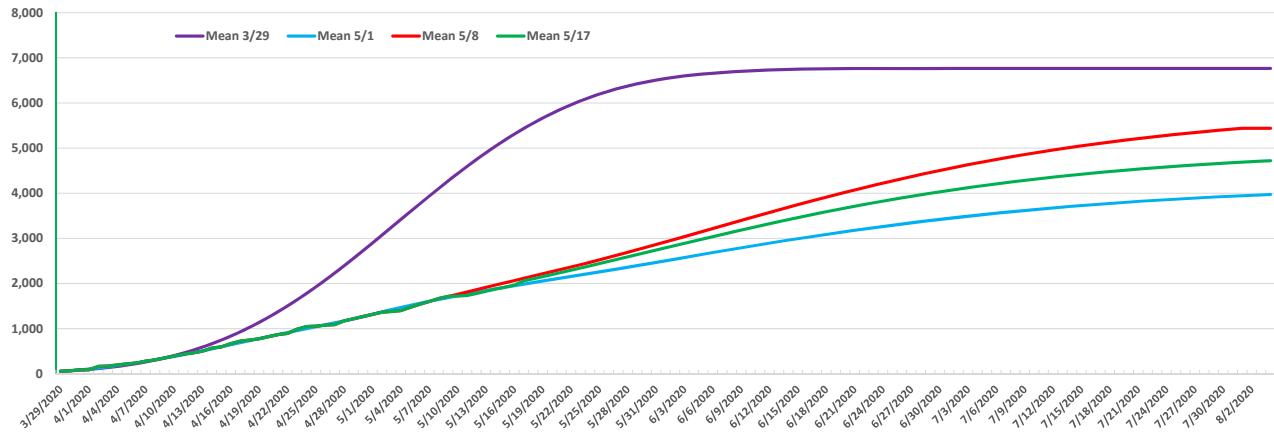
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California COVID 19 Cumulative Death Projections Revised Forecasts



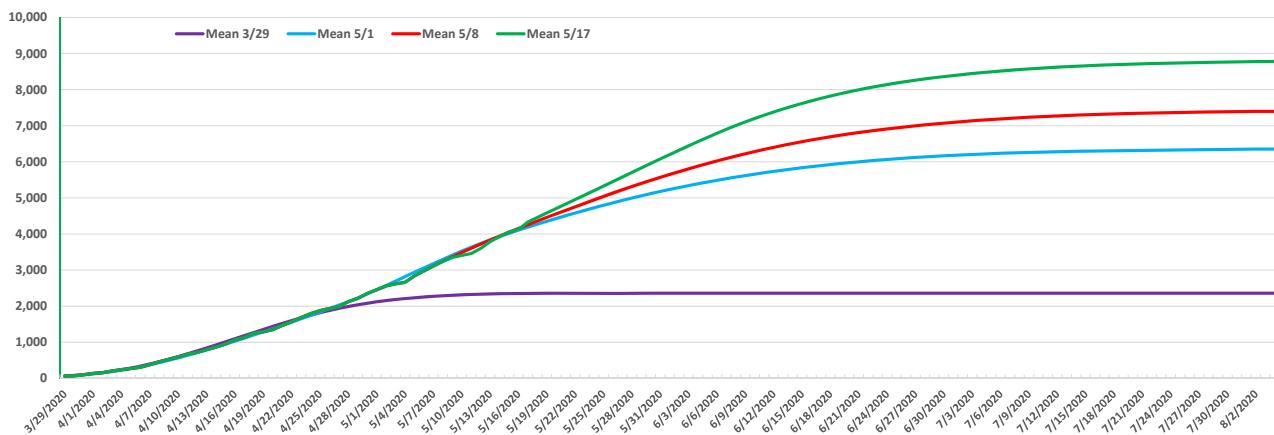
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Florida COVID 19 Cumulative Death Projections Revised Forecasts



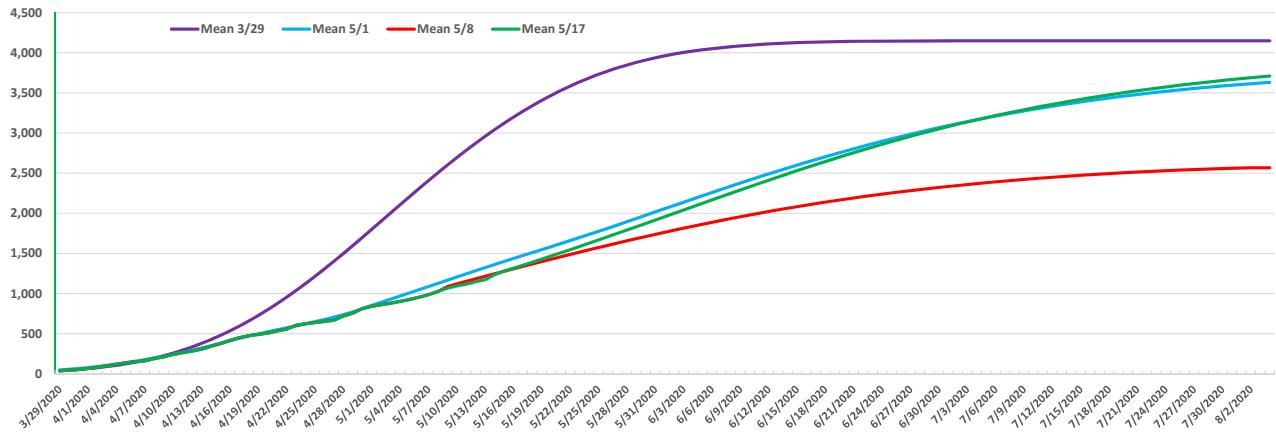
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Illinois COVID 19 Cumulative Death Projections Revised Forecasts



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Texas COVID 19 Cumulative Death Projections Revised Forecasts



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Kansas COVID Deaths by Age Group

Age Group	Number of Deaths	Percent of COVID Deaths	2018 Mortality Rates
35-44 years	4	2.1%	2.5%
45-54 years	5	4.3%	4.8%
55-64 years	20	14.9%	12.8%
65-74 years	29	19.1%	18.2%
75-84 years	35	20.7%	23.4%
85+ years	65	38.8%	34.2%
Total	158	100%	95.8%

<https://www.coronavirus.kdheks.gov/160/COVID-19-in-Kansas>, May 26, 2020

https://www.kdheks.gov/phi/AS_Tables/AS_2018_Tables_and_Figures/general_mortality/Table_E4.pdf, May 26, 2020



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U.S. COVID Deaths by Age Group

Age Group	Number of Deaths	Percent of COVID Deaths	2017 Mortality Rates
15-24 years	76	0.1%	0.2%
25-34 years	463	0.7%	1.1%
35-44 years	1,186	1.7%	2.1%
45-54 years	3,338	4.8%	6.0%
55-64 years	8,312	12.0%	13.2%
65-74 years	14,447	20.9%	18.9%
75-84 years	18,621	27.0%	23.4%
85+ years	22,543	32.7%	31.2%
Total	68,998	99.98%	98.87%

<https://data.cdc.gov/NCHS/Provisional-COVID-19-Death-Counts-by-Sex-Age-and-S/9bhg-hcku>, May 26, 2020



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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	4	0.01	1.9
45-54 years	5	0.02	3.9
55-64 years	20	0.07	9.3
65-74 years	29	0.14	18.9
75-84 years	35	0.29	47.5
85+ years	65	1.11	142.1

<https://www.coronavirus.kdheks.gov/160/COVID-19-in-Kansas>, May 26, 2020

https://www.kdheks.gov/phi/AS_Tables/AS_2018_Tables_and_Figures/general_mortality/, May 26, 2020



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U.S. COVID and General Mortality by Age Group

Age Group	COVID Deaths	COVID Deaths per 1000	2017 Mortality Rate per 1000
Under 1 year	3	0.00	5.67
1-14 years	9	0.00	0.17
15-24 years	76	0.00	0.74
25-34 years	463	0.01	1.33
35-44 years	1,186	0.03	1.95
45-54 years	3,338	0.08	4.02
55-64 years	8,312	0.20	8.86
65-74 years	14,447	0.49	17.91
75-84 years	18,621	1.27	44.73
85+ years	22,543	3.48	135.74

<https://data.cdc.gov/NCHS/Provisional-COVID-19-Death-Counts-by-Sex-Age-and-S/9bhg-hcku>, May 26, 2020



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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			Idaho	May 1		May 1
Arizona	May 16	May 16	May 16	Illinois			
Arkansas	n/a			Indiana	May 4		
California				Iowa	n/a		
Colorado	April 27			Kansas	May 4		
Connecticut	n/a			Kentucky	n/a		
Delaware				Louisiana	May 15		May 15
Florida	May 4			Maine			
Georgia	May 1			Maryland	May 15		



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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 4	May 4	May 4	Ohio			
Montana	April 26			Oklahoma	n/a		
Nebraska	n/a			Oregon			
Nevada	May 9			Pennsylvania	May 8		
New Hampshire				Rhode Island	May 9		
New Jersey				South Carolina	May 4		



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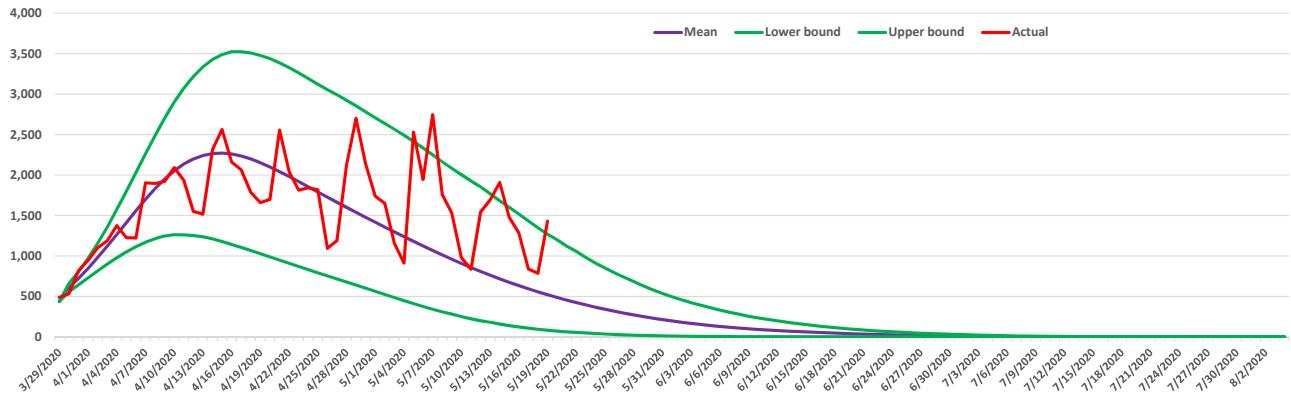
Relaxing of Social Distancing by State from the IHME

	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		



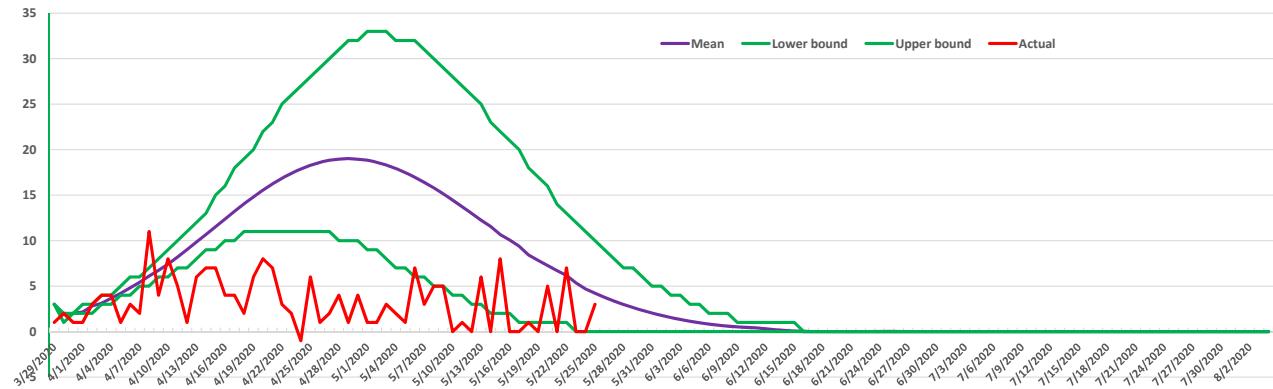
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U.S. COVID 19 Daily Death Projections March 26



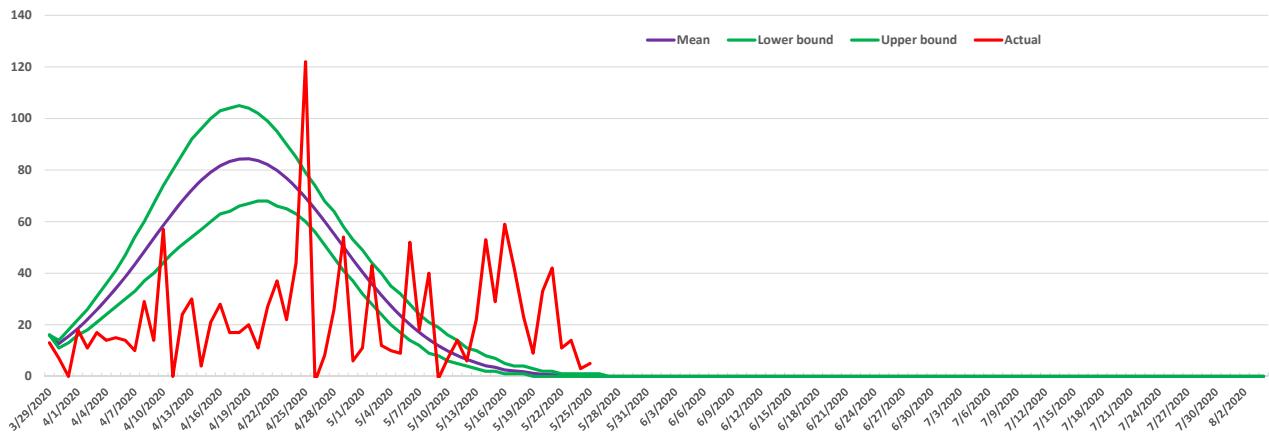
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Kansas COVID 19 Daily Death Projections March 26



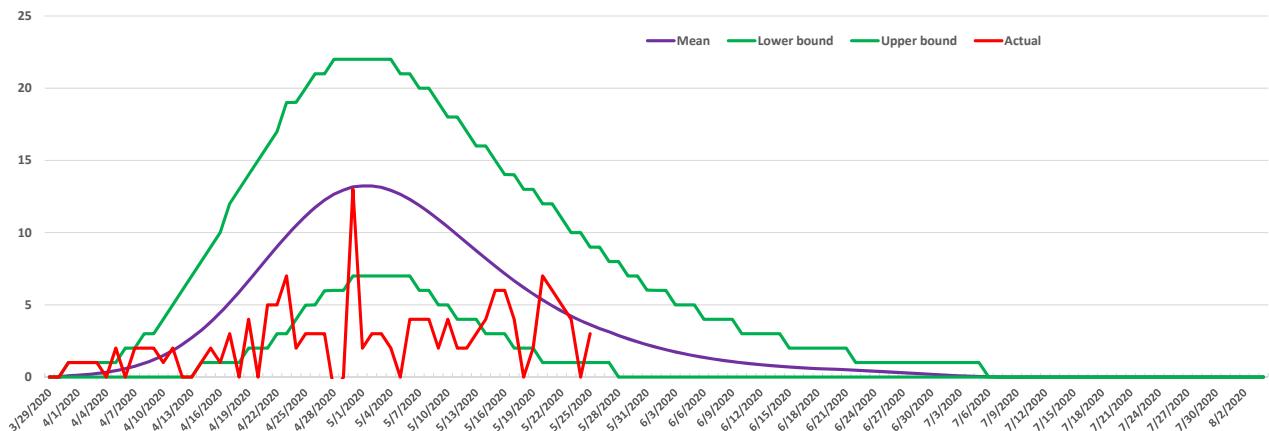
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Colorado COVID 19 Daily Death Projections March 26



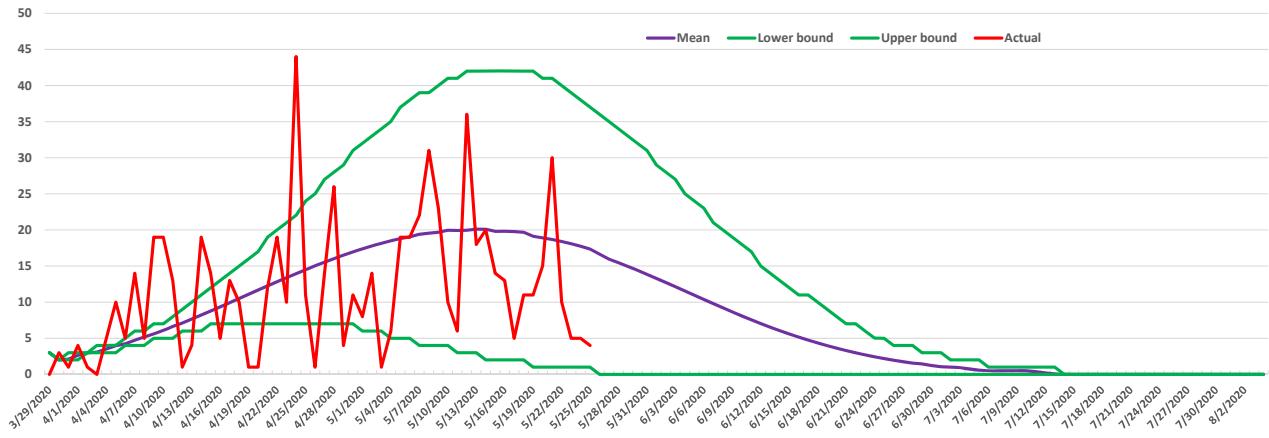
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Nebraska COVID 19 Daily Death Projections March 26



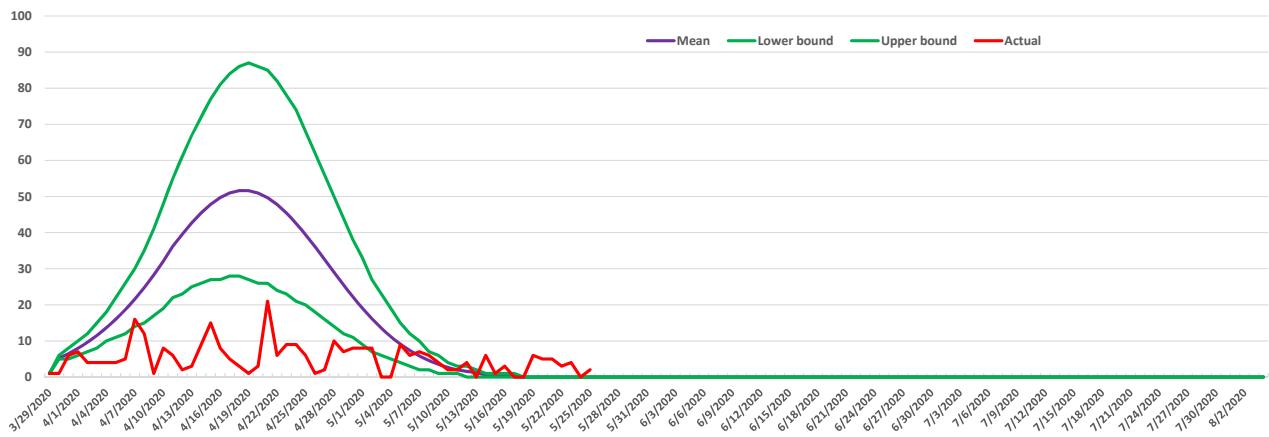
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Missouri COVID 19 Daily Death Projections March 26



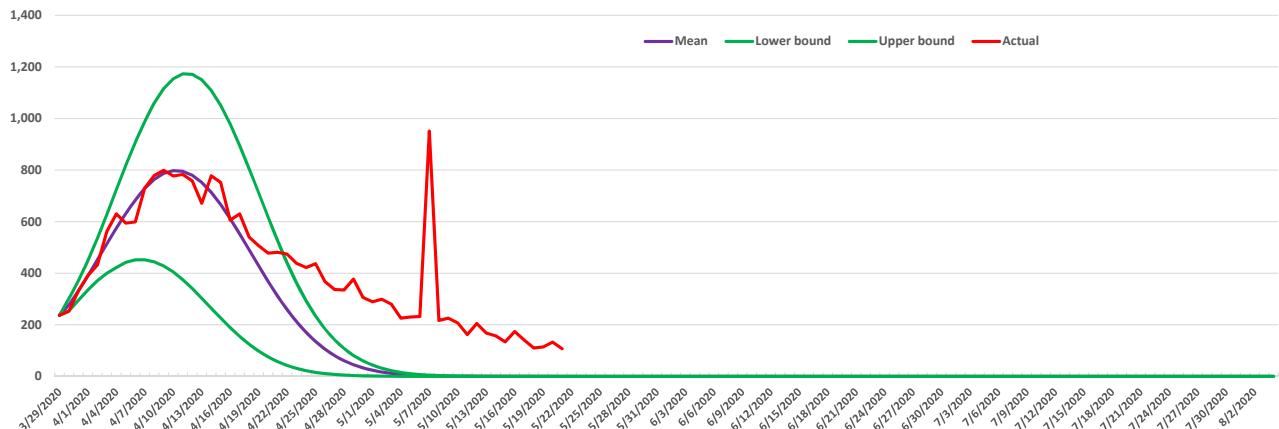
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Oklahoma COVID 19 Daily Death Projections March 26



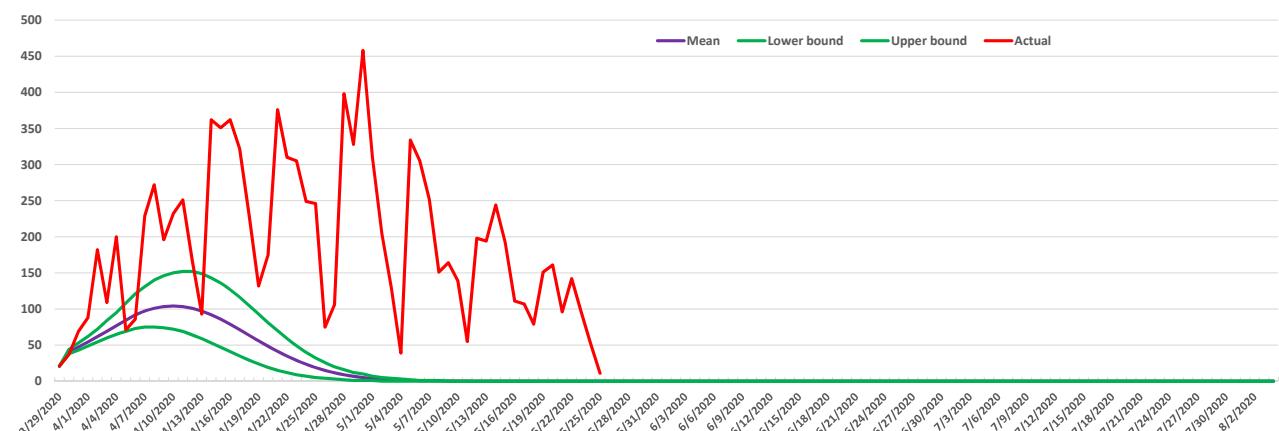
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New York COVID 19 Daily Death Projections March 26



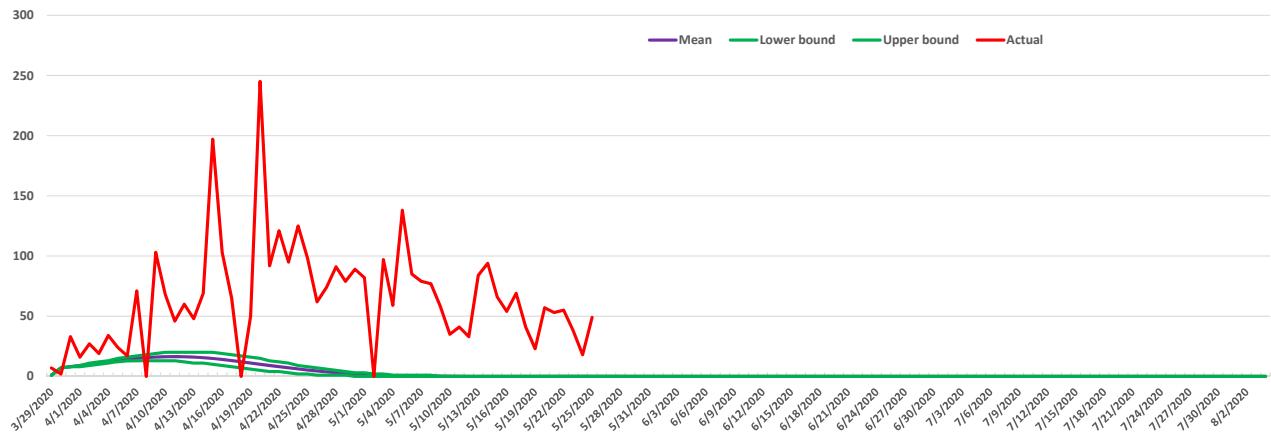
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New Jersey COVID 19 Daily Death Projections March 26



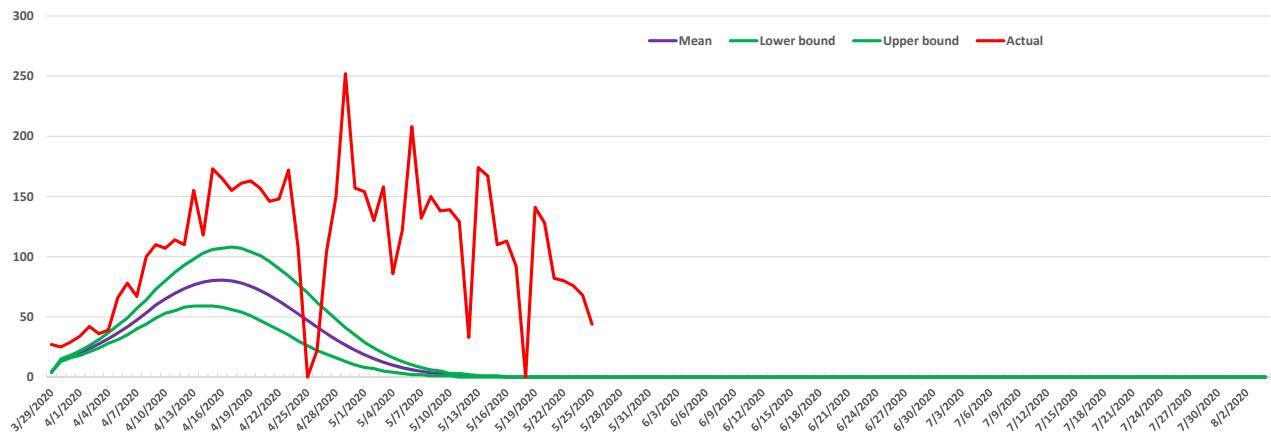
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Connecticut COVID 19 Daily Death Projections March 26



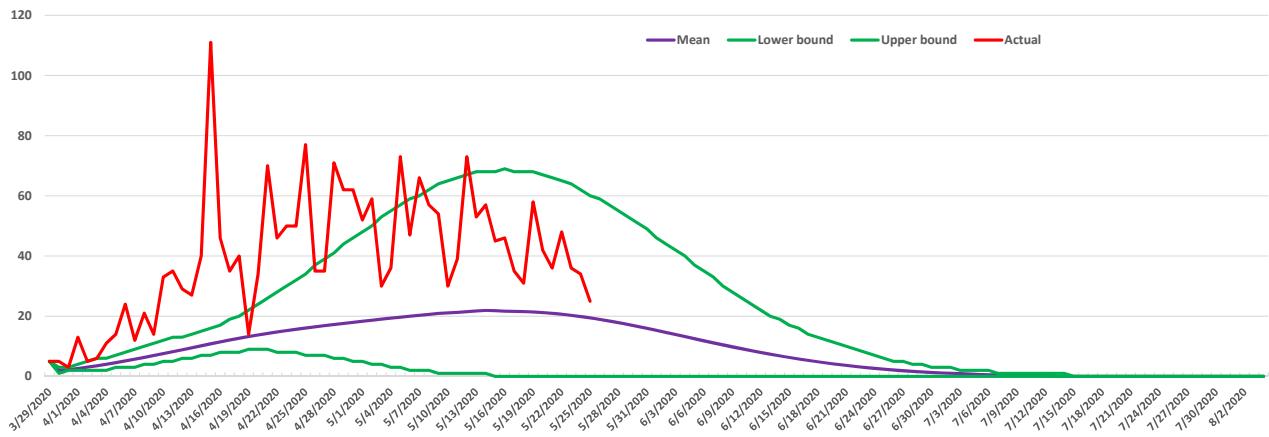
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Massachusetts COVID 19 Daily Death Projections March 26



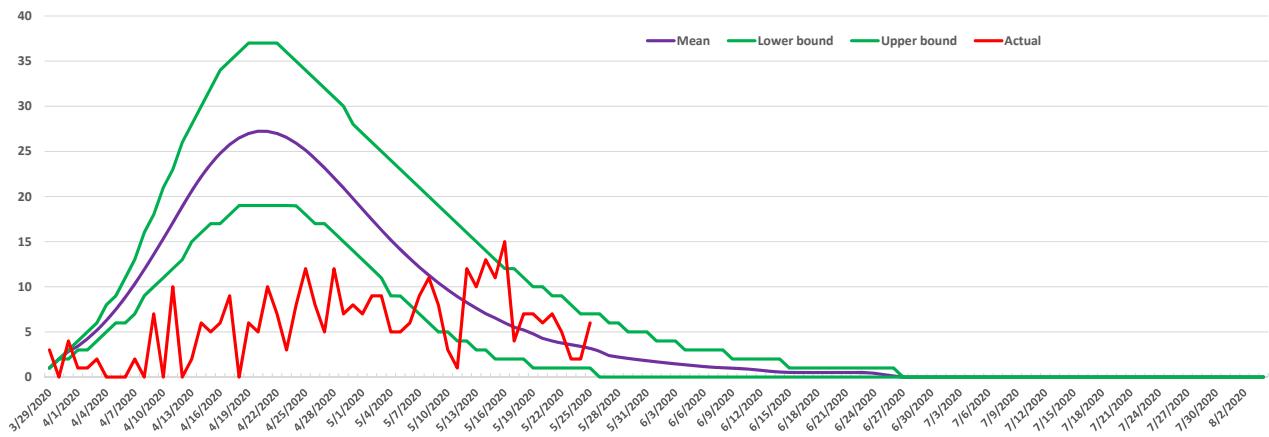
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Maryland COVID 19 Daily Death Projections March 26



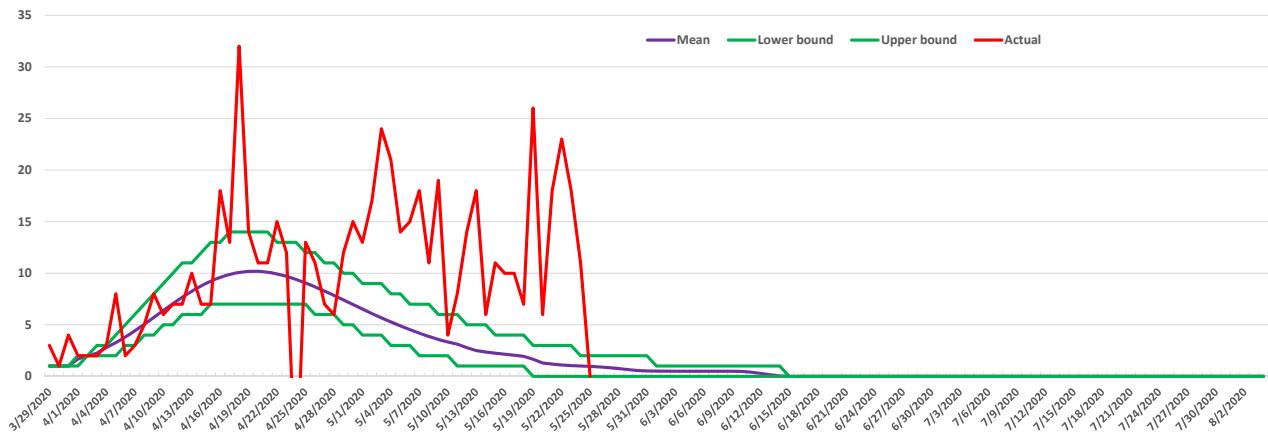
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Delaware COVID 19 Daily Death Projections March 26



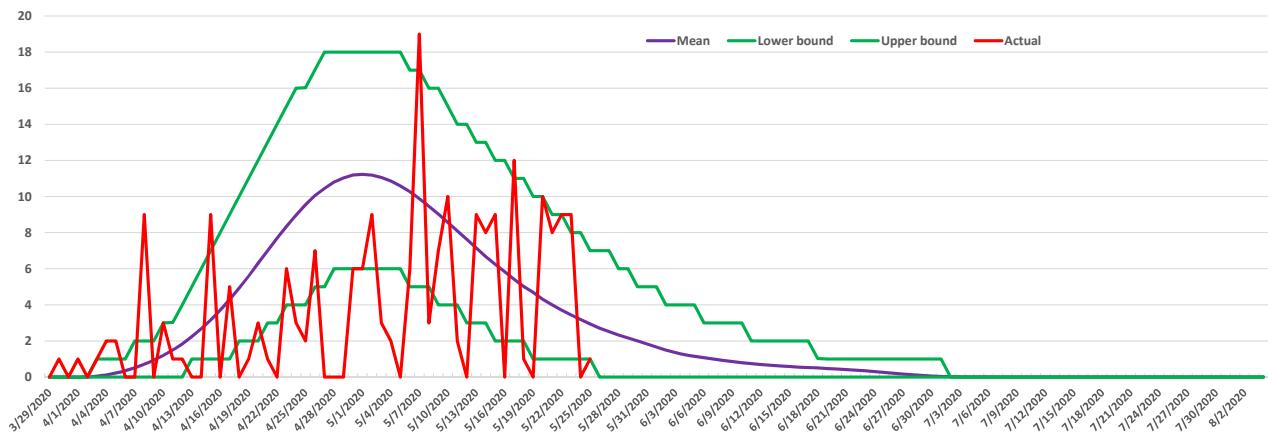
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Rhode Island COVID 19 Daily Death Projections March 26



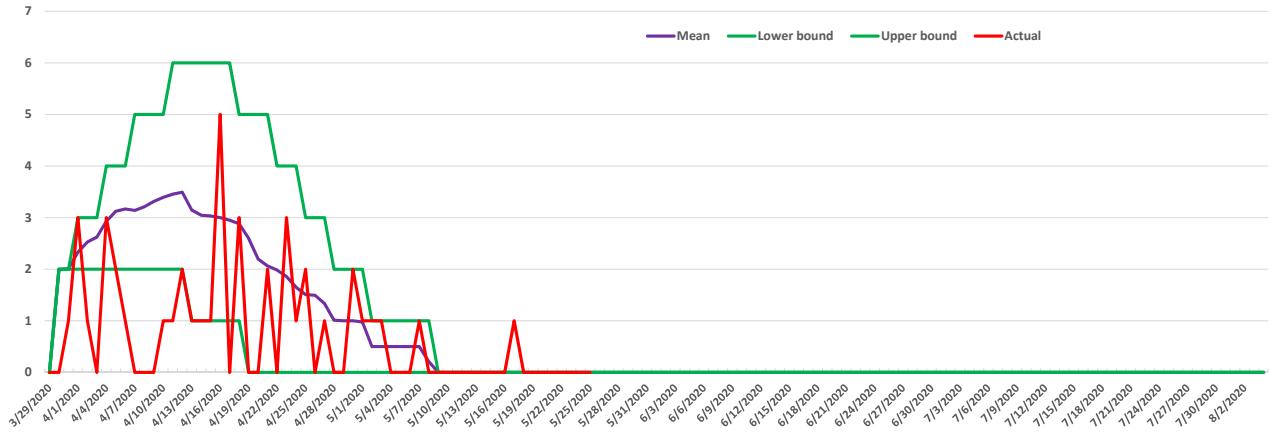
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New Hampshire COVID 19 Daily Death Projections March 26



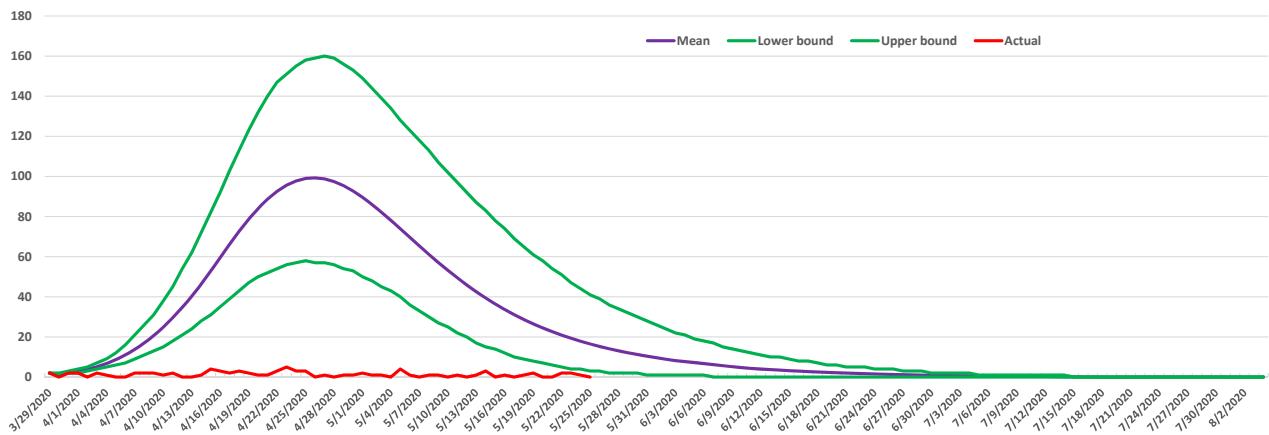
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Vermont COVID 19 Daily Death Projections March 26



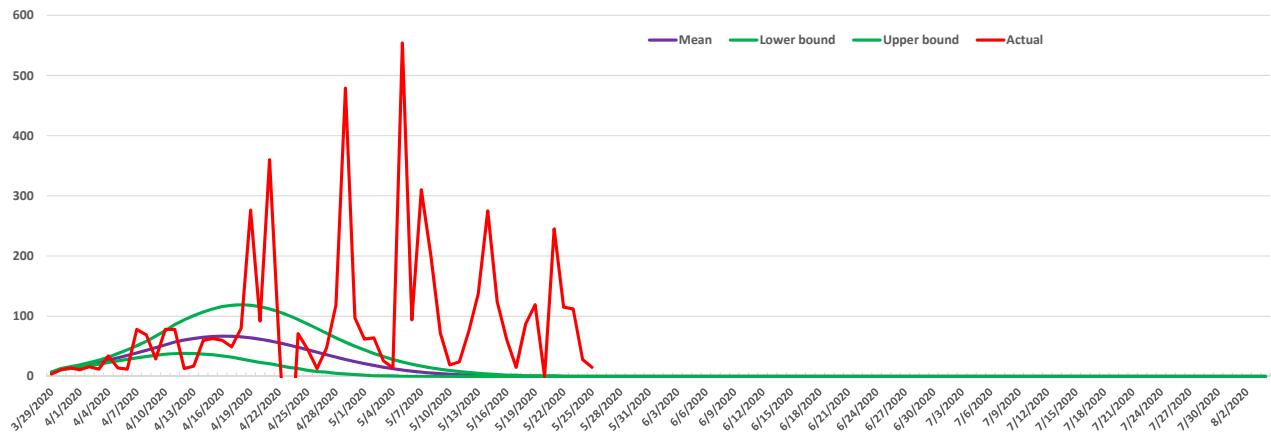
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Maine COVID 19 Daily Death Projections March 26



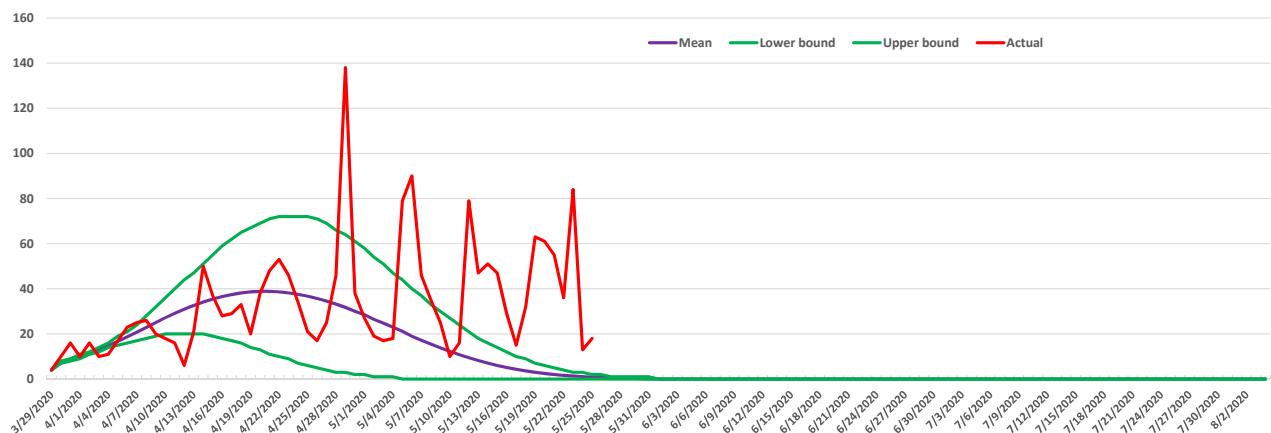
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Pennsylvania COVID 19 Daily Death Projections March 26



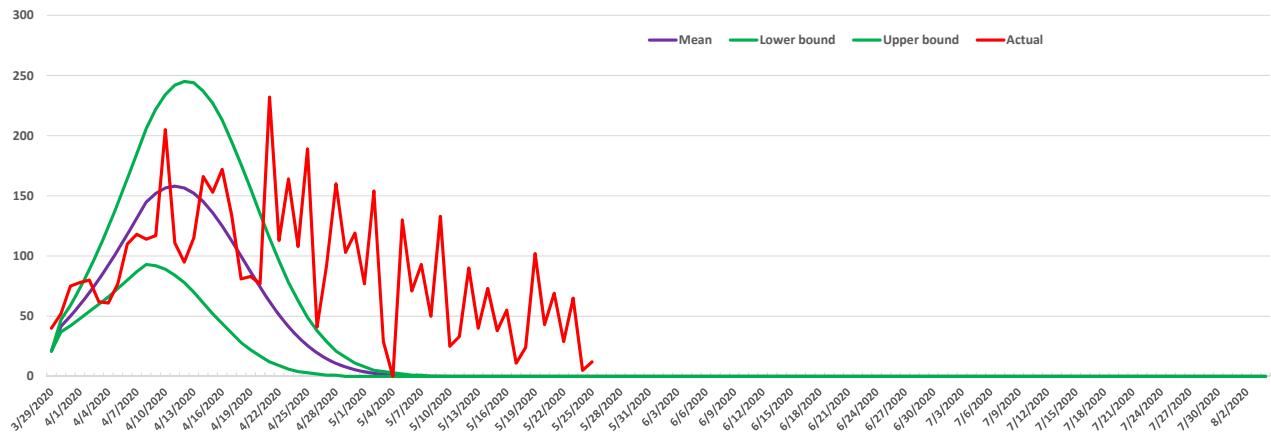
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Ohio COVID 19 Daily Death Projections March 26



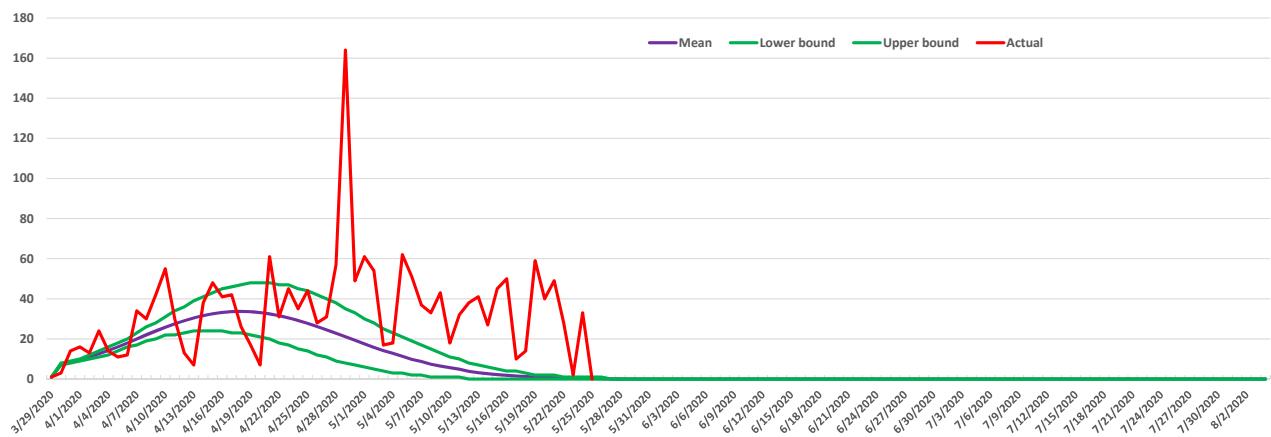
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Michigan COVID 19 Daily Death Projections March 26



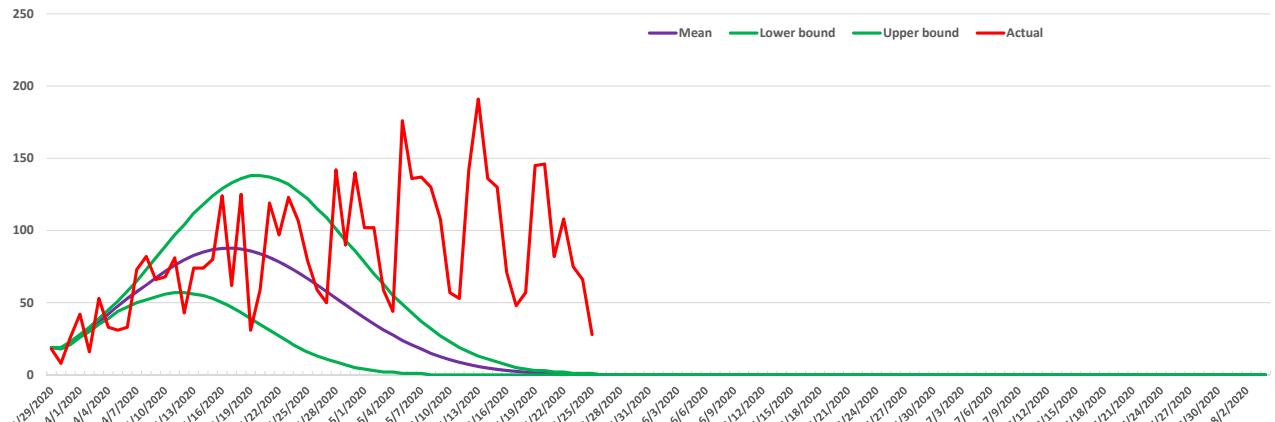
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Indiana COVID 19 Daily Death Projections March 26



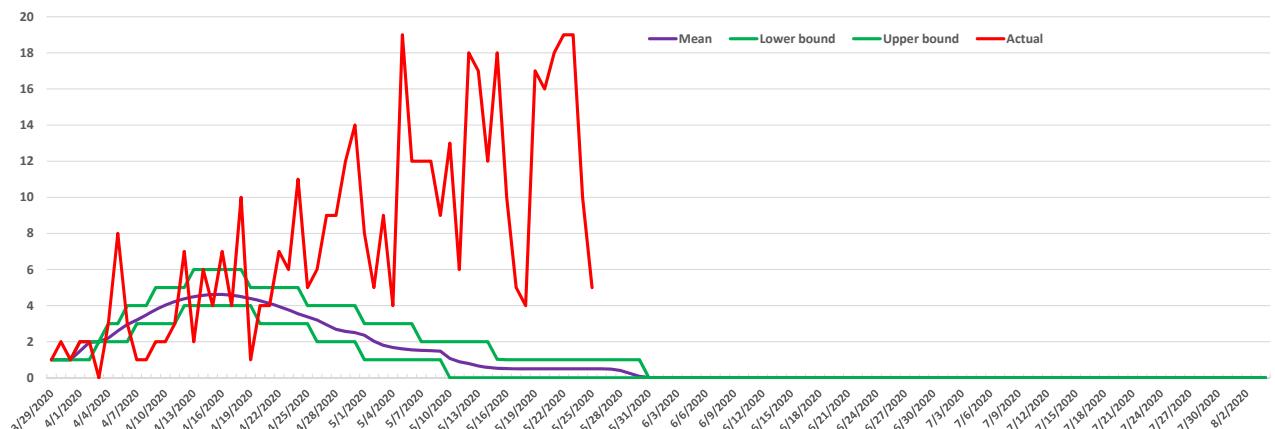
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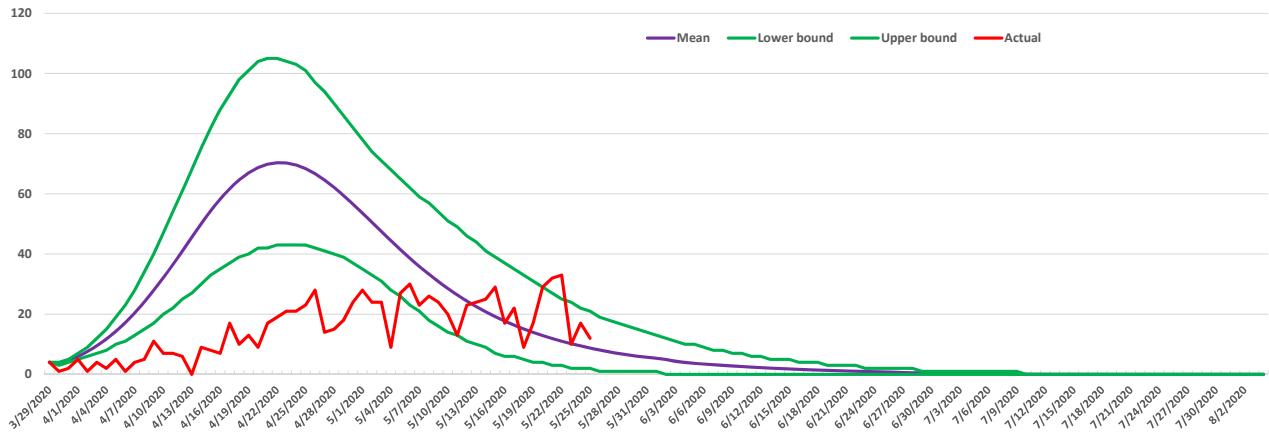
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Iowa COVID 19 Daily Death Projections March 26



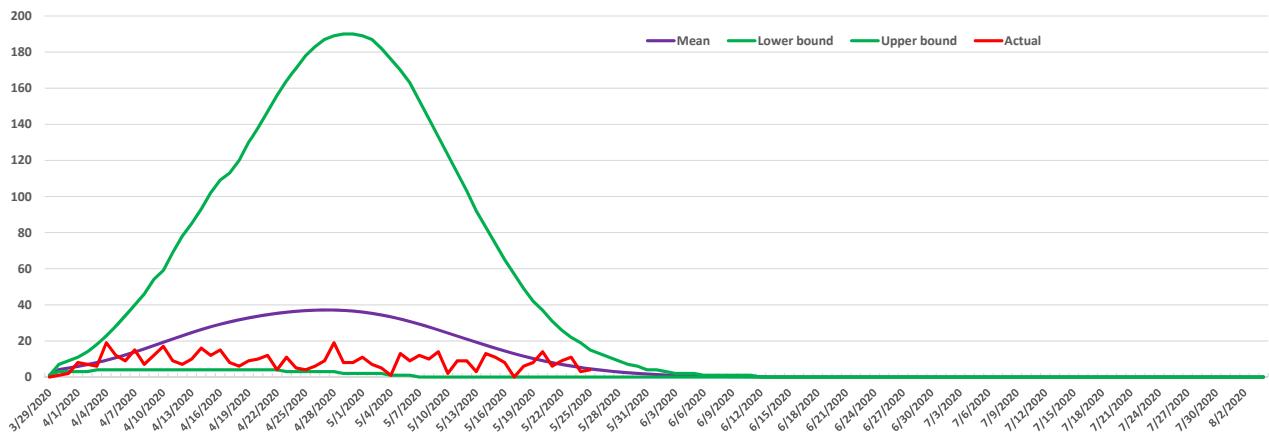
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Minnesota COVID 19 Daily Death Projections March 26



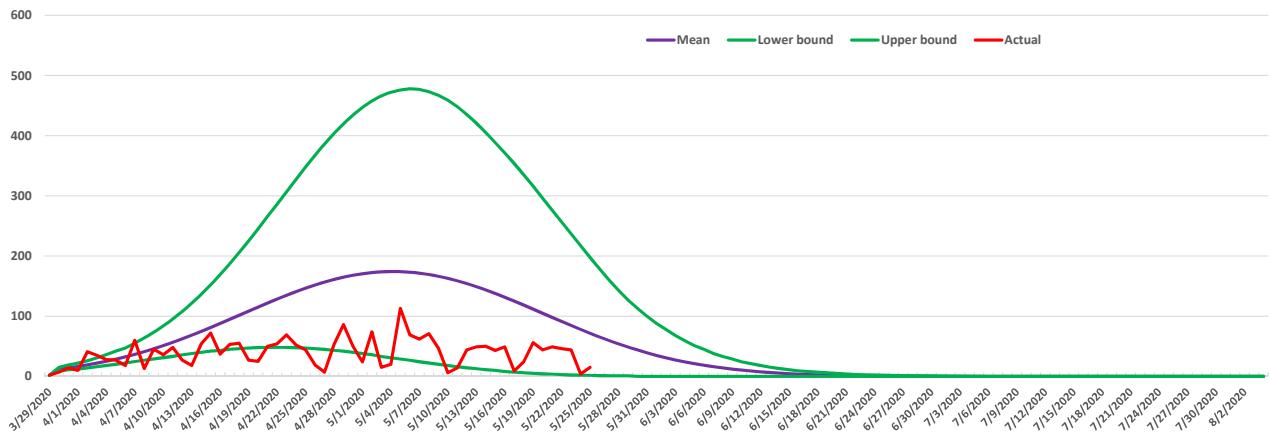
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Wisconsin COVID 19 Daily Death Projections March 26



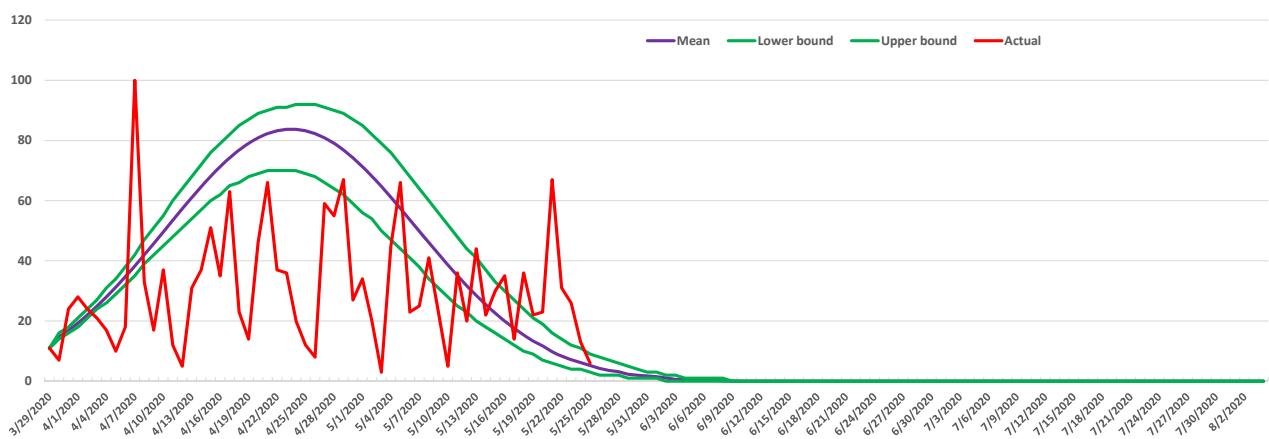
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Florida COVID 19 Daily Death Projections March 26



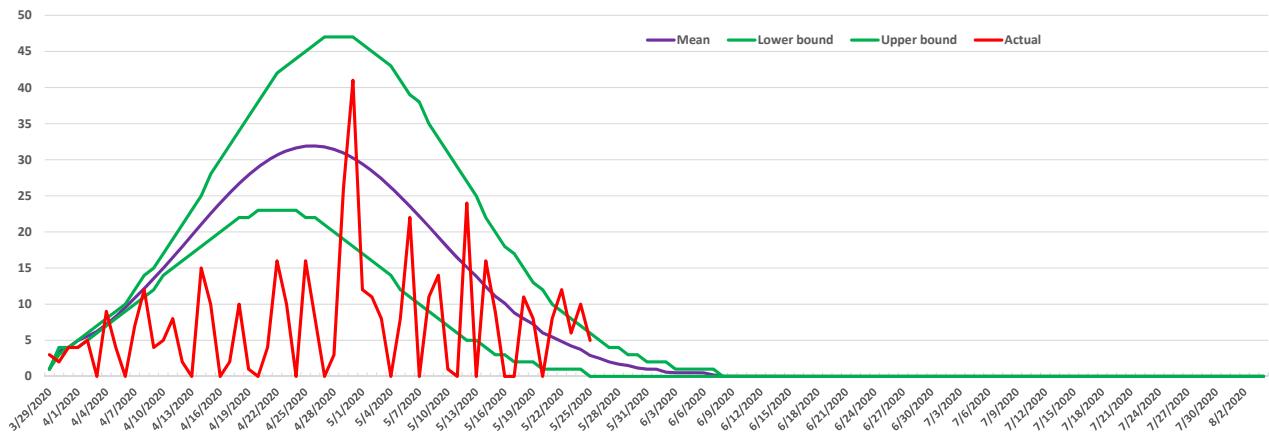
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Georgia COVID 19 Daily Death Projections March 26



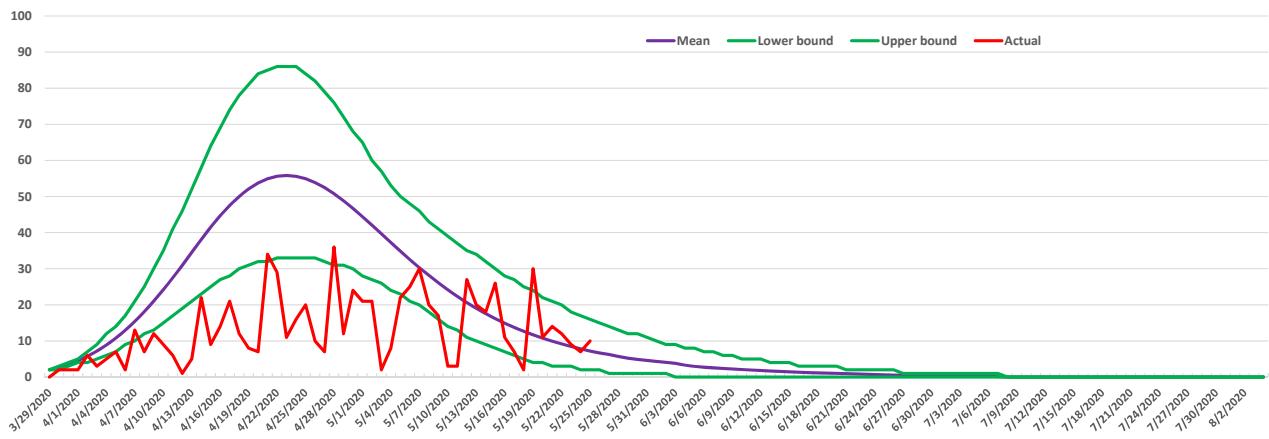
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South Carolina COVID 19 Daily Death Projections March 26



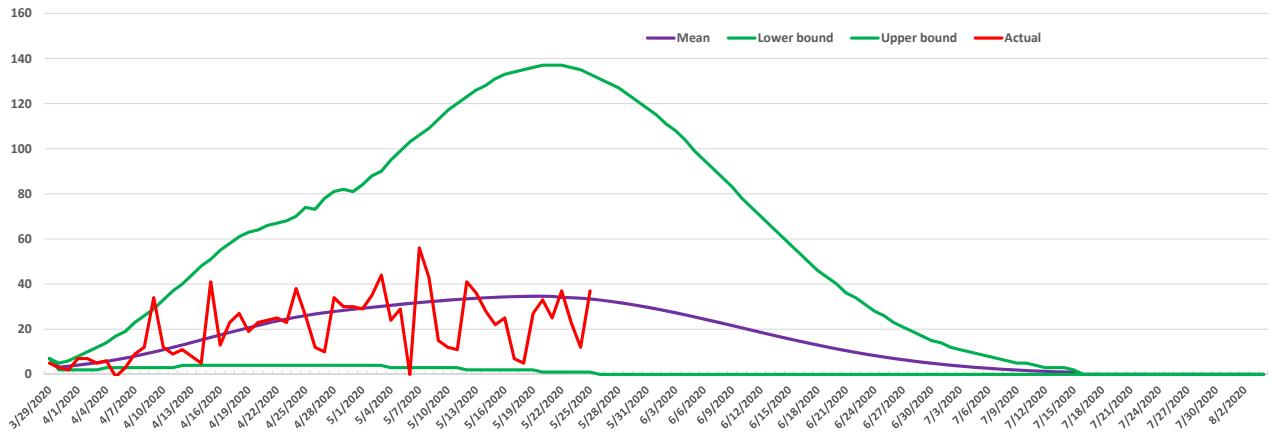
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North Carolina COVID 19 Daily Death Projections March 26



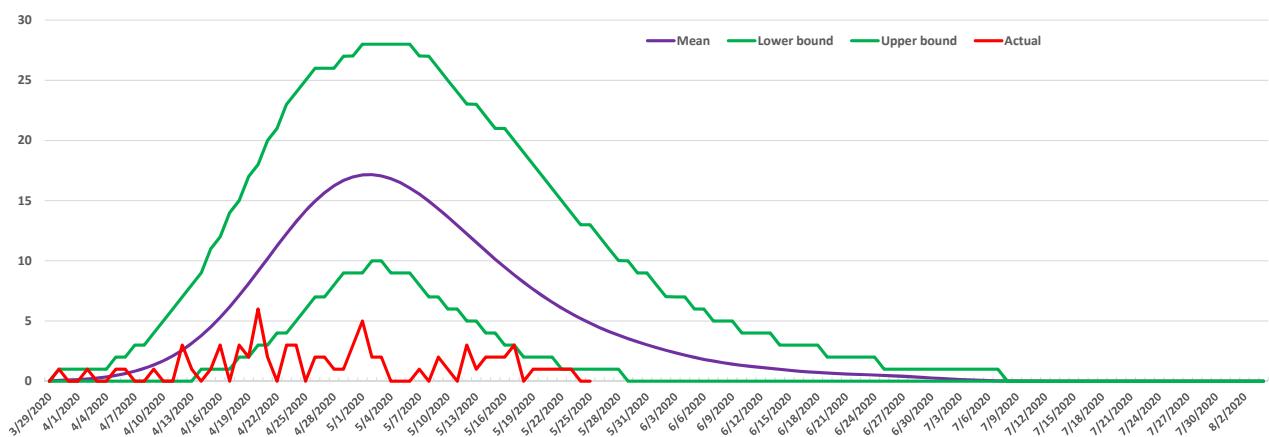
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Virginia COVID 19 Daily Death Projections March 26



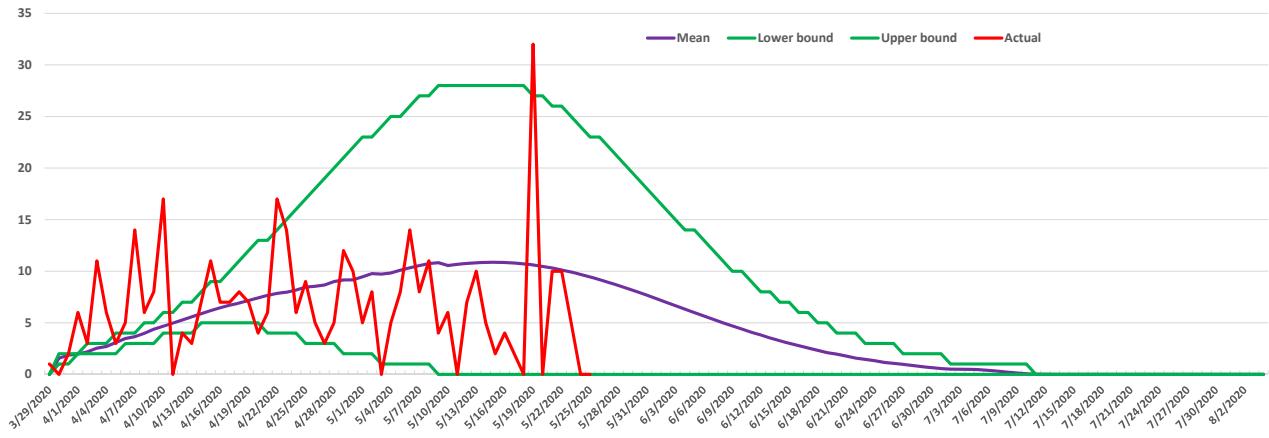
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West Virginia COVID 19 Daily Death Projections March 26



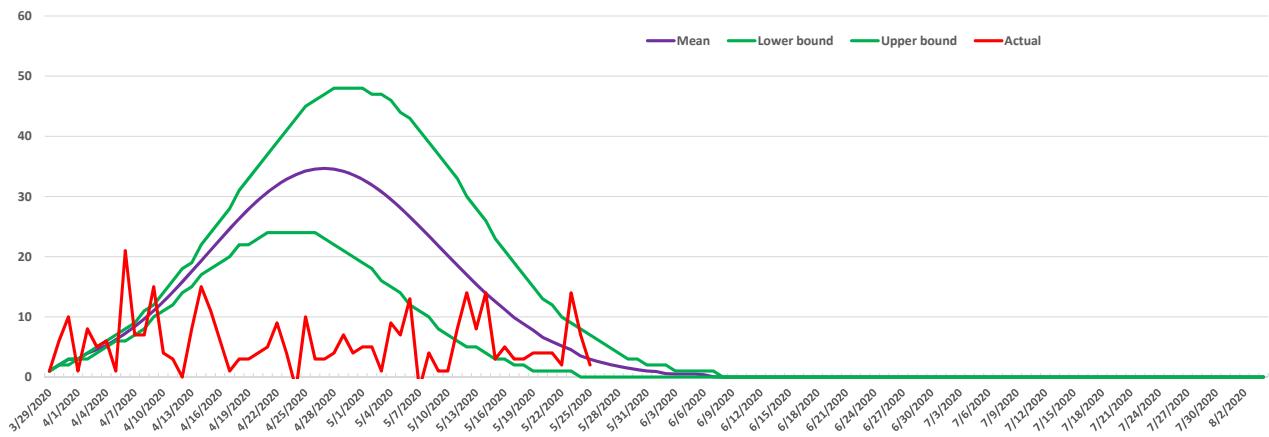
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Kentucky COVID 19 Daily Death Projections March 26



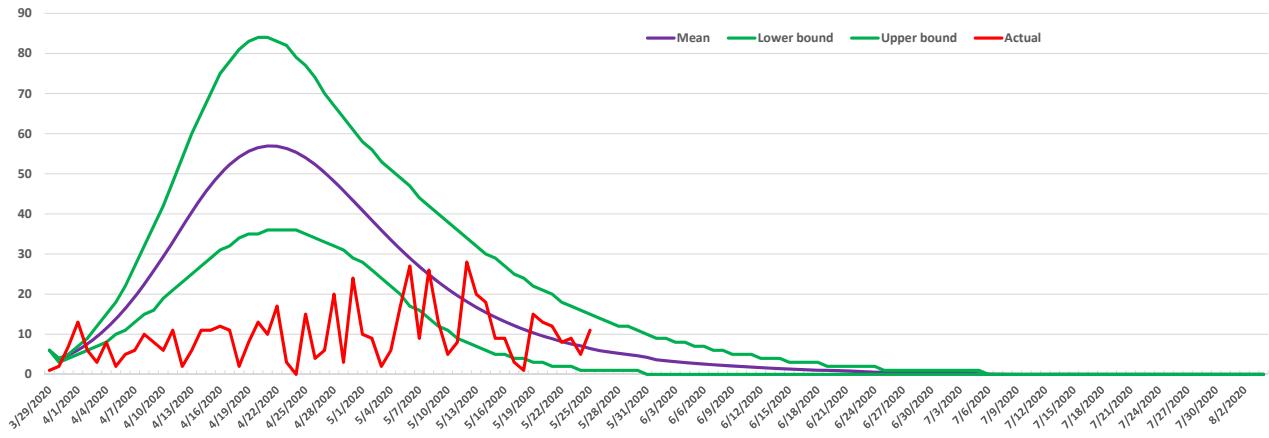
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Tennessee COVID 19 Daily Death Projections March 26



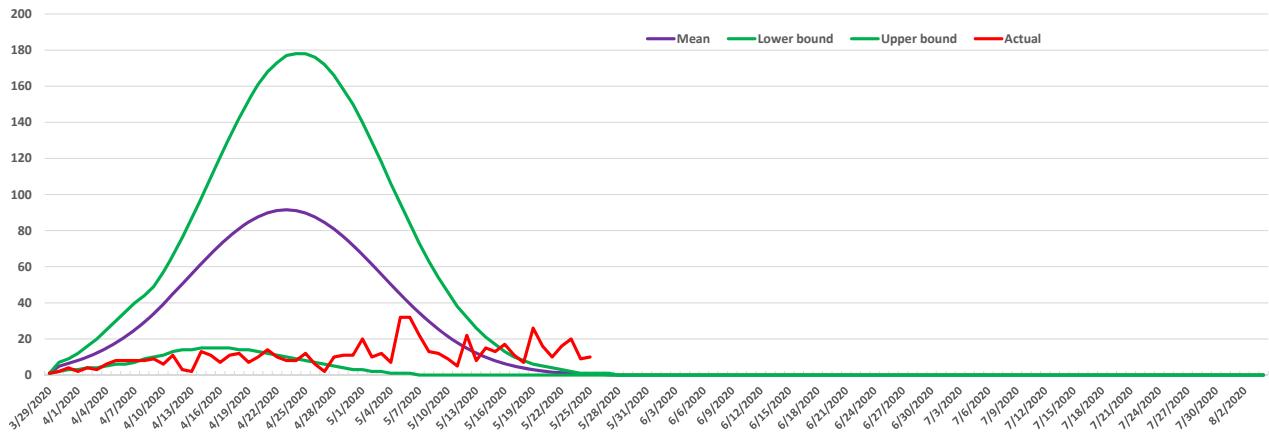
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Alabama COVID 19 Daily Death Projections March 26



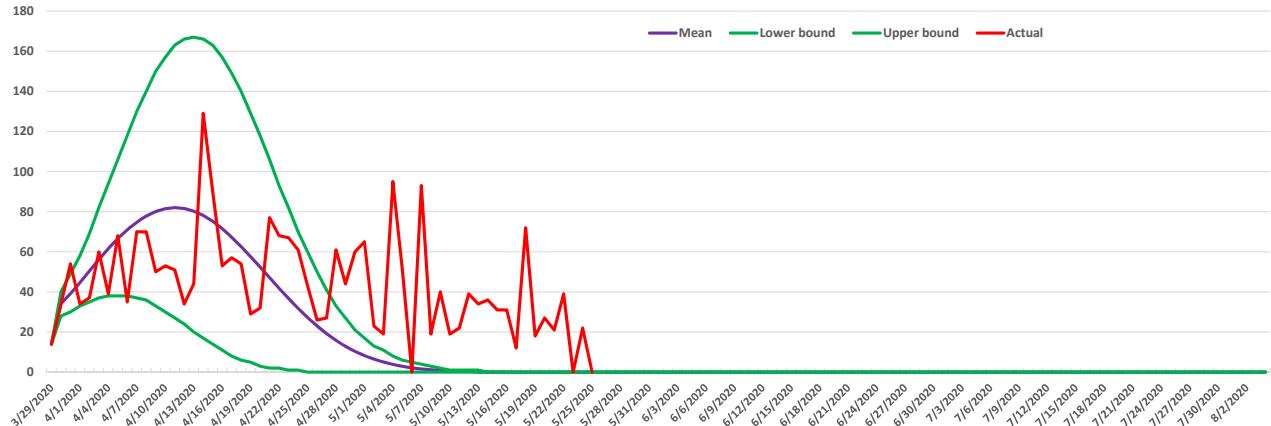
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Mississippi COVID 19 Daily Death Projections March 26



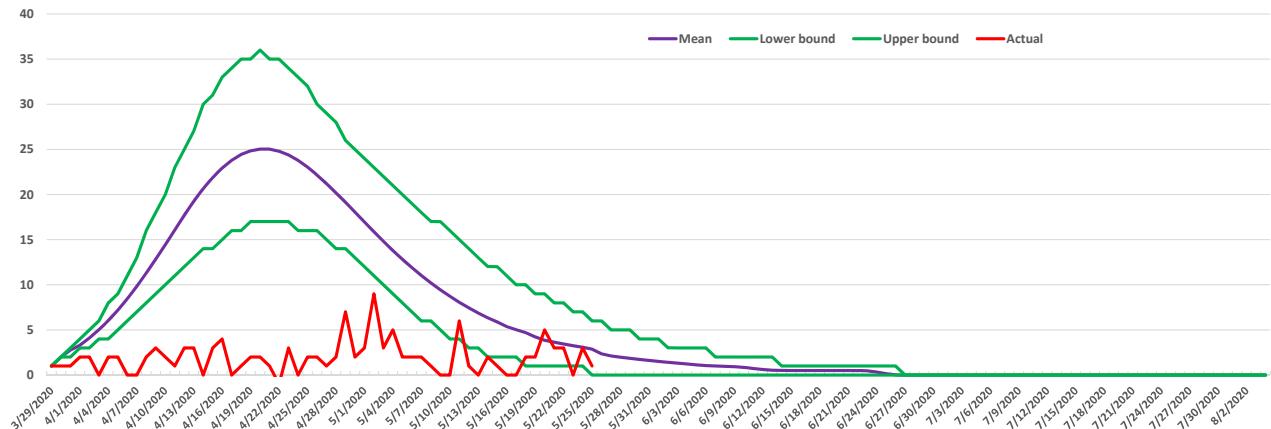
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Louisiana COVID 19 Daily Death Projections March 26



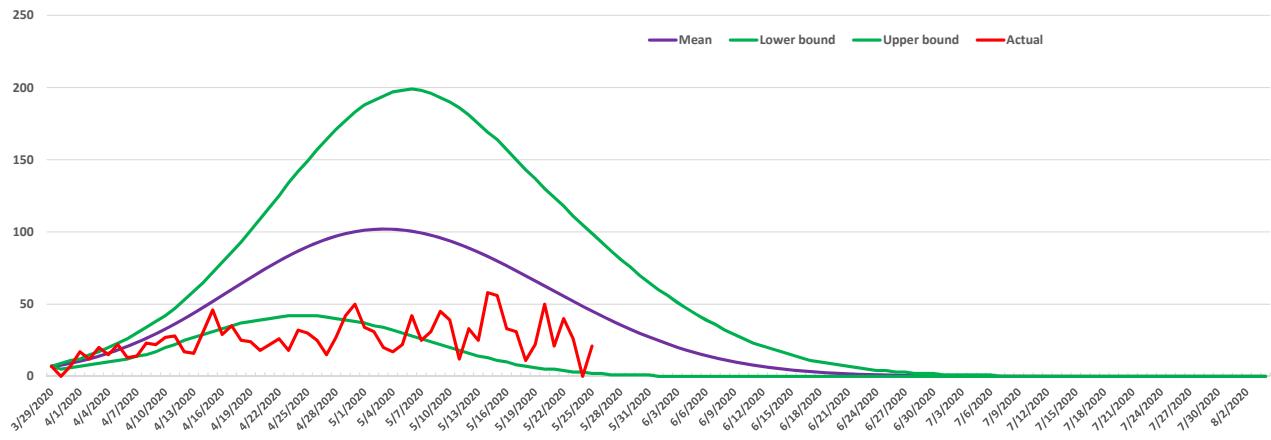
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Arkansas COVID 19 Daily Death Projections March 26



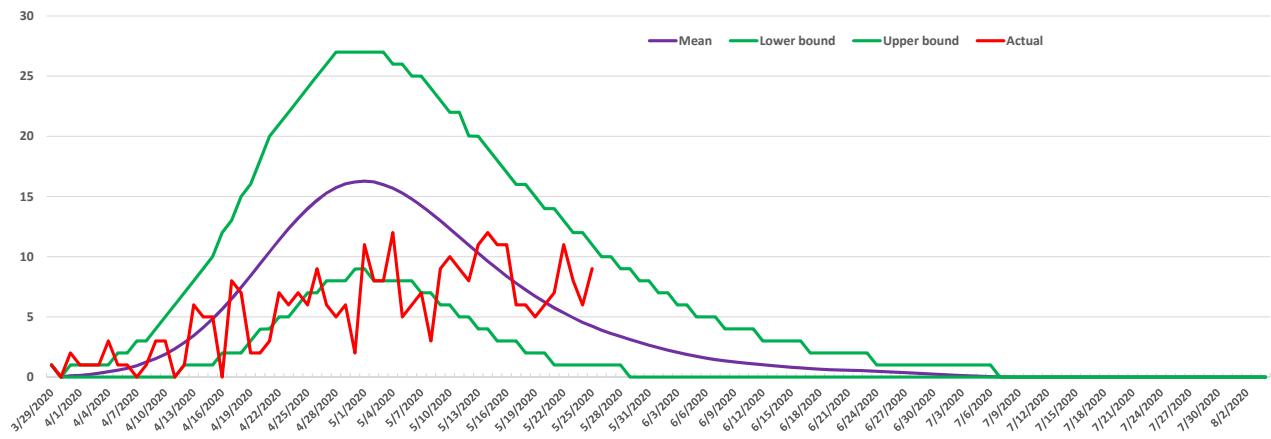
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Texas COVID 19 Daily Death Projections March 26



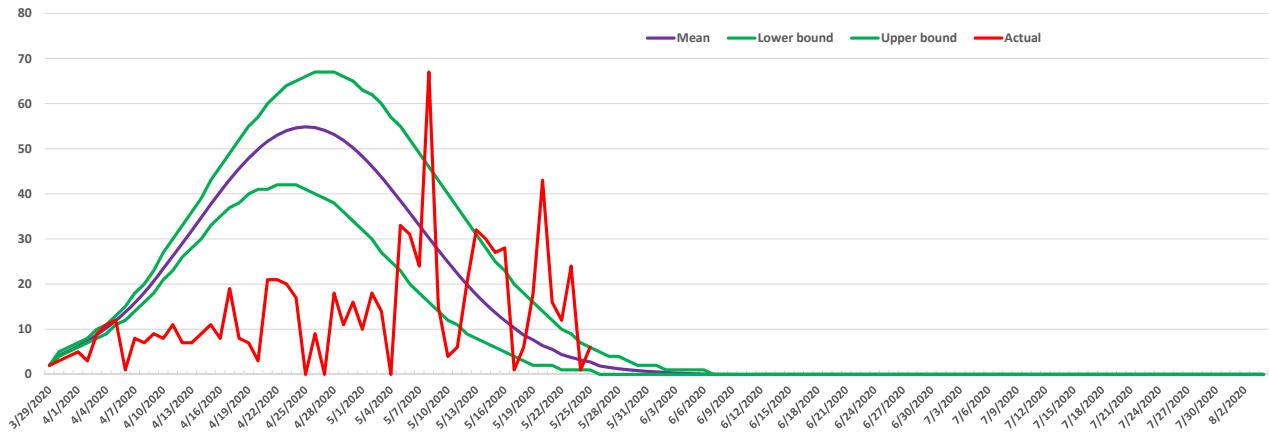
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New Mexico COVID 19 Daily Death Projections March 26



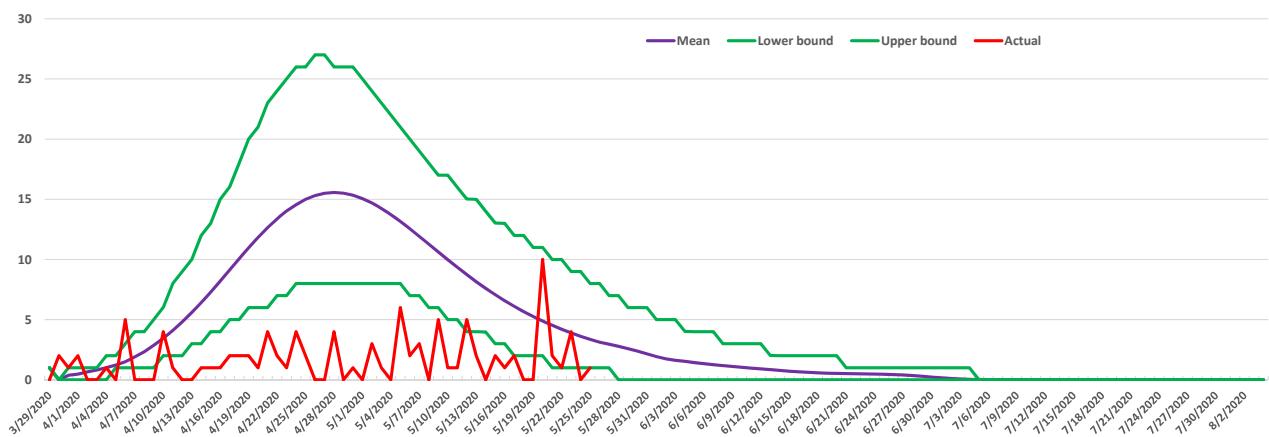
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Arizona COVID 19 Daily Death Projections March 26



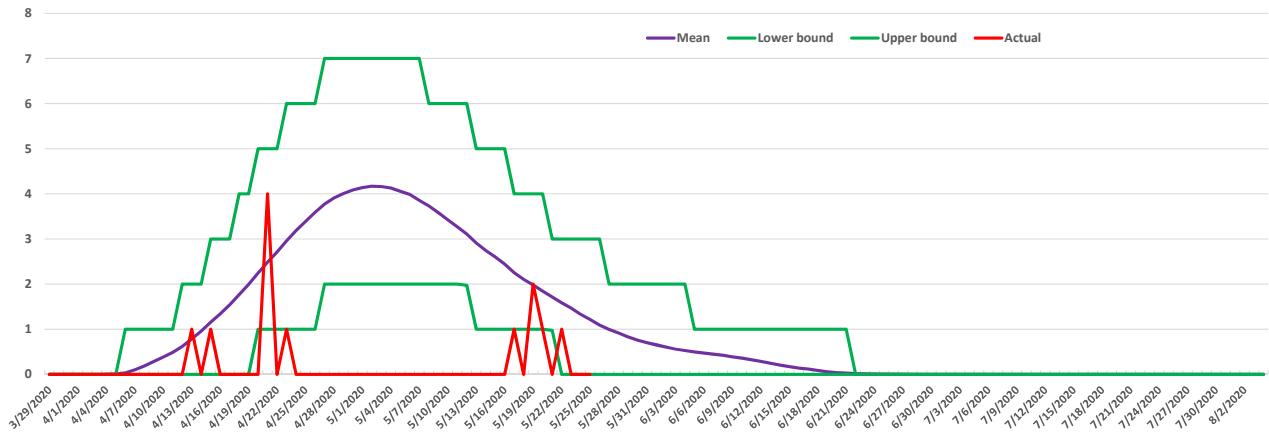
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Utah COVID 19 Daily Death Projections March 26



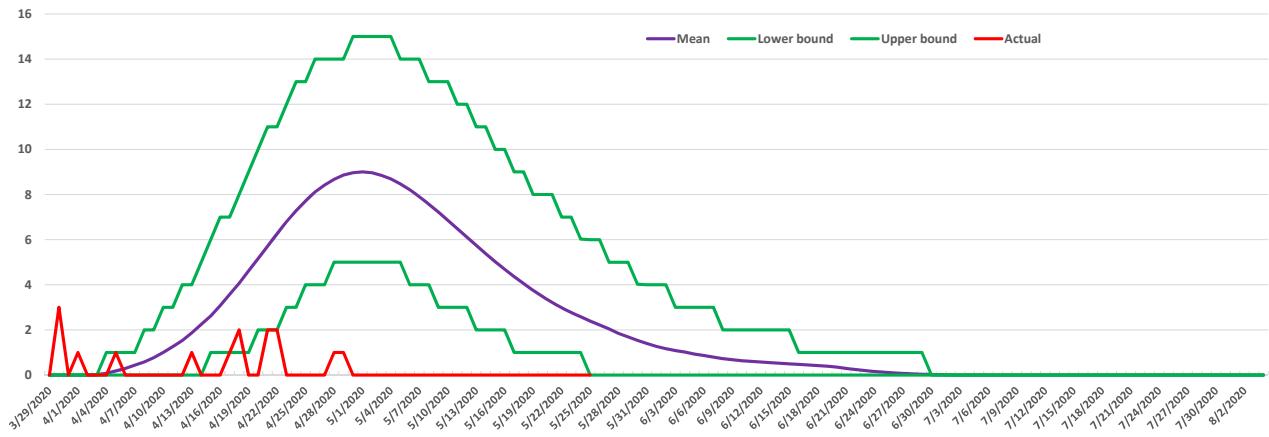
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Wyoming COVID 19 Daily Death Projections March 26



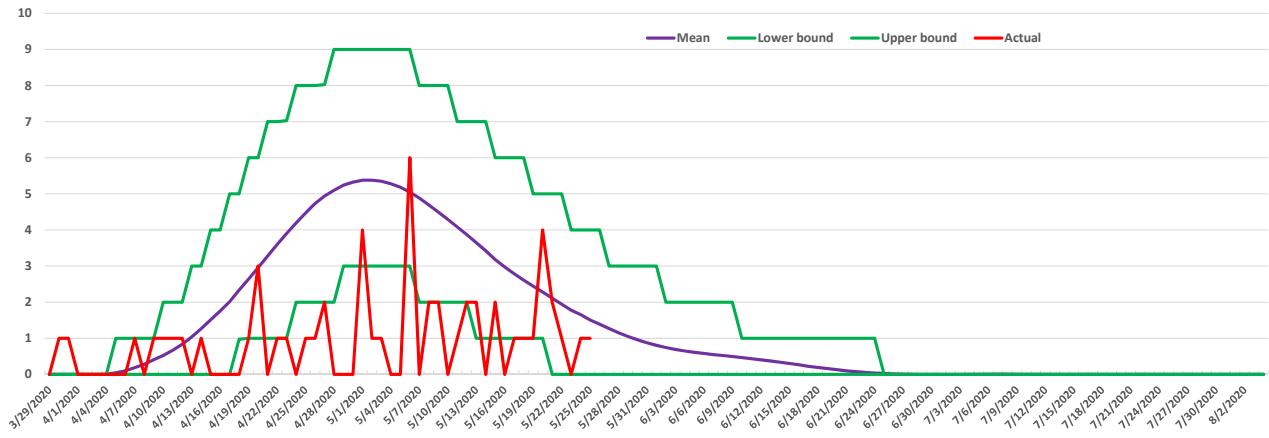
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Montana COVID 19 Daily Death Projections March 26



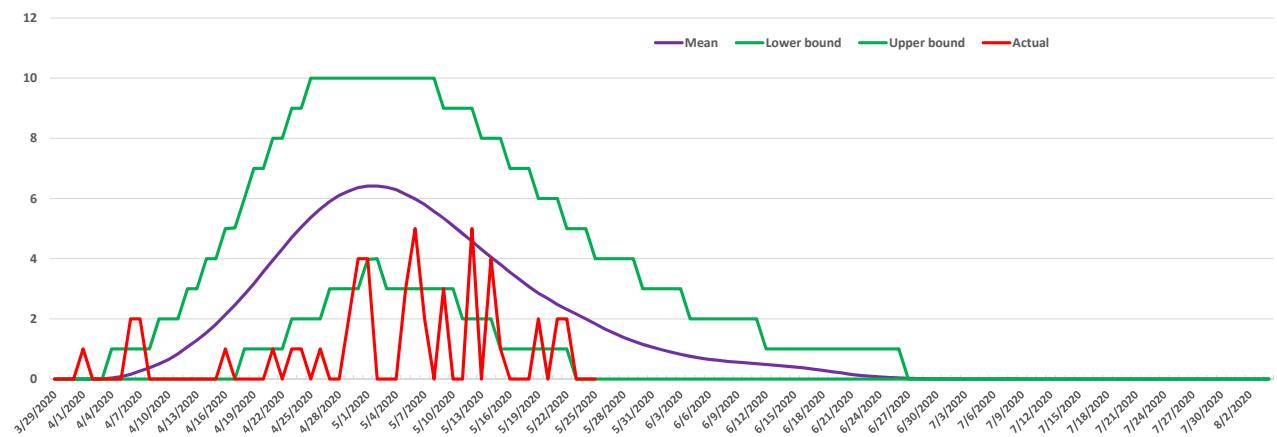
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North Dakota COVID 19 Daily Death Projections March 26



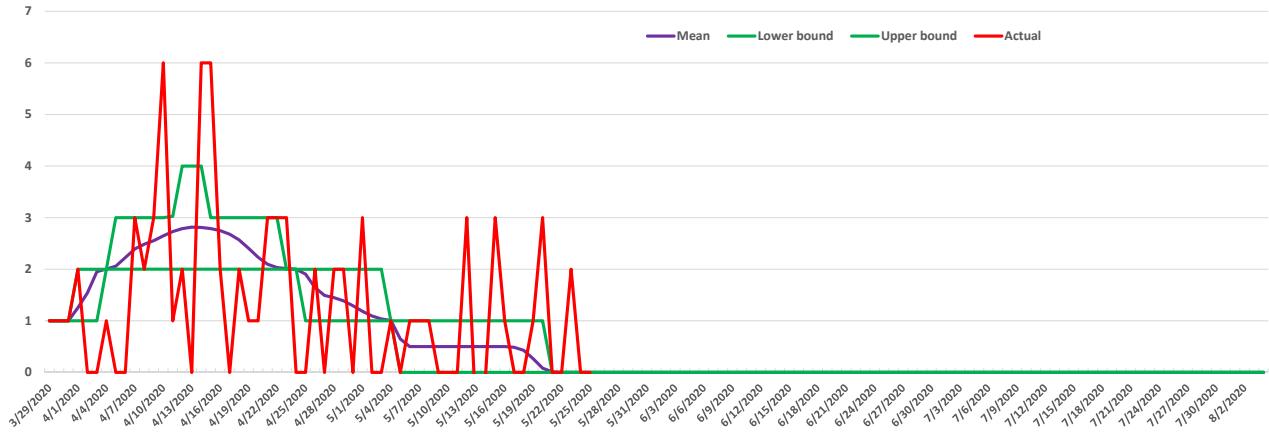
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South Dakota COVID 19 Daily Death Projections March 26



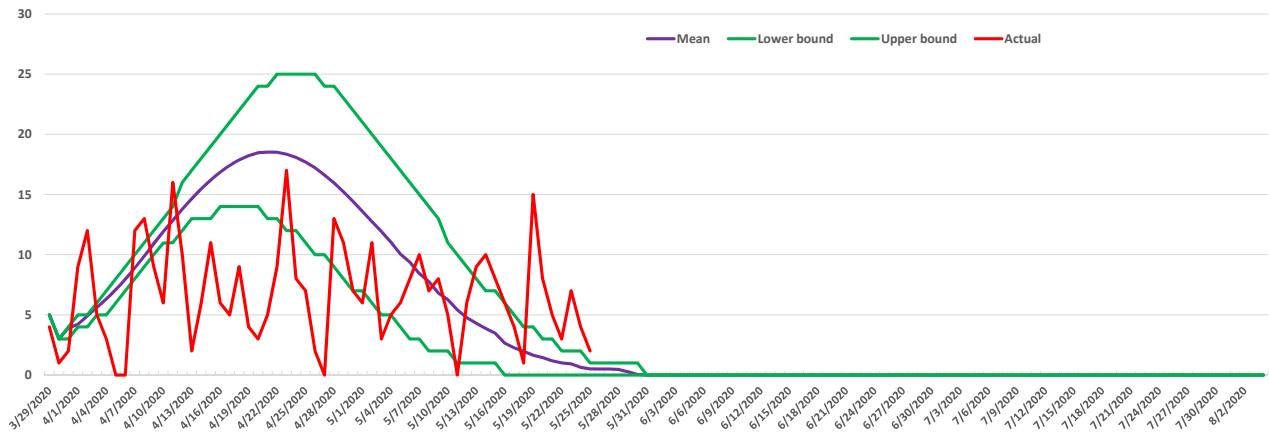
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Idaho COVID 19 Daily Death Projections March 26



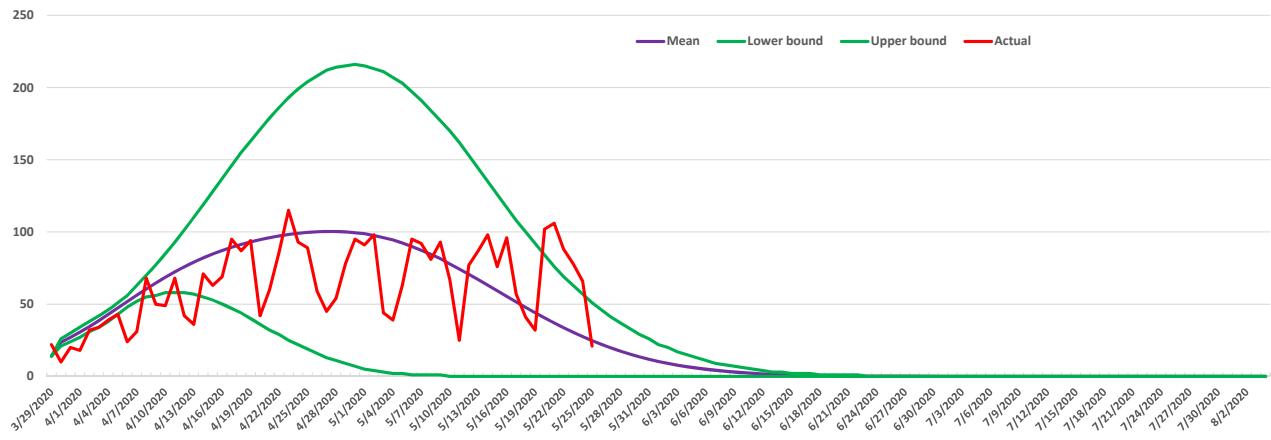
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Nevada COVID 19 Daily Death Projections March 26



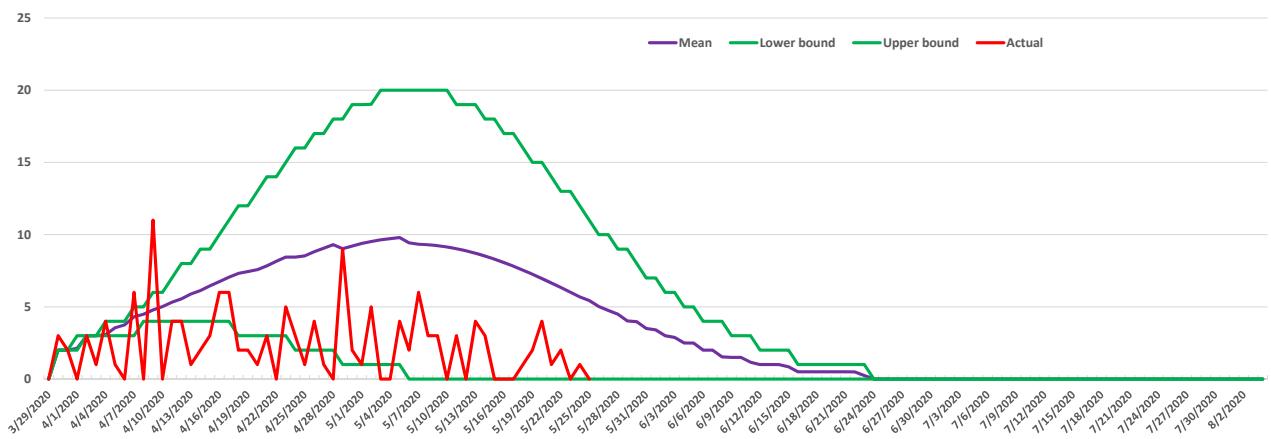
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California COVID 19 Daily Death Projections March 26



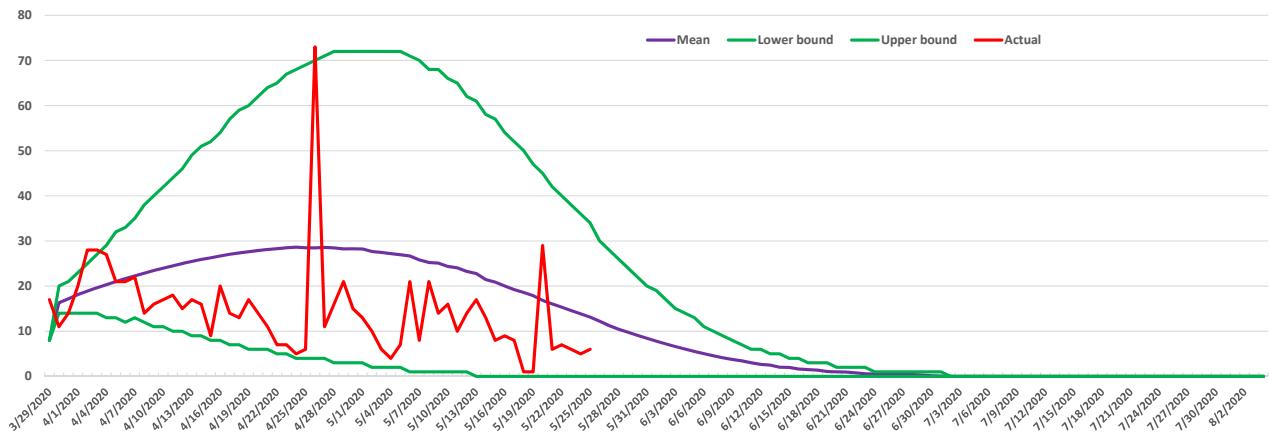
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Oregon COVID 19 Daily Death Projections March 26



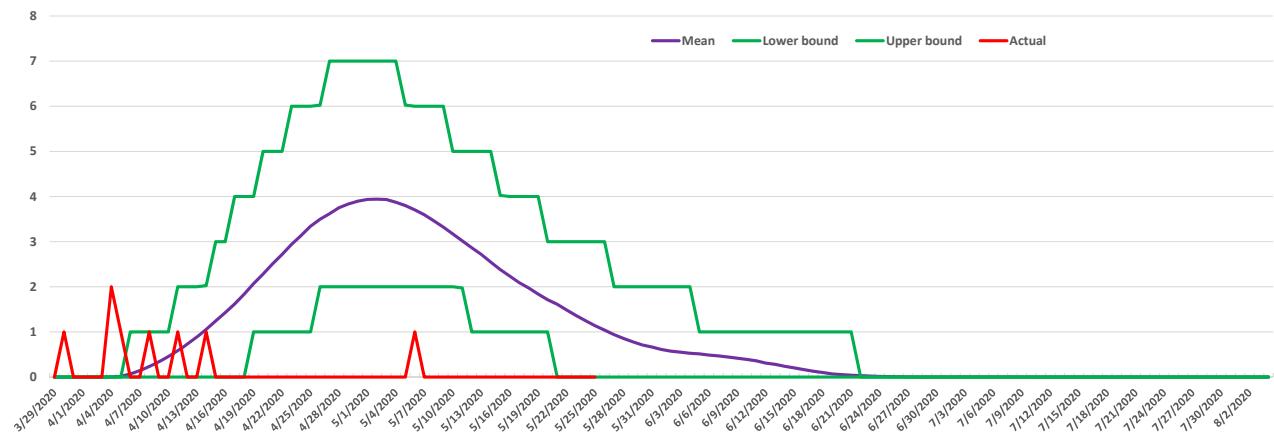
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Washington COVID 19 Daily Death Projections March 26



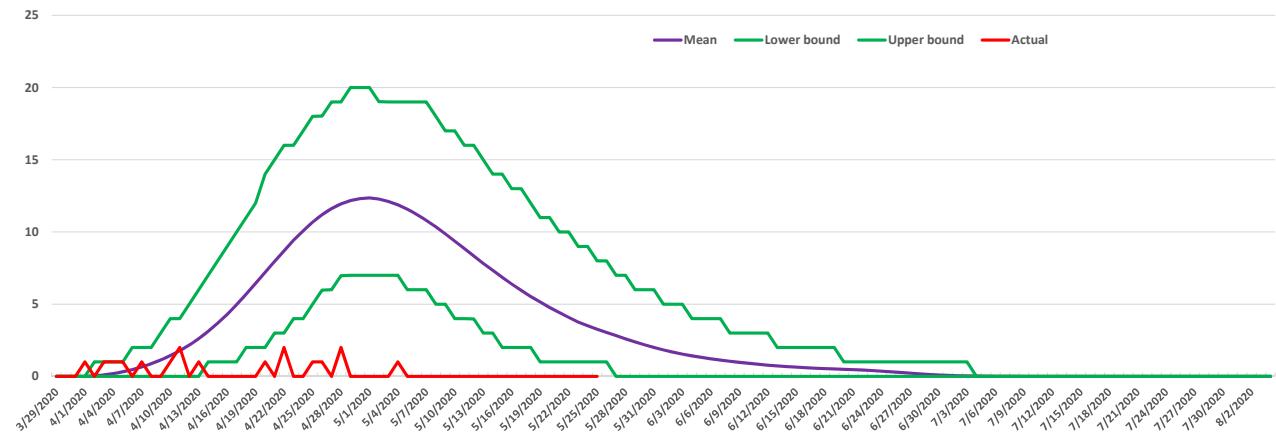
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Alaska COVID 19 Daily Death Projections March 26



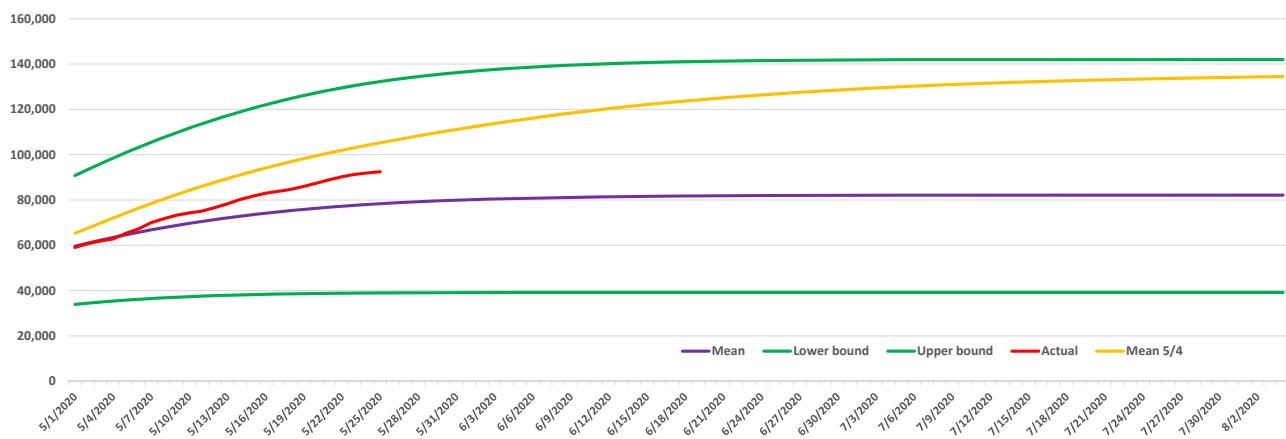
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Hawaii COVID 19 Daily Death Projections March 26



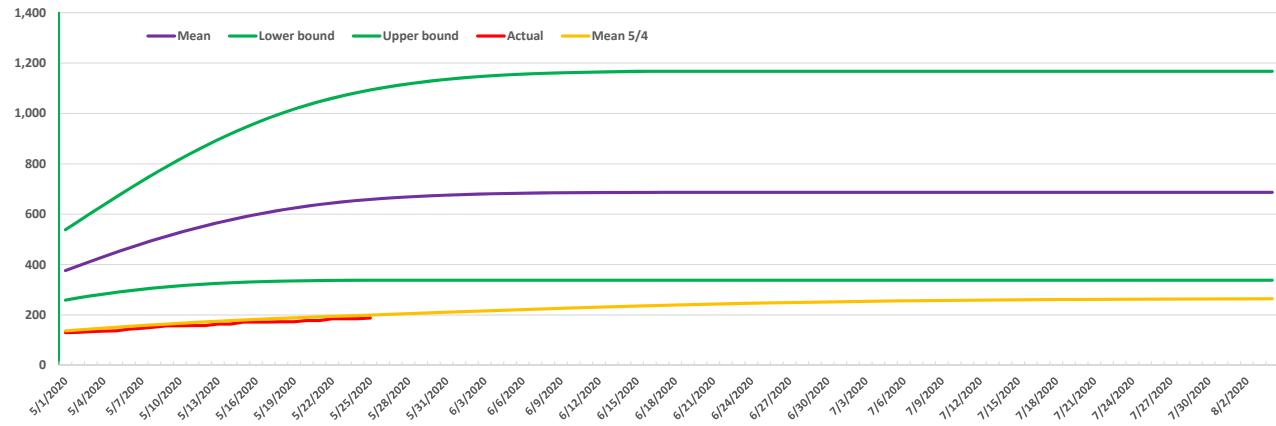
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U.S. COVID 19 Cumulative Death Projections



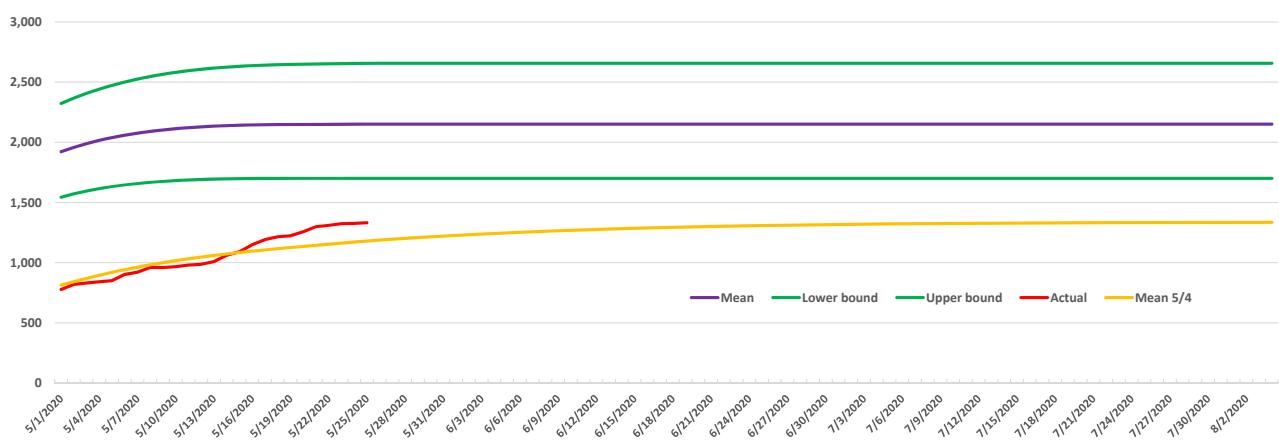
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Kansas COVID 19 Cumulative Death Projections



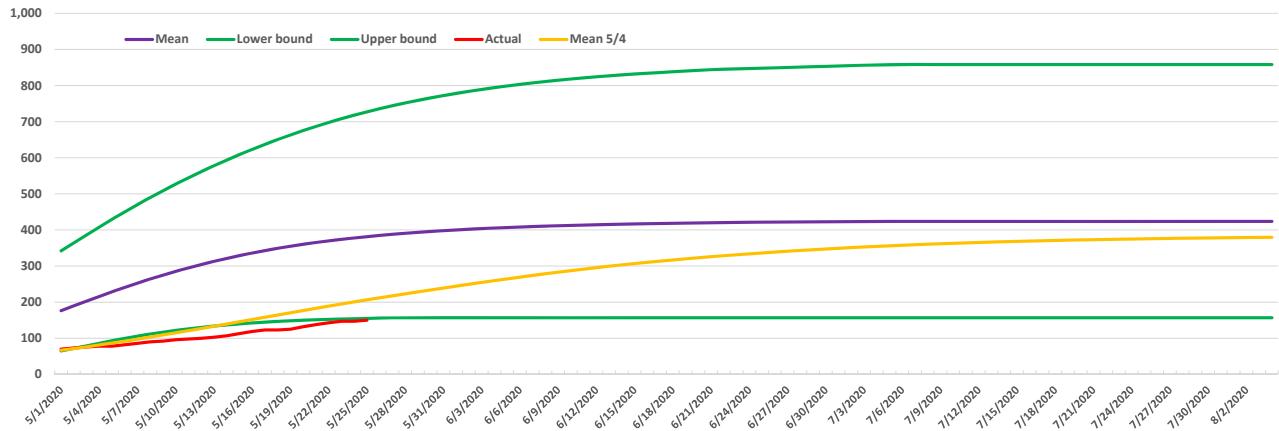
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Colorado COVID 19 Cumulative Death Projections March 26



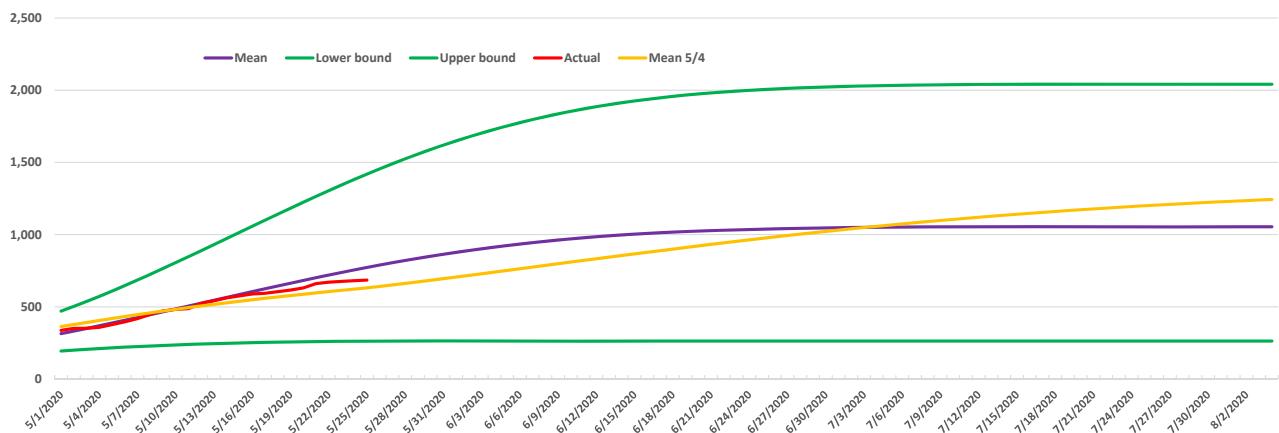
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Nebraska COVID 19 Daily Death Projections March 26



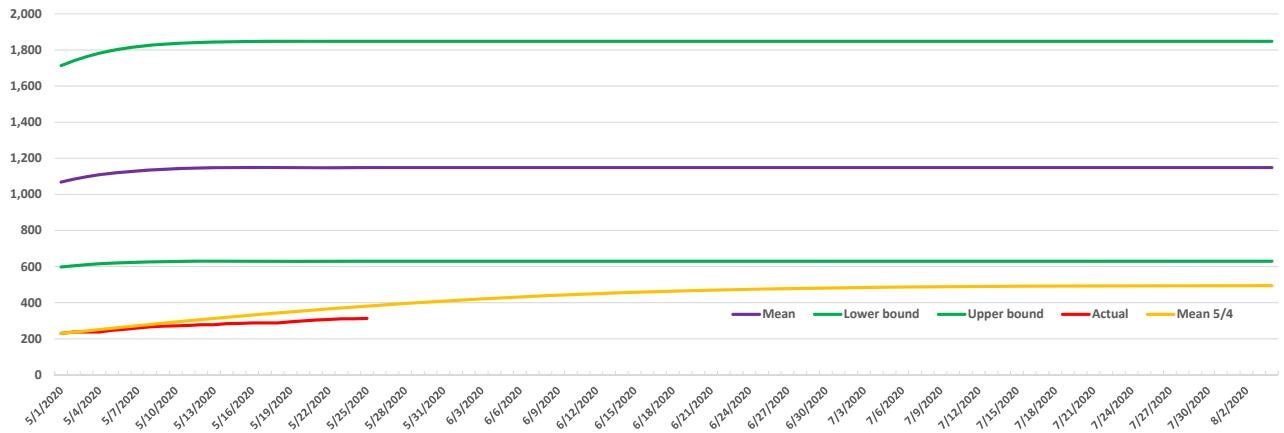
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Missouri COVID 19 Cumulative Death Projections March 26



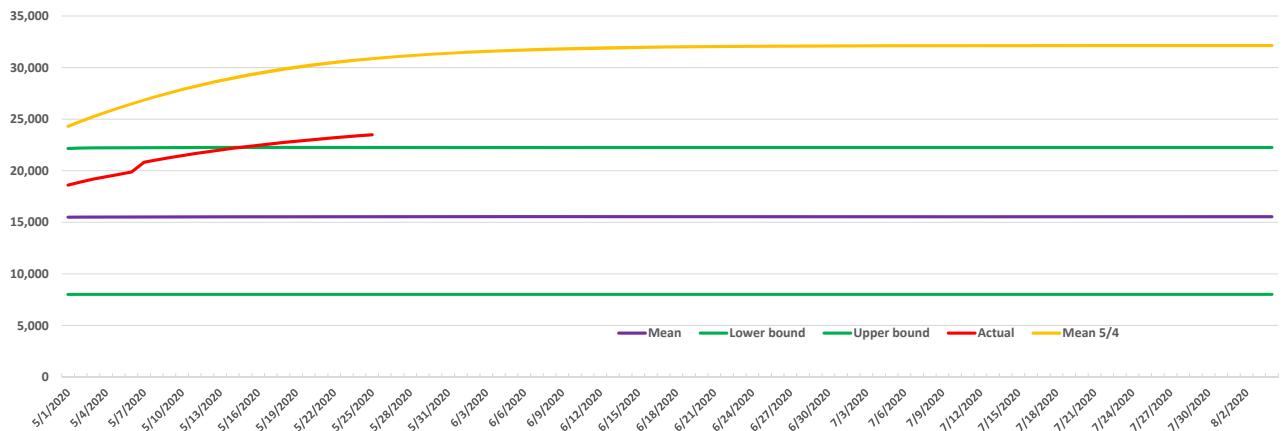
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Oklahoma COVID 19 Daily Death Projections March 26



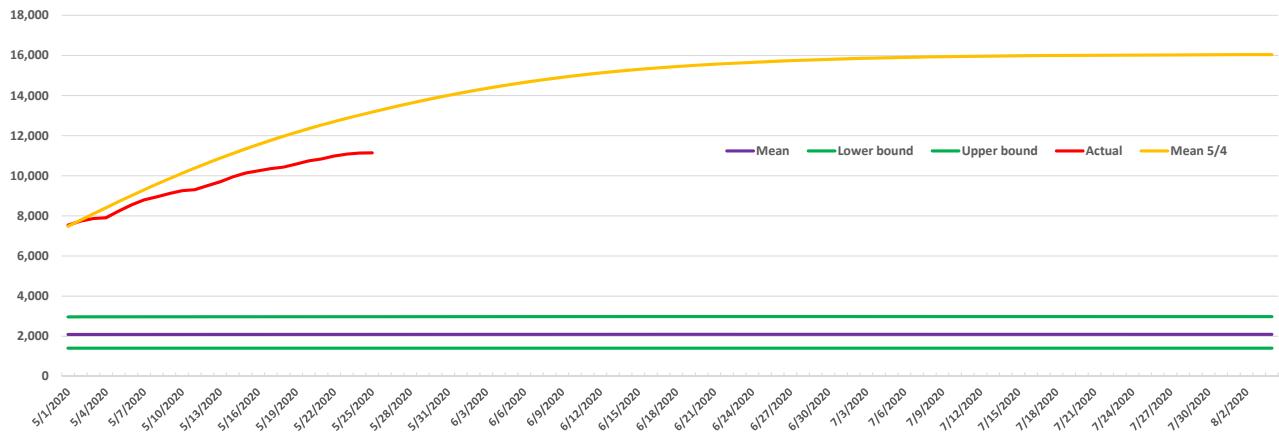
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New York COVID 19 Cumulative Death Projections



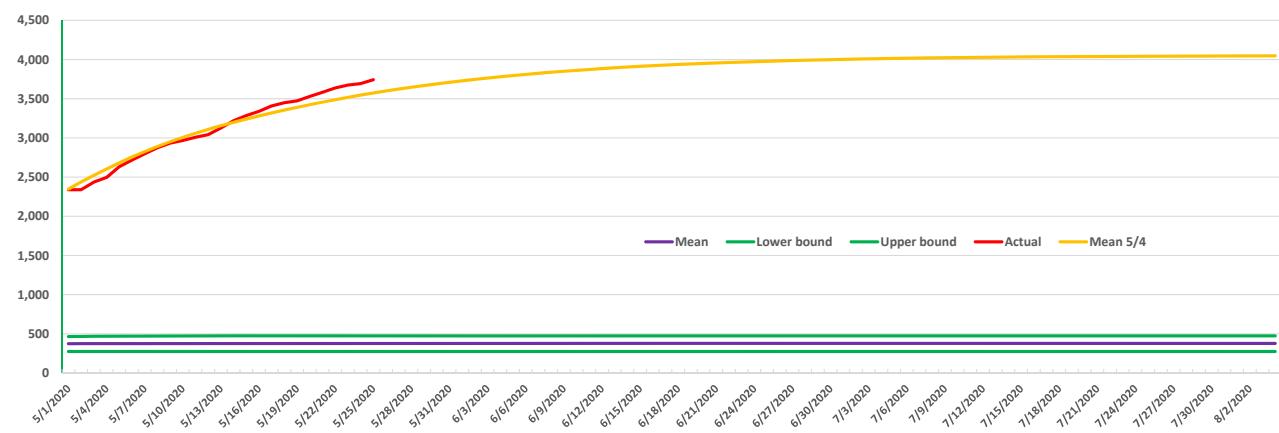
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New Jersey COVID 19 Cumulative Death Projections



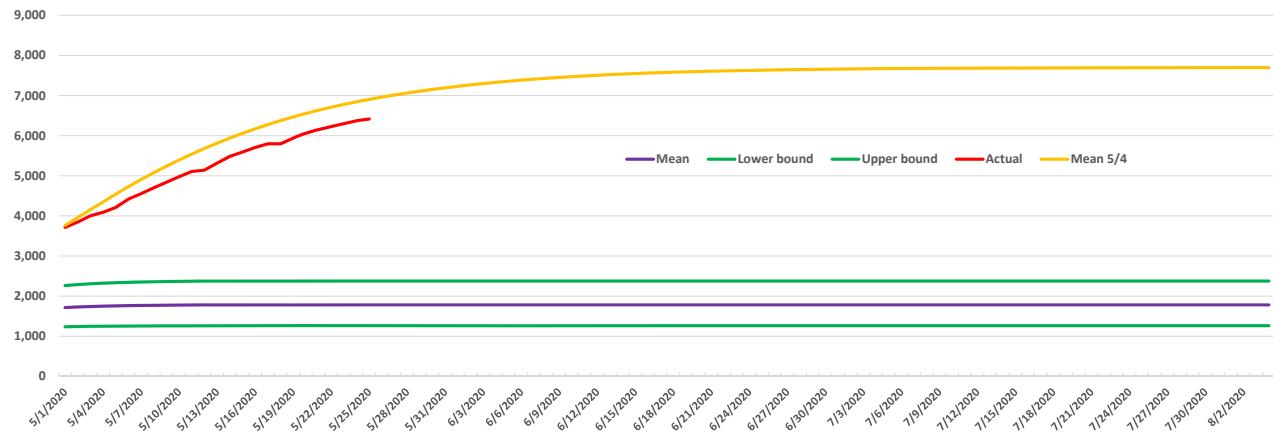
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Connecticut COVID 19 Cumulative Death Projections



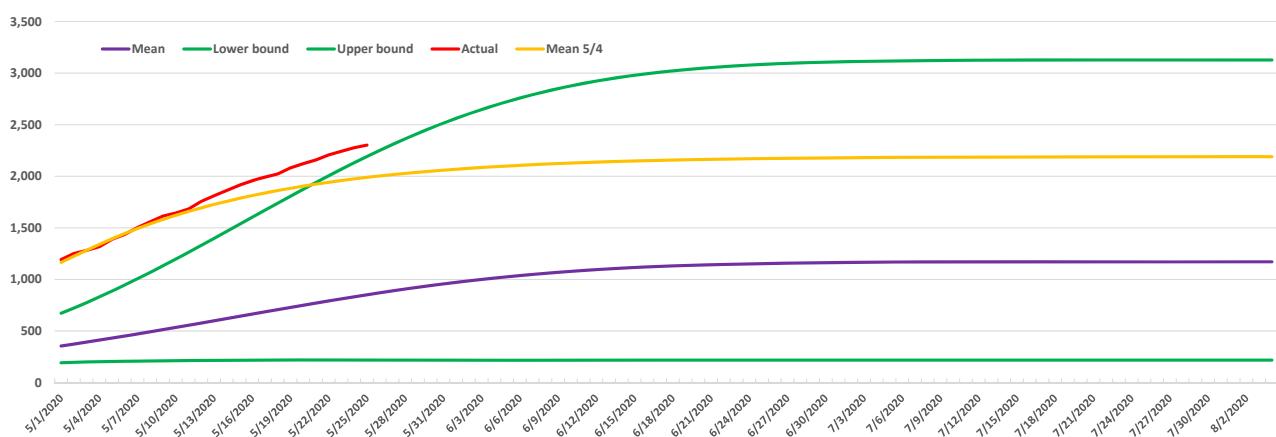
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Massachusetts COVID 19 Cumulative Death Projections



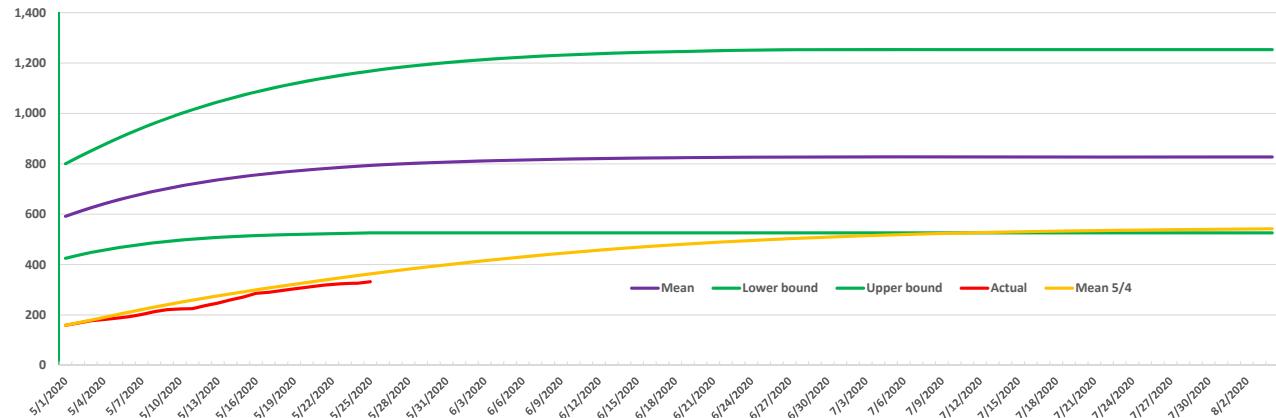
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Maryland COVID 19 Daily Death Projections March 26



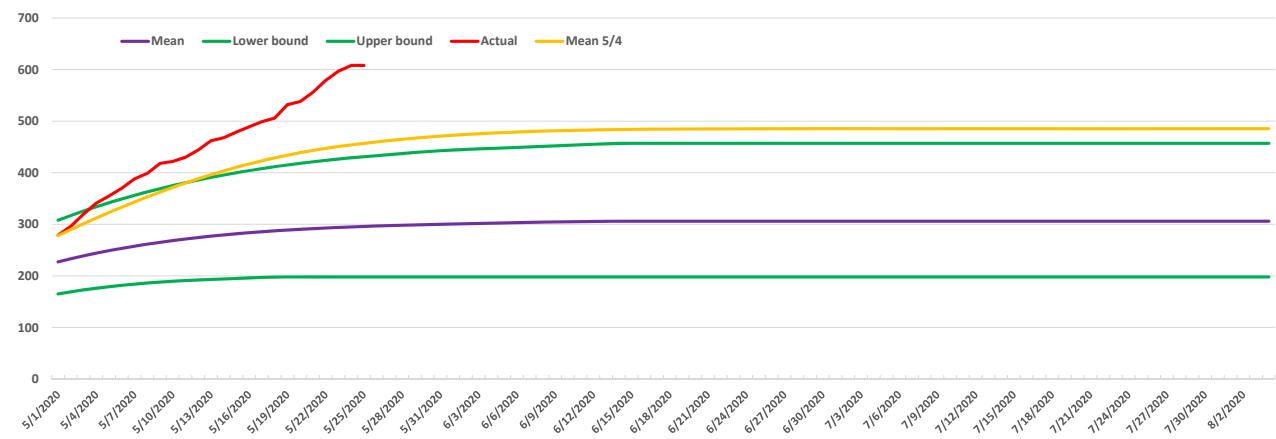
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Delaware COVID 19 Cumulative Death Projections



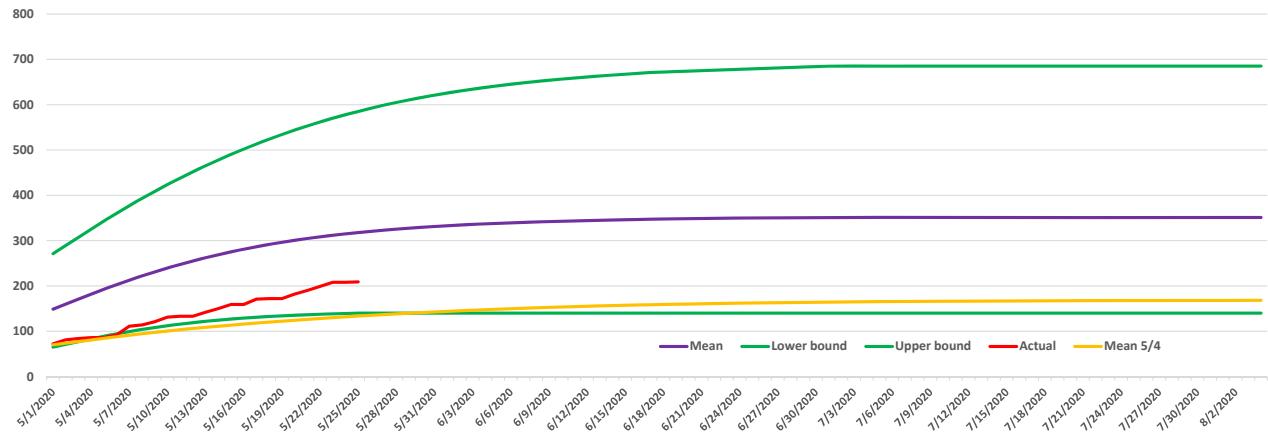
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Rhode Island COVID 19 Cumulative Death Projections March 26



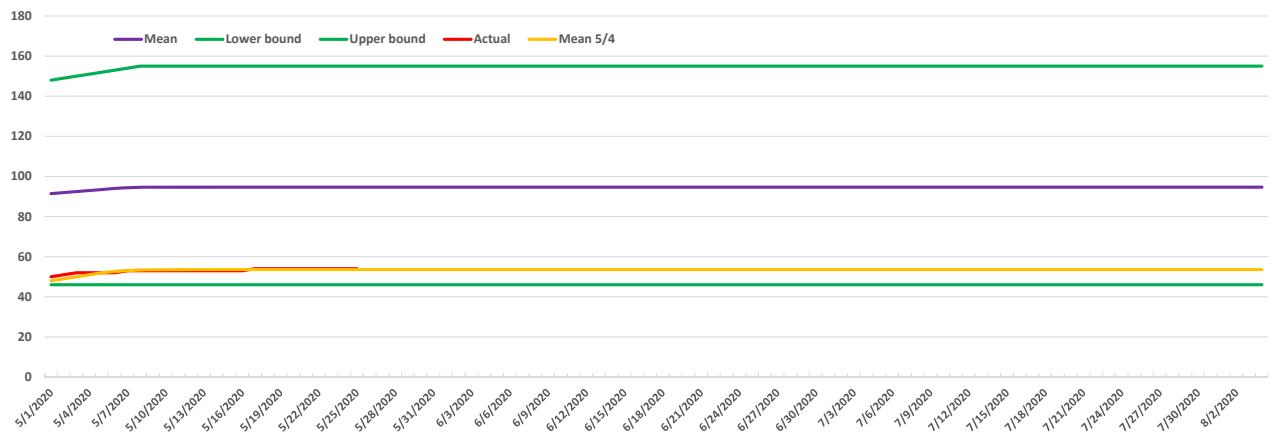
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New Hampshire COVID 19 Cumulative Death Projections



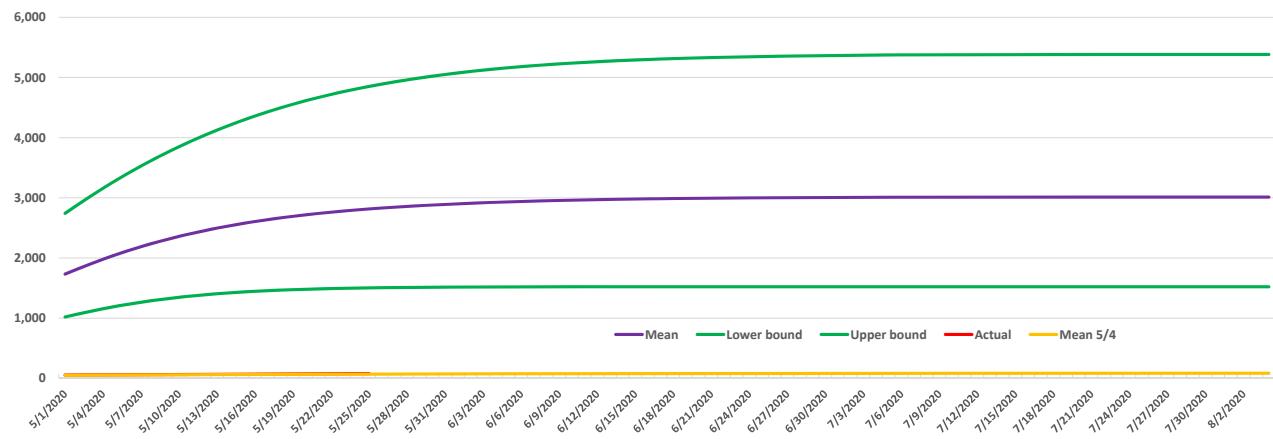
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Vermont COVID 19 Cumulative Death Projections March 26



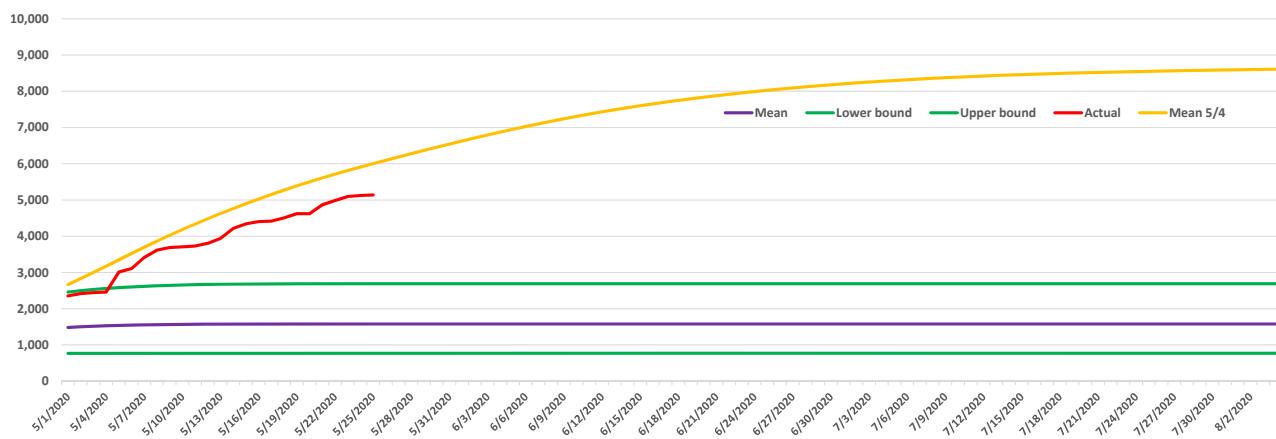
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Maine COVID 19 Cumulative Death Projections



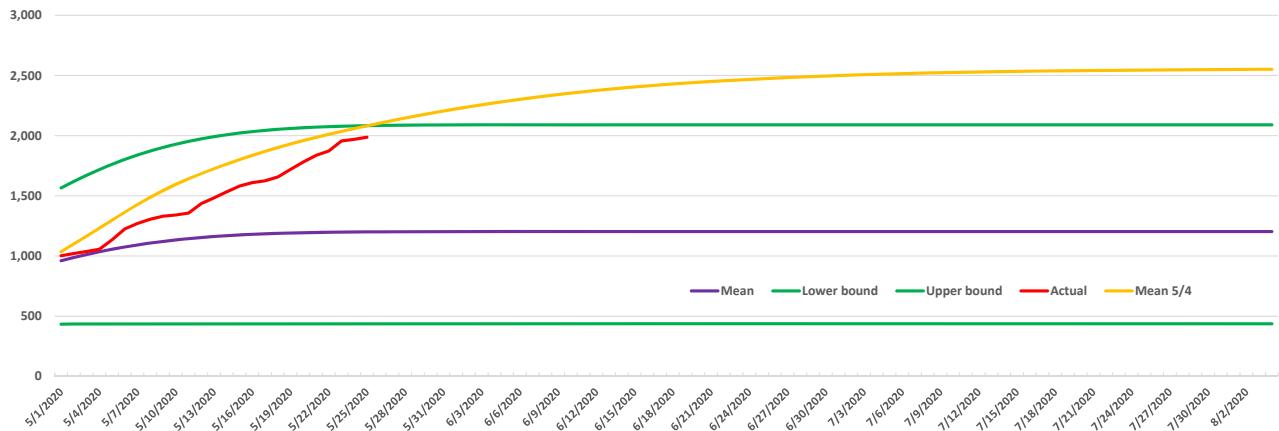
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Pennsylvania COVID 19 Cumulative Death Projections



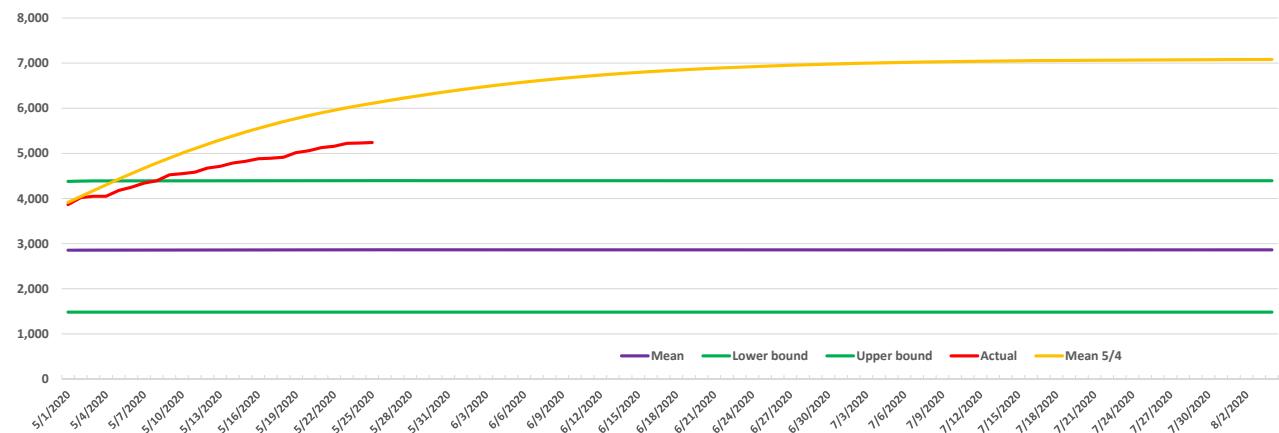
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Ohio COVID 19 Cumulative Death Projections March 26



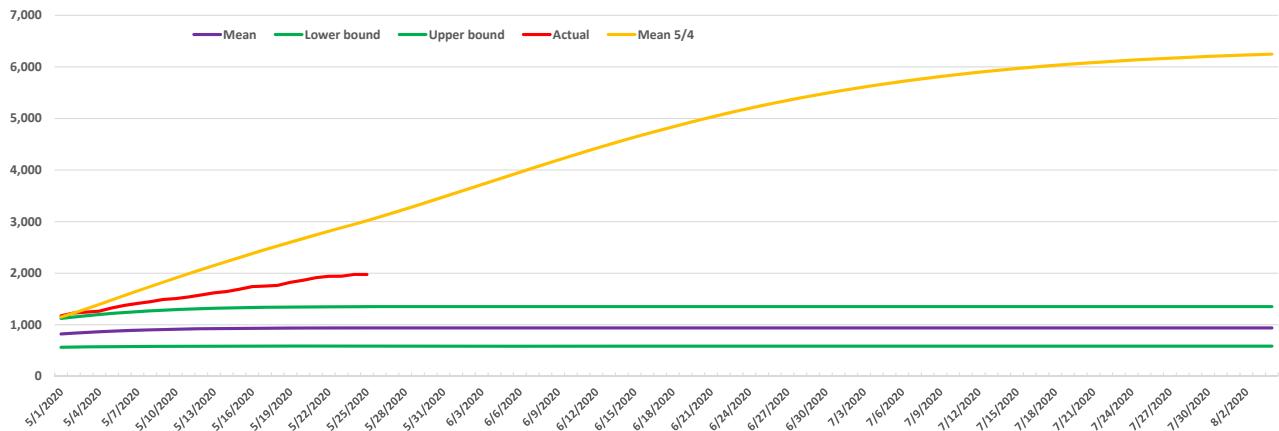
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Michigan COVID 19 Cumulative Death Projections



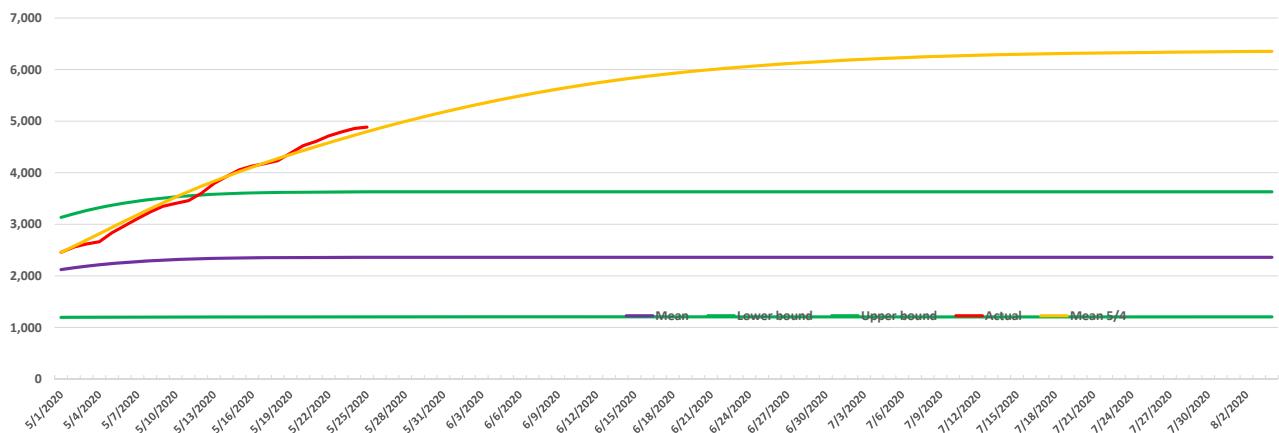
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Indiana COVID 19 Cumulative Death Projections March 26



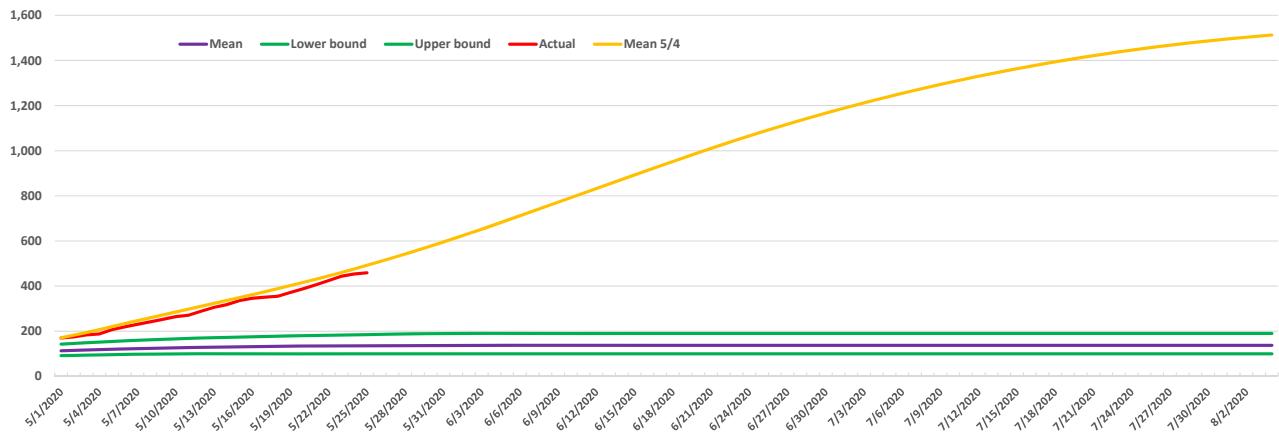
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Illinois COVID 19 Cumulative Death Projections March 26



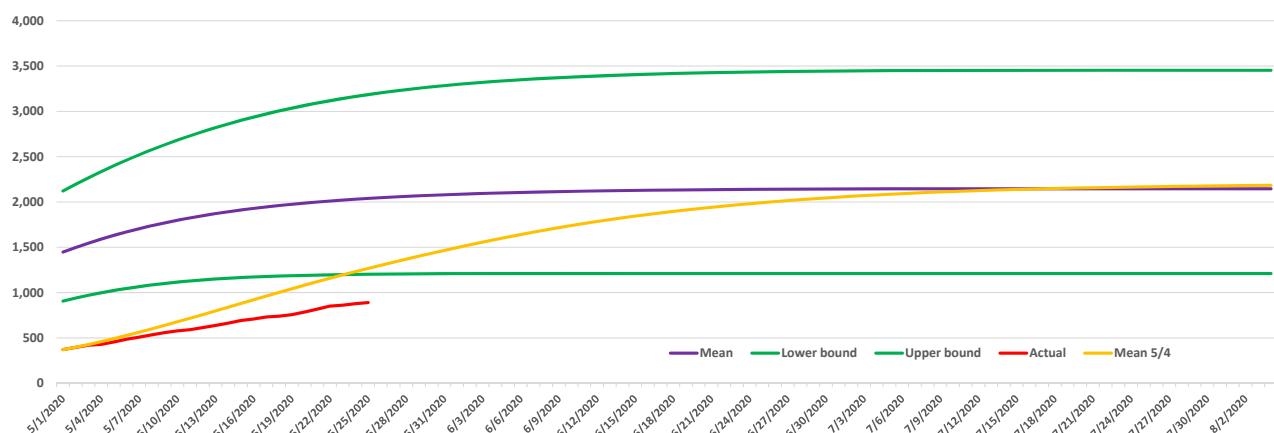
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Iowa COVID 19 Daily Death Projections March 26



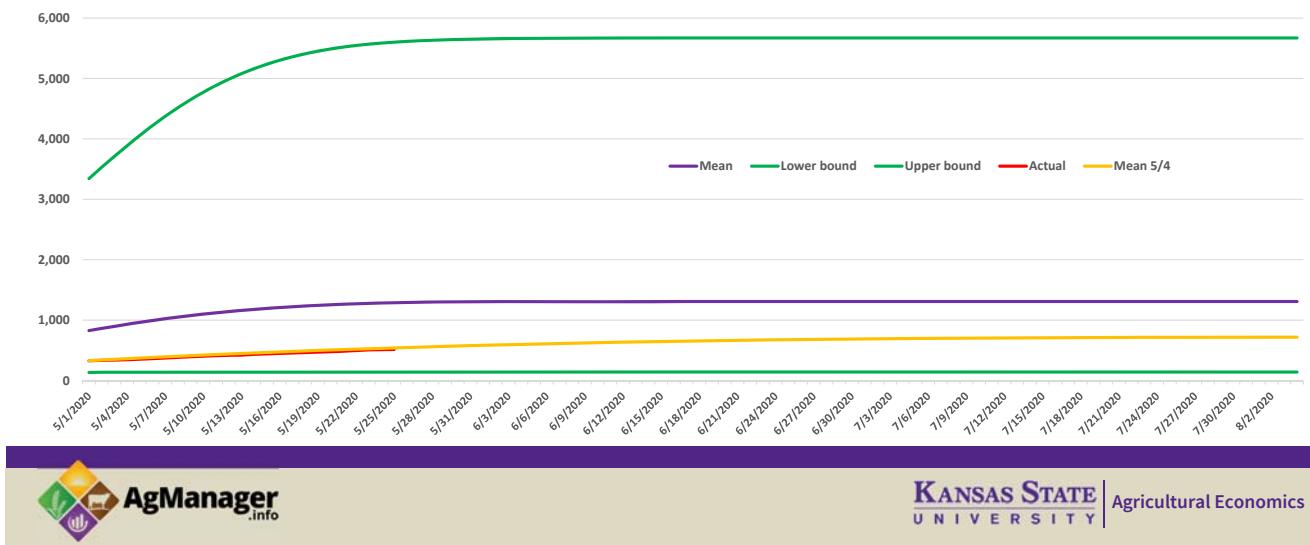
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Minnesota COVID 19 Cumulative Death Projections



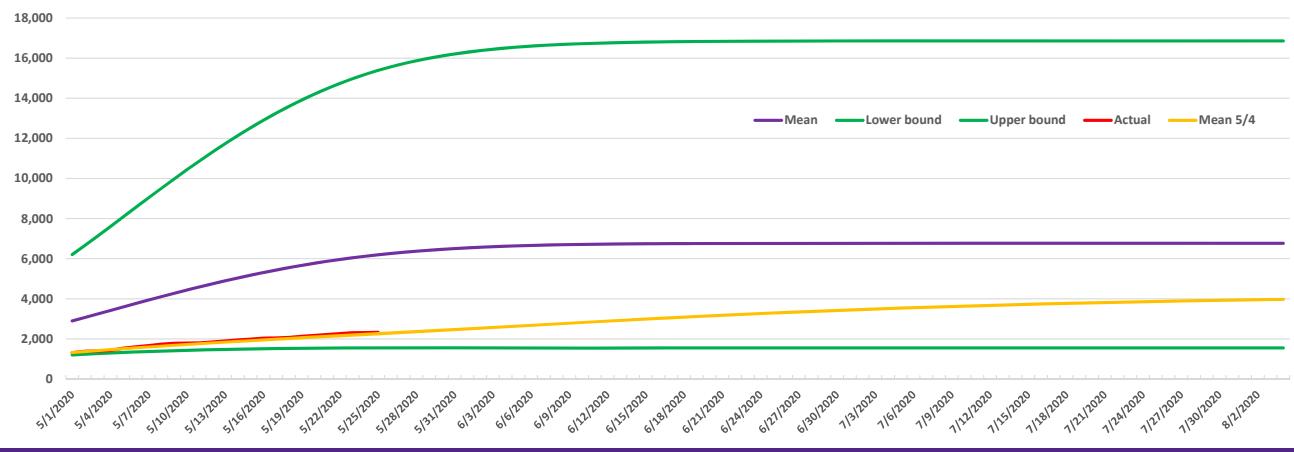
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Wisconsin COVID 19 Cumulative Death Projections



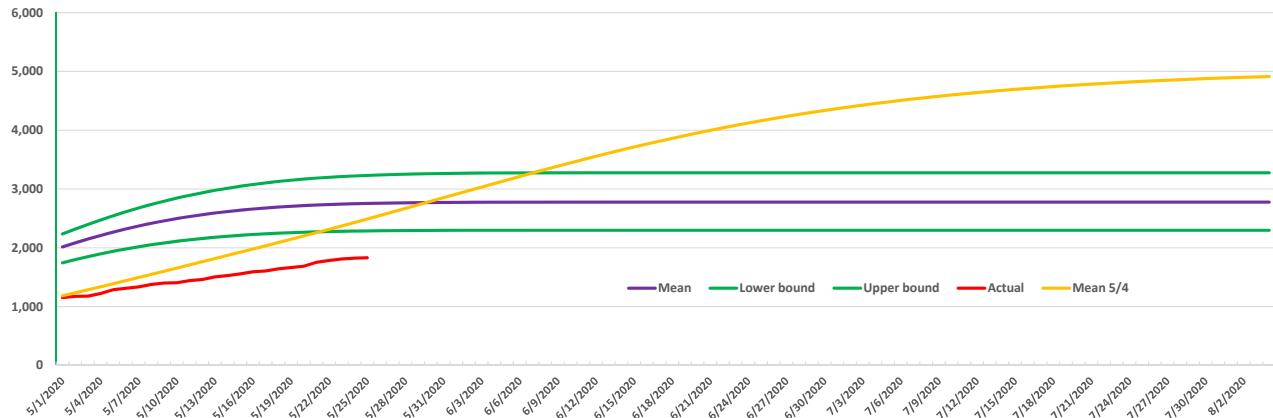
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Florida COVID 19 Cumulative Death Projections March 26



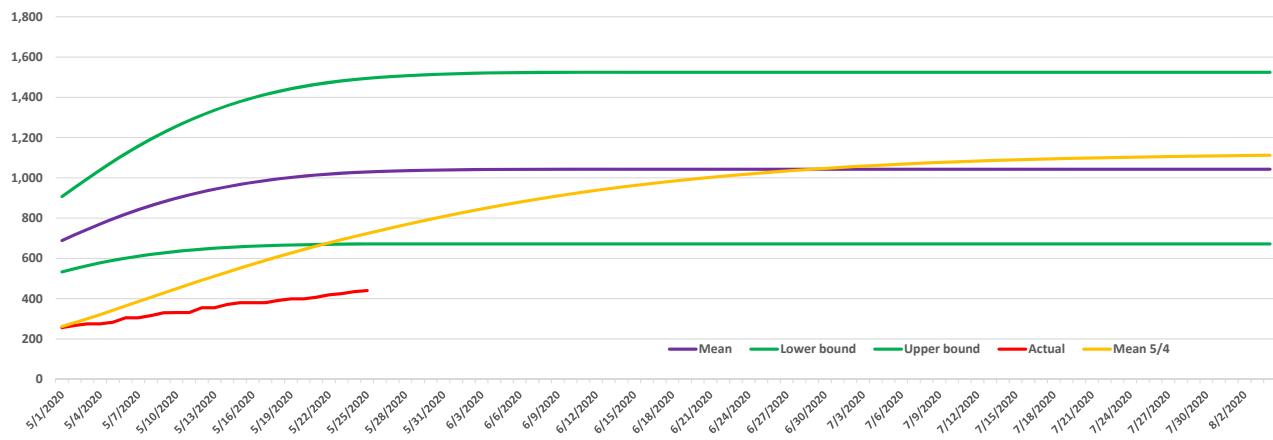
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Georgia COVID 19 Cumulative Death Projections



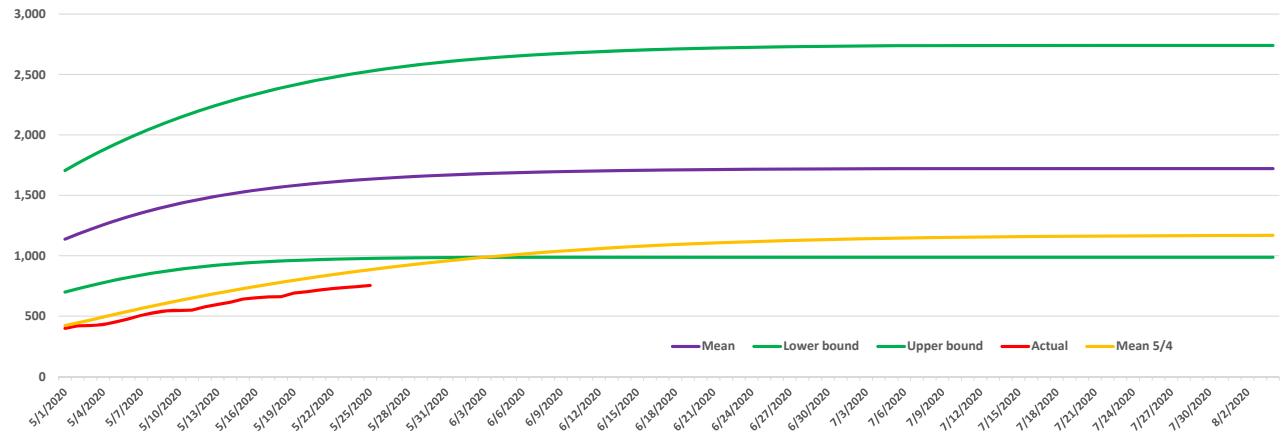
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South Carolina COVID 19 Cumulative Death Projections



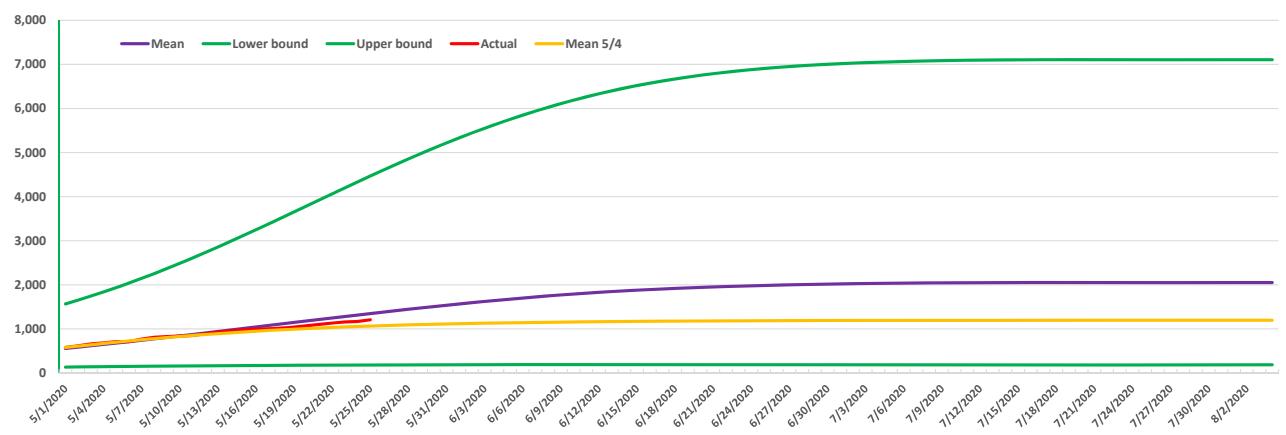
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North Carolina COVID 19 Cumulative Death Projections



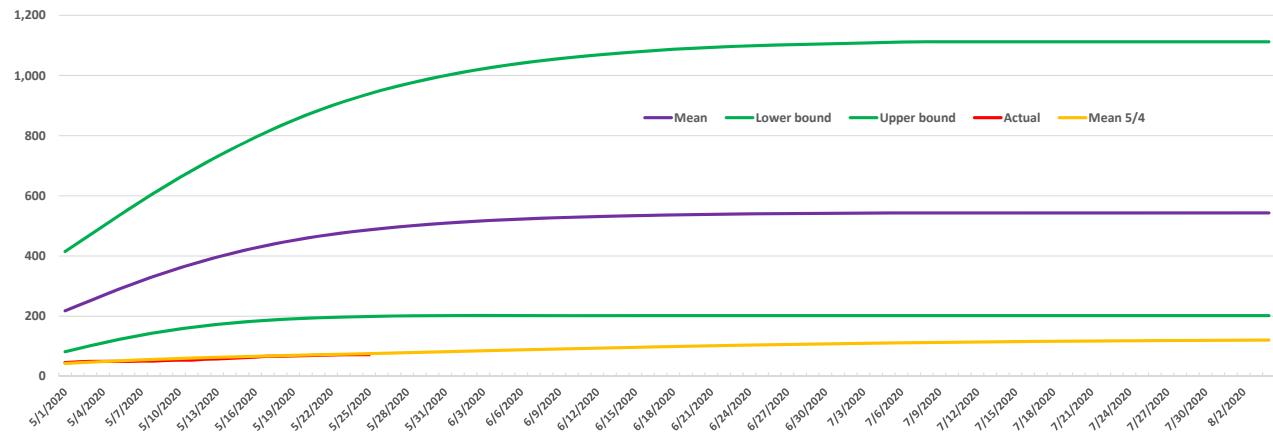
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Virginia COVID 19 Cumulative Death Projections



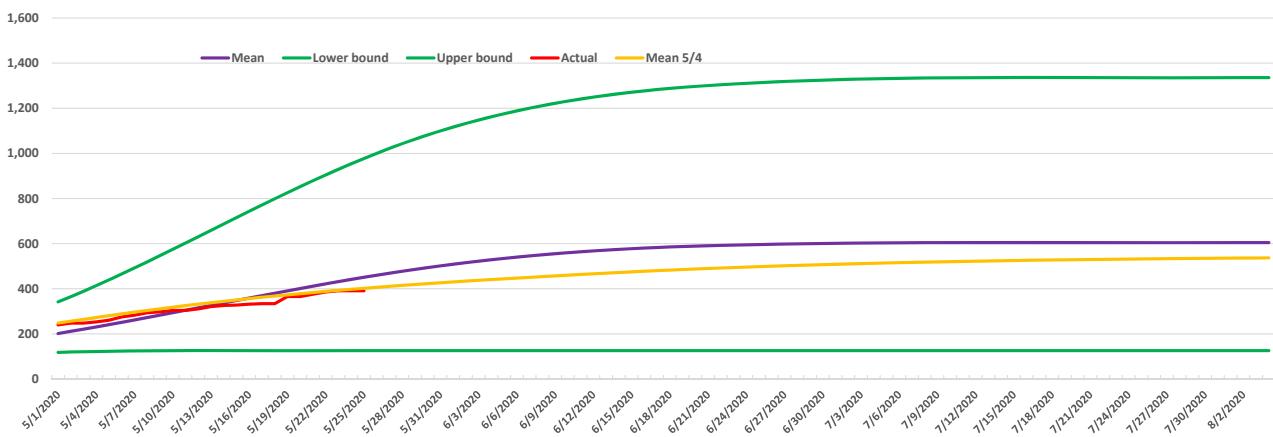
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West Virginia COVID 19 Cumulative Death Projections



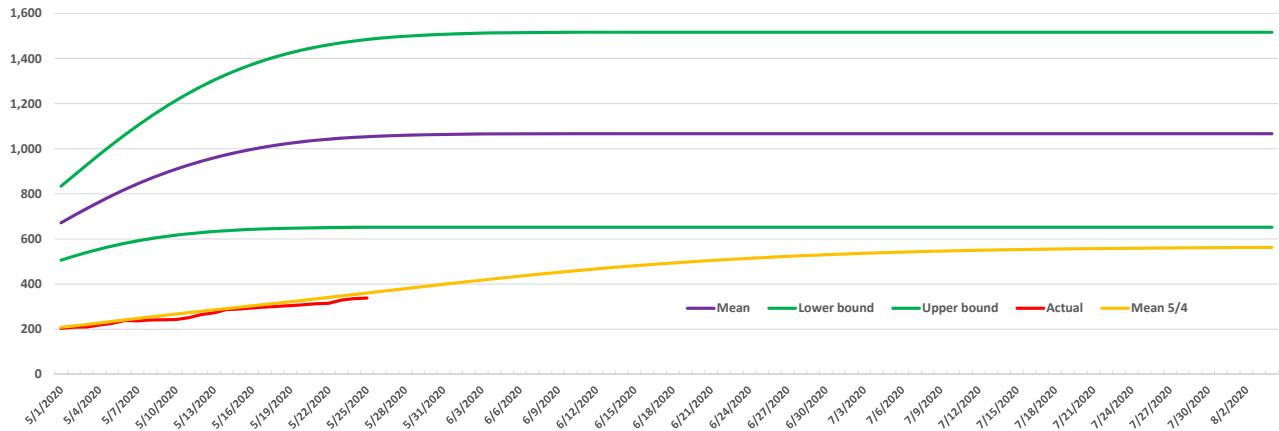
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Kentucky COVID 19 Cumulative Death Projections March 26



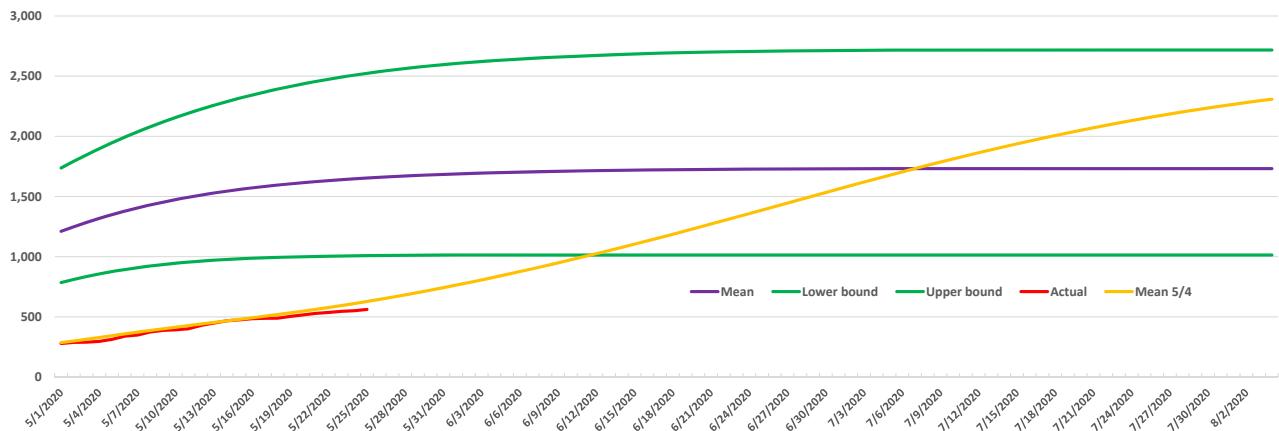
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Tennessee COVID 19 Cumulative Death Projections March 26



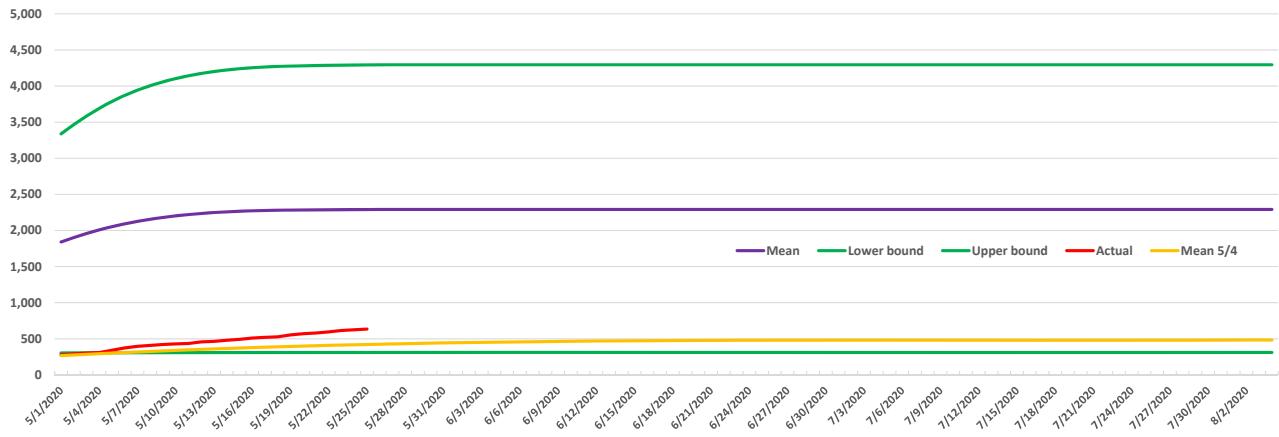
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Alabama COVID 19 Cumulative Death Projections March 26



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Mississippi COVID 19 Daily Death Projections March 26



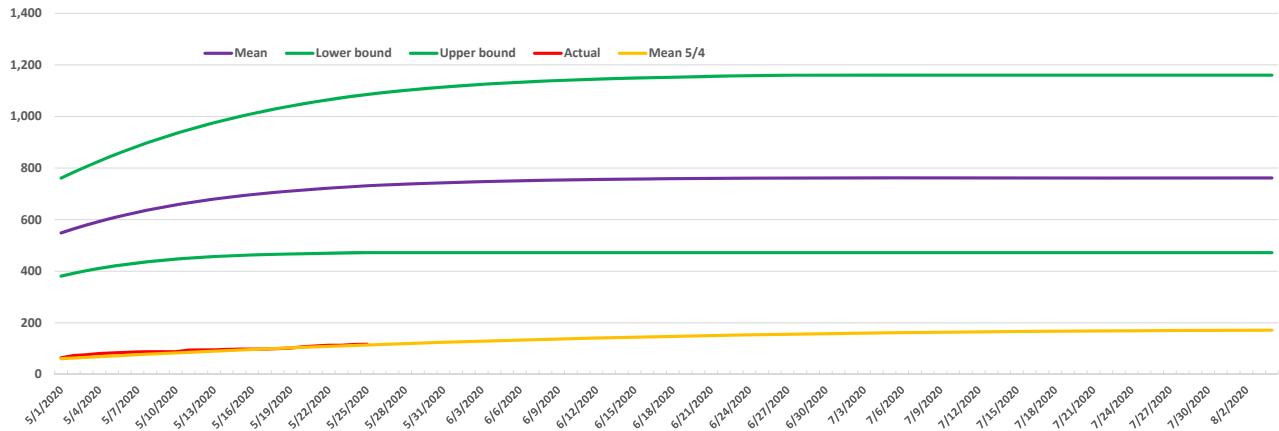
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Louisiana COVID 19 Daily Death Projections March 26



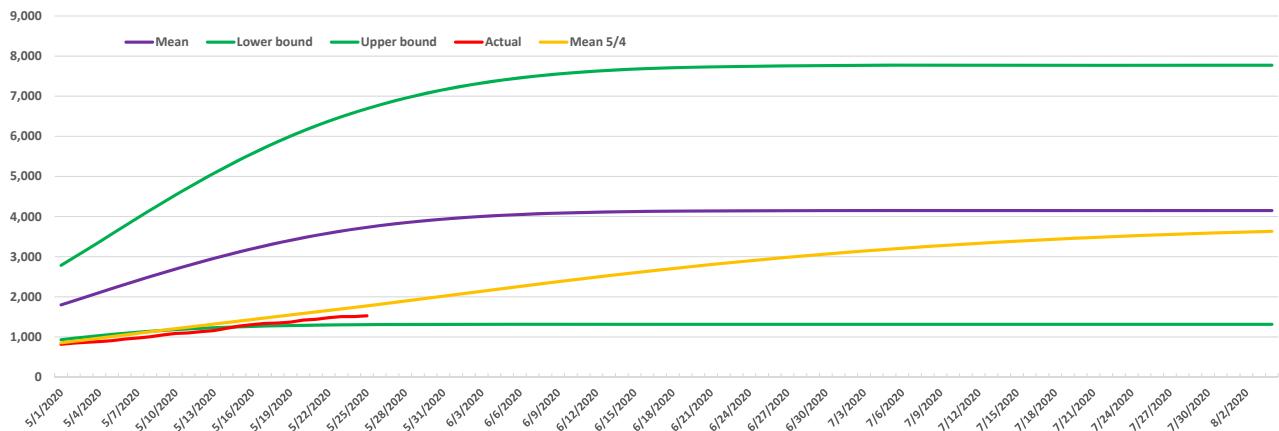
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Arkansas COVID 19 Cumulative Death Projections March 26



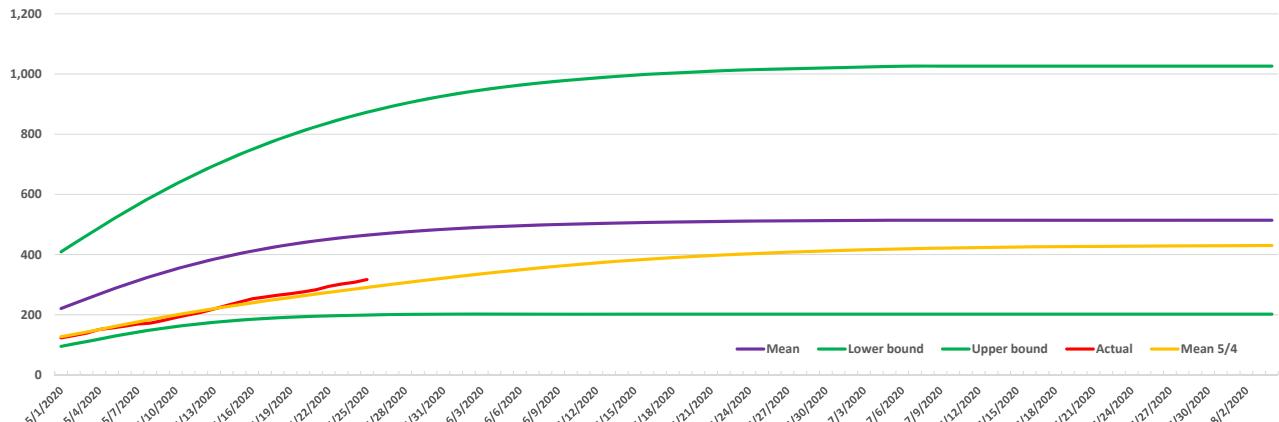
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Texas COVID 19 Daily Death Projections March 26



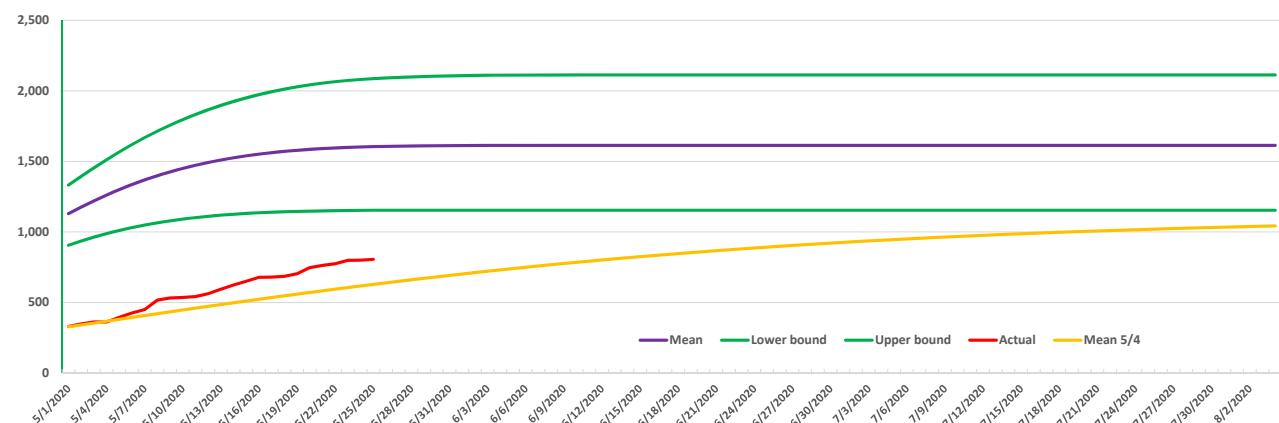
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New Mexico COVID 19 Daily Death Projections March 26



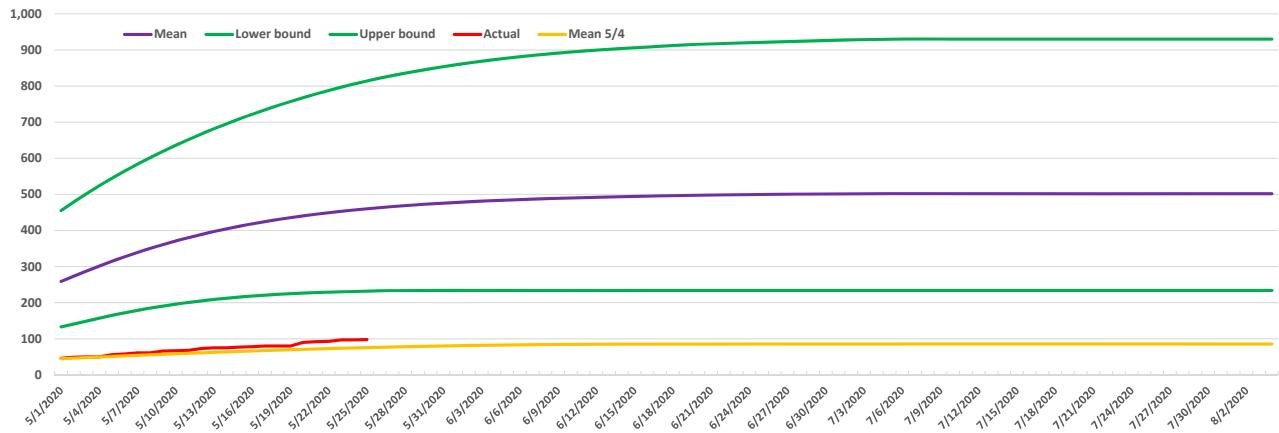
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Arizona COVID 19 Cumulative Death Projections



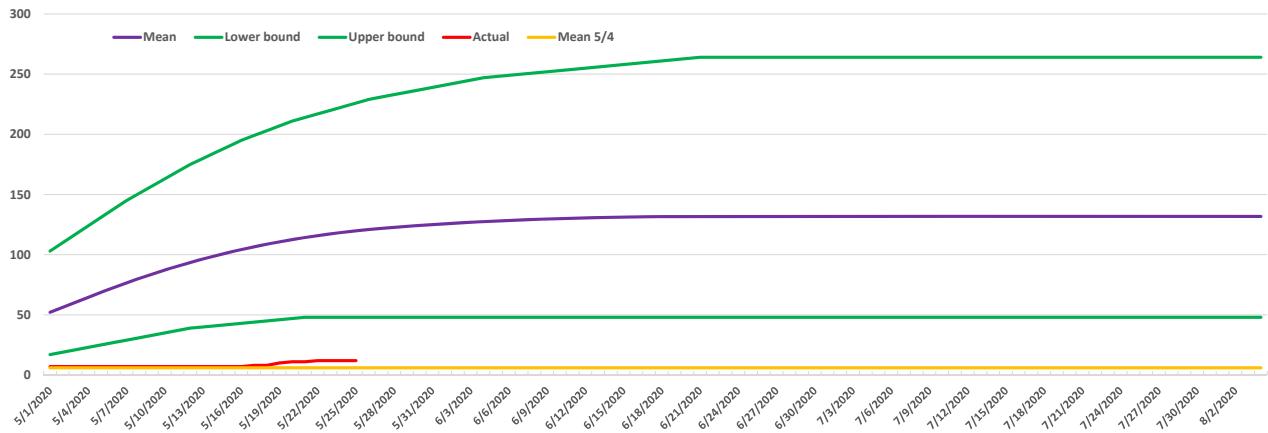
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Utah COVID 19 Daily Death Projections March 26



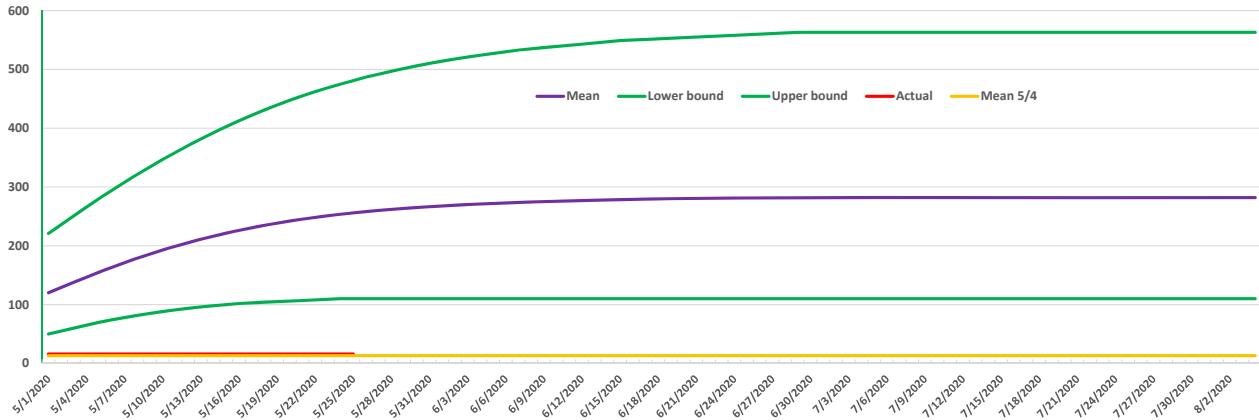
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Wyoming COVID 19 Cumulative Death Projections March 26



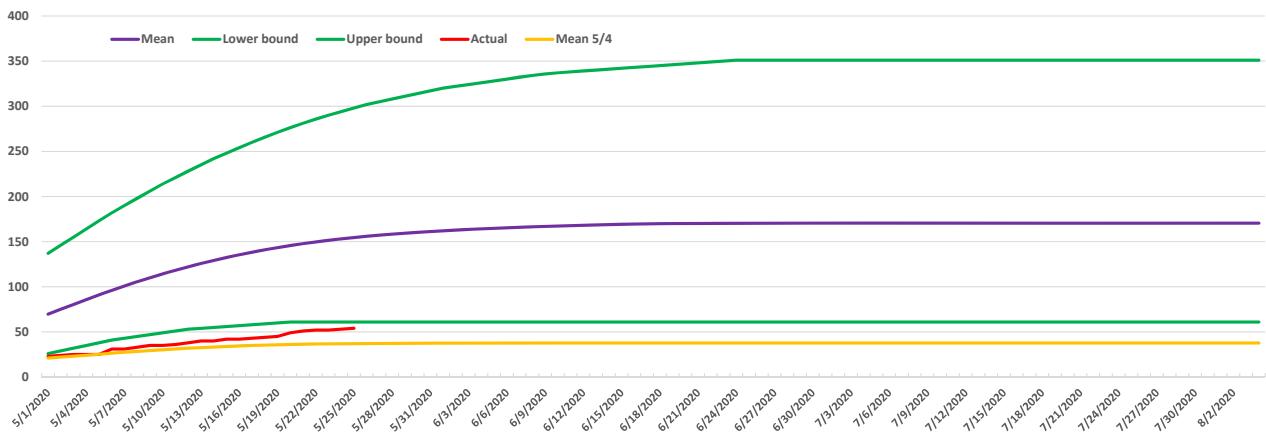
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Montana COVID 19 Cumulative Death Projections



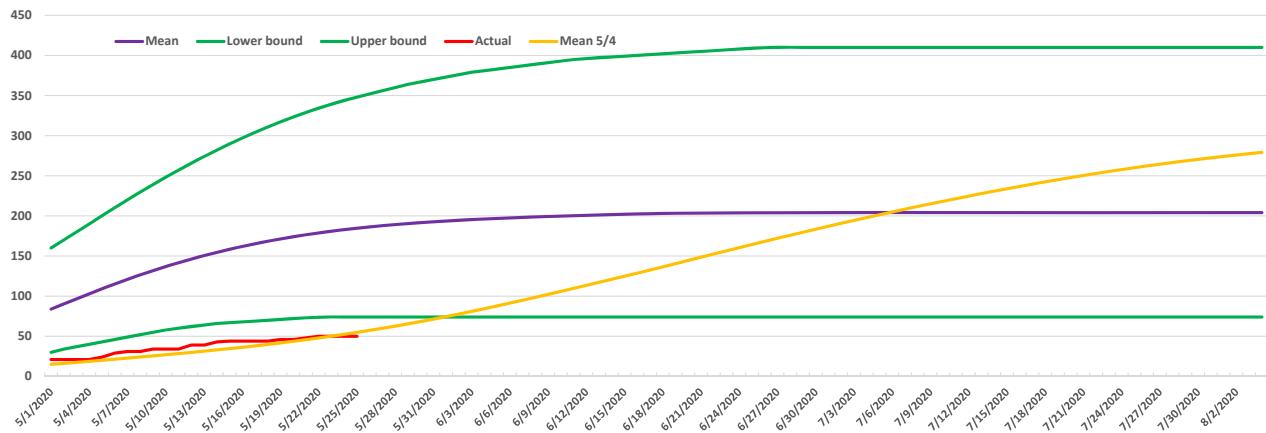
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North Dakota COVID 19 Cumulative Death Projections March 26



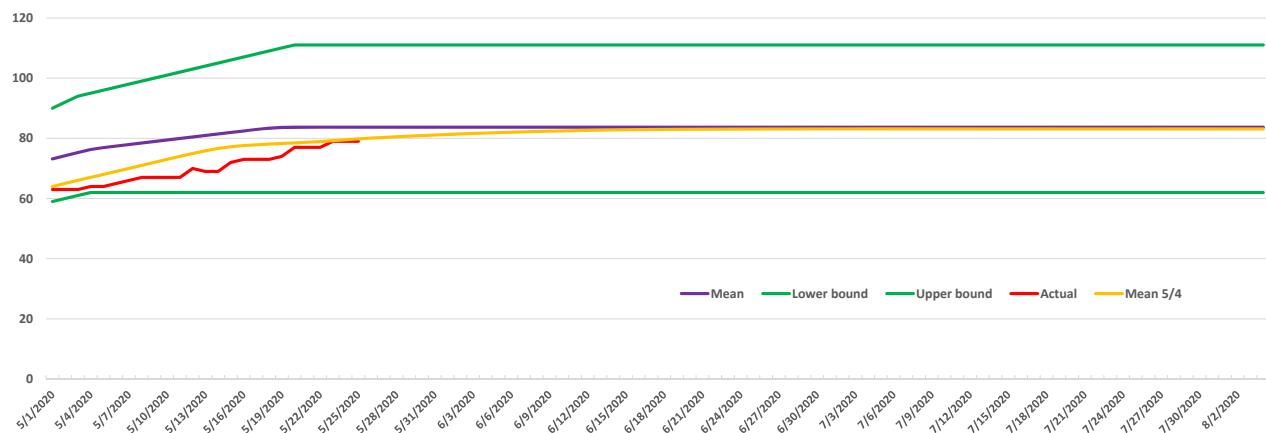
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South Dakota COVID 19 Daily Death Projections March 26



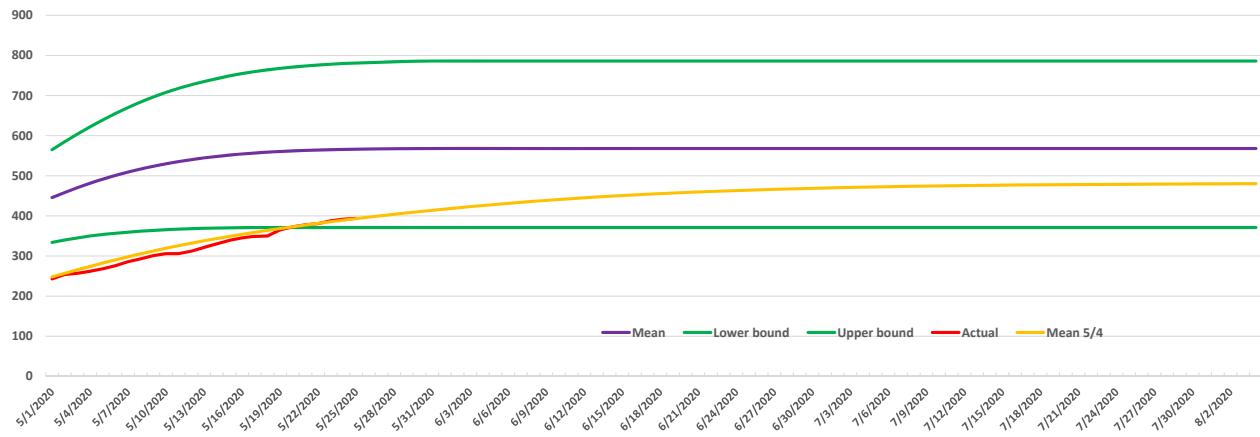
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Idaho COVID 19 Cumulative Death Projections March 26



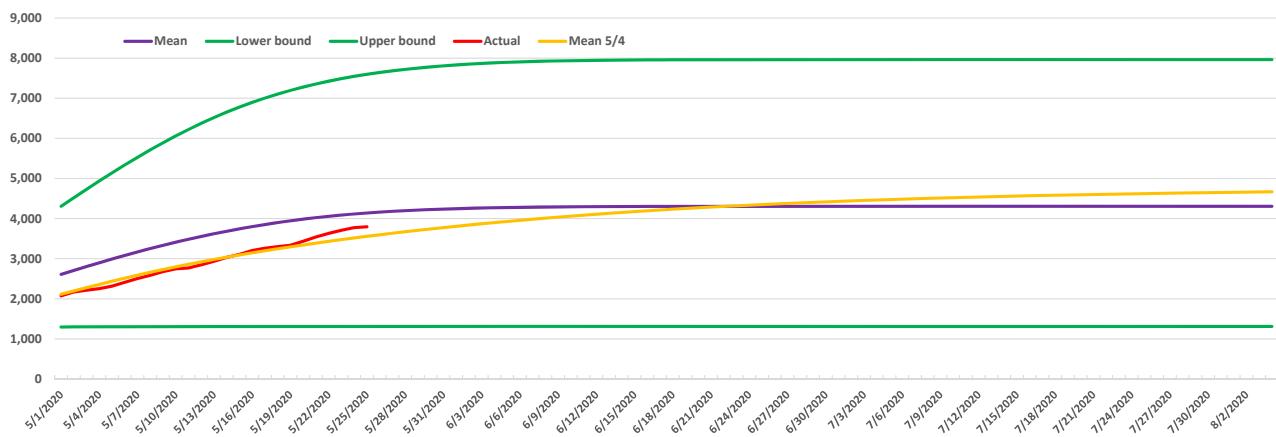
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Nevada COVID 19 Cumulative Death Projections



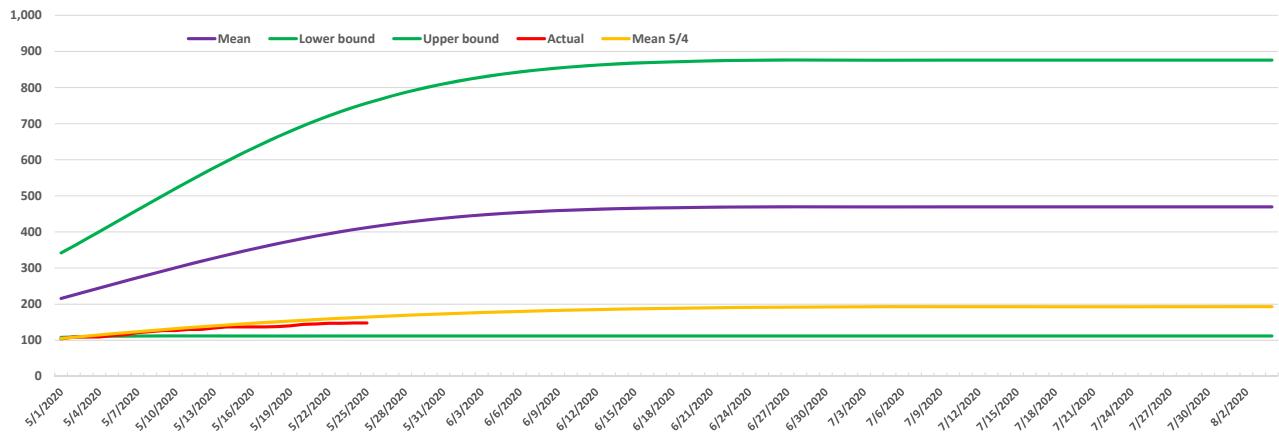
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California COVID 19 Cumulative Death Projections March 26



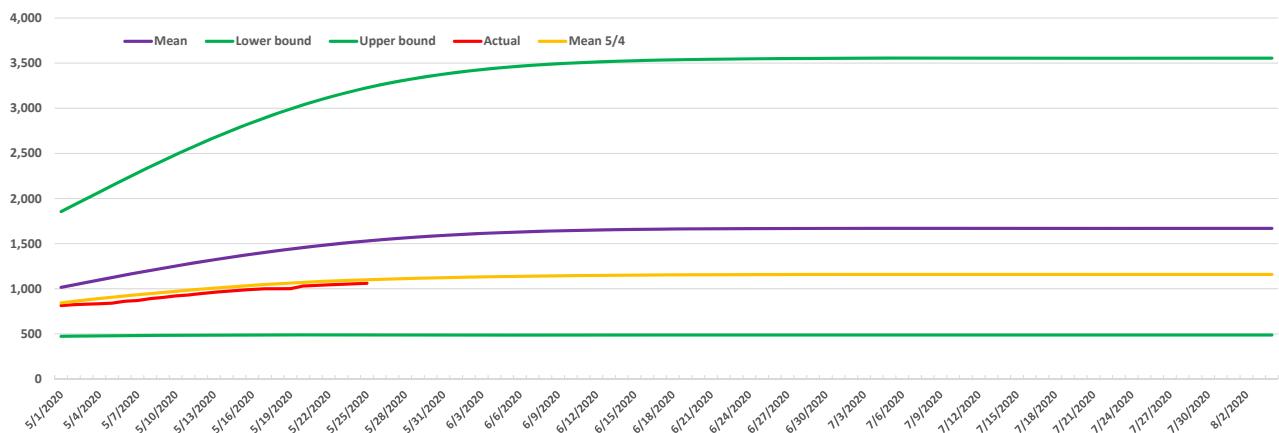
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Oregon COVID 19 Cumulative Death Projections March 26



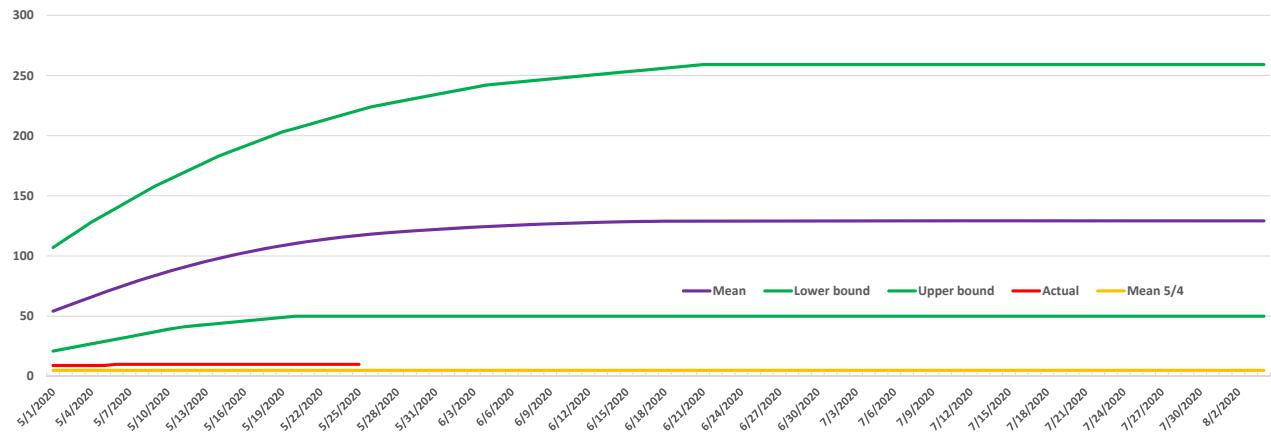
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Washington COVID 19 Cumulative Death Projections March 26



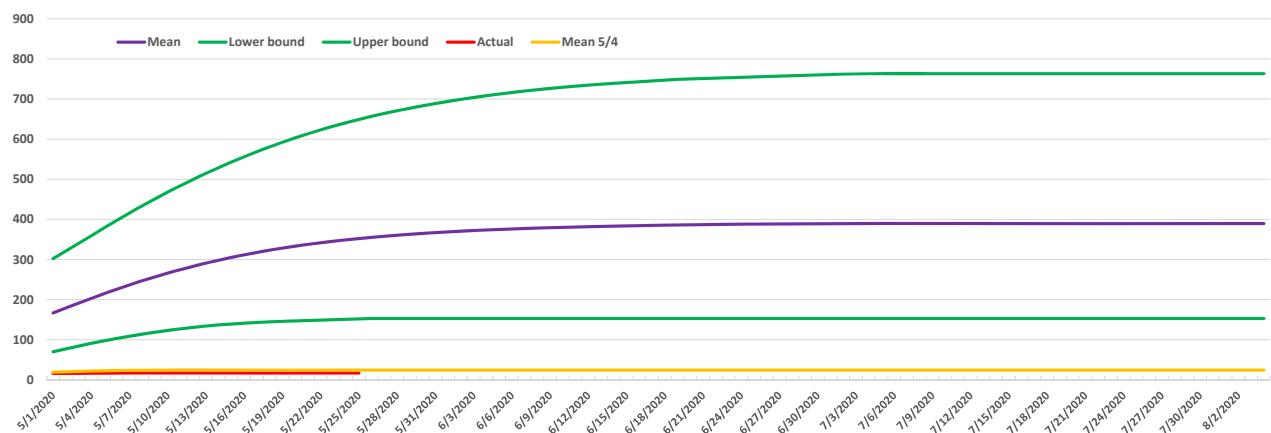
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Alaska COVID 19 Cumulative Death Projections March 26



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Hawaii COVID 19 Daily Death Projections March 26



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Cumulative Death Change from the Original Model to the May 4, May 11 and the May 18 Release

	% Change 5/4	% Change 5/11	% Change 5/18		% Change 5/4	% Change 5/11	% Change 5/18
Alabama	33.3%	-10.3%	-30.2%	Hawaii	-93.8%	-95.1%	-95.1%
Alaska	-96.1%	-96.1%	-97.7%	Idaho	-0.7%	-10.2%	-3.2%
Arizona	-35.4%	85.2%	282.7%	Illinois	169.2%	213.3%	272.0%
Arkansas	-77.5%	-72.0%	-84.9%	Indiana	564.9%	335.4%	155.1%
California	8.4%	41.3%	58.9%	Iowa	998.6%	564.2%	657.1%
Colorado	-37.9%	-22.1%	6.0%	Kansas	-61.5%	-41.1%	-52.4%
Connecticut	970.6%	1,110.2%	1,185.6%	Kentucky	-11.2%	16.3%	-16.1%
Delaware	-34.5%	-50.1%	-34.7%	Louisiana	48.7%	70.4%	65.5%
Florida	-41.3%	-19.6%	-30.2%	Maine	-97.2%	-97.0%	-97.4%
Georgia	76.9%	29.5%	-14.3%	Maryland	87.0%	122.6%	272.6%



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Cumulative Death Change from the Original Model to the May 4, May 11 and the May 18 Release

	% Change 5/4	% Change 5/11	% Change 5/18		% Change 5/4	% Change 5/11	% Change 5/18
Massachusetts	331.9%	323.3%	402.1%	New Mexico	-16.3%	-25.8%	1.1%
Michigan	147.4%	117.2%	111.2%	New York	106.7%	103.4%	106.7%
Minnesota	1.7%	-3.4%	-15.5%	North Carolina	-32.1%	-30.8%	46.7%
Mississippi	-78.9%	-46.1%	-57.0%	North Dakota	-77.9%	-52.6%	-22.7%
Missouri	17.9%	88.1%	42.8%	Ohio	112.1%	146.0%	146.3%
Montana	-95.3%	-95.0%	-95.7%	Oklahoma	-57.0%	-59.1%	-68.0%
Nebraska	-10.4%	-48.5%	-42.7%	Oregon	-58.9%	-56.6%	-50.7%
Nevada	-15.4%	-10.0%	7.3%	Pennsylvania	445.2%	580.5%	509.6%
New Hampshire	-52.1%	-35.1%	-10.2%	Rhode Island	58.6%	120.6%	153.5%
New Jersey	665.3%	603.7%	571.2%	South Carolina	6.6%	-28.7%	-53.5%



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Cumulative Death Change from the Original Model to the May 4, May 11 and the May 18 Release

	% Change 5/4	% Change 5/11	% Change 5/18		% Change 5/4	% Change 5/11	% Change 5/18
South Dakota	36.8%	-18.3%	-38.3%	Virginia	-41.7%	-32.0%	-3.6%
Tennessee	-47.3%	-52.5%	-54.1%	Washington	-30.6%	-32.9%	-24.4%
Texas	-12.5%	-38.1%	-10.6%	West Virginia	-77.8%	-85.5%	-80.4%
Utah	-82.9%	-70.2%	-70.1%	Wisconsin	-45.2%	-48.6%	-43.9%
Vermont	-43.4%	-44.7%	-48.2%	Wyoming	-95.4%	-95.4%	-97.0%
United States	63.7%	67.0%	74.5%				



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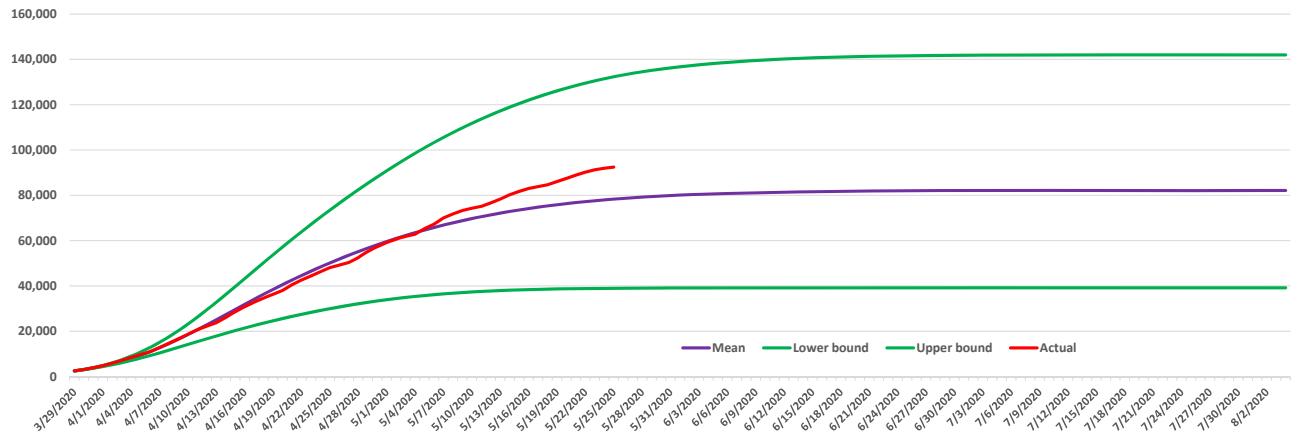
Concluding Thoughts

- 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 so far seen a large increase in deaths
- Graphical analysis indicates that the model revision at the first of May is generally more accurate although there are states that over and under predict



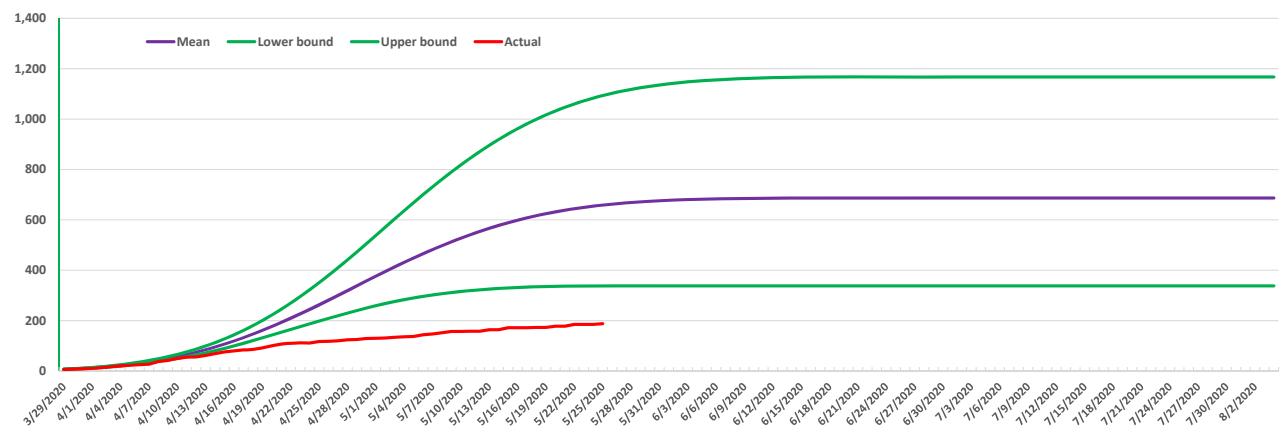
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U.S. COVID 19 Cumulative Death Projections



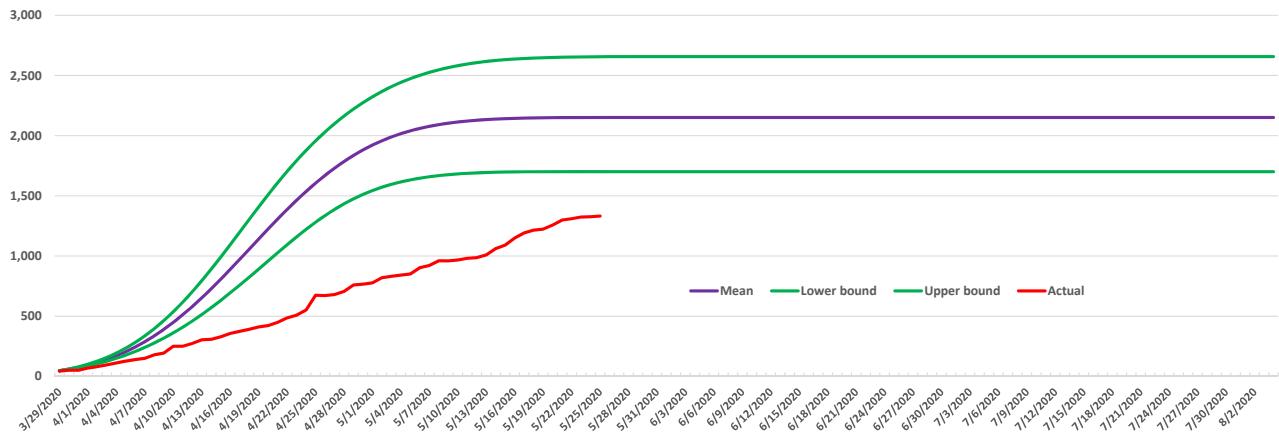
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Kansas COVID 19 Cumulative Death Projections



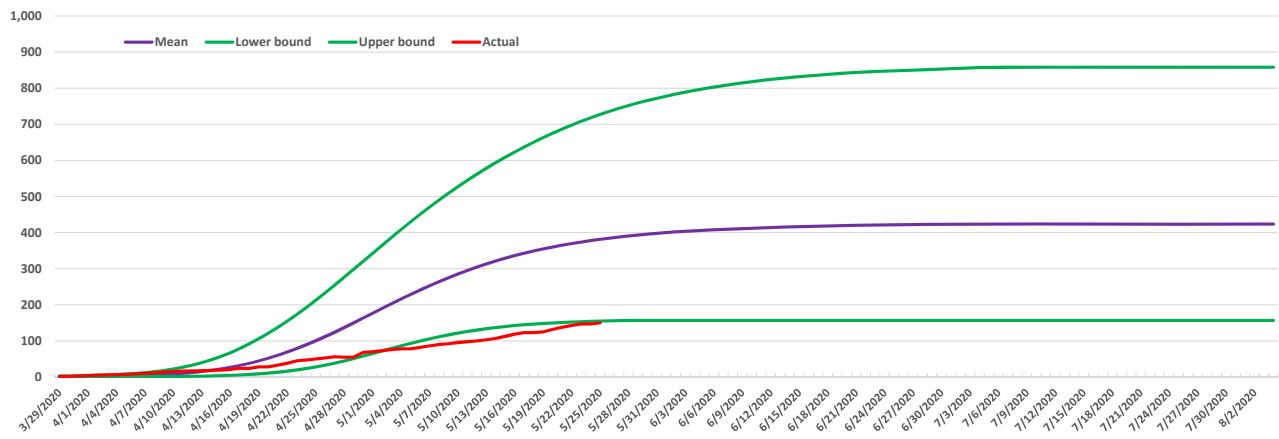
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Colorado COVID 19 Cumulative Death Projections March 26



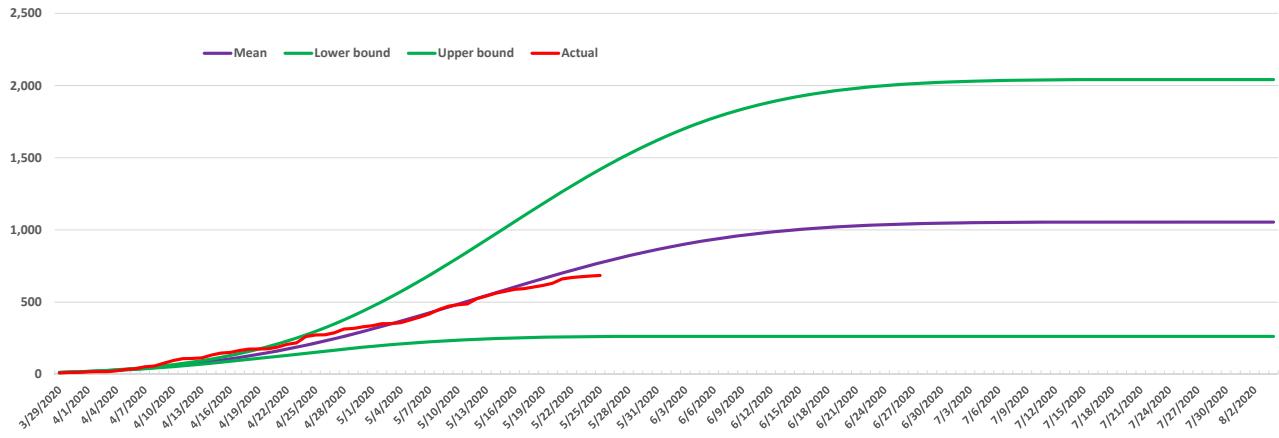
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Nebraska COVID 19 Daily Death Projections March 26



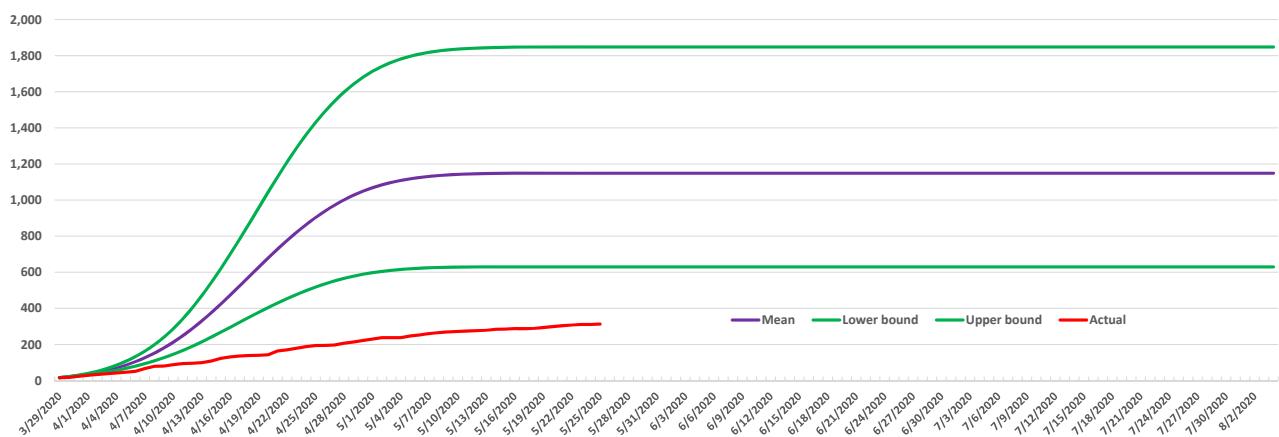
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Missouri COVID 19 Cumulative Death Projections March 26



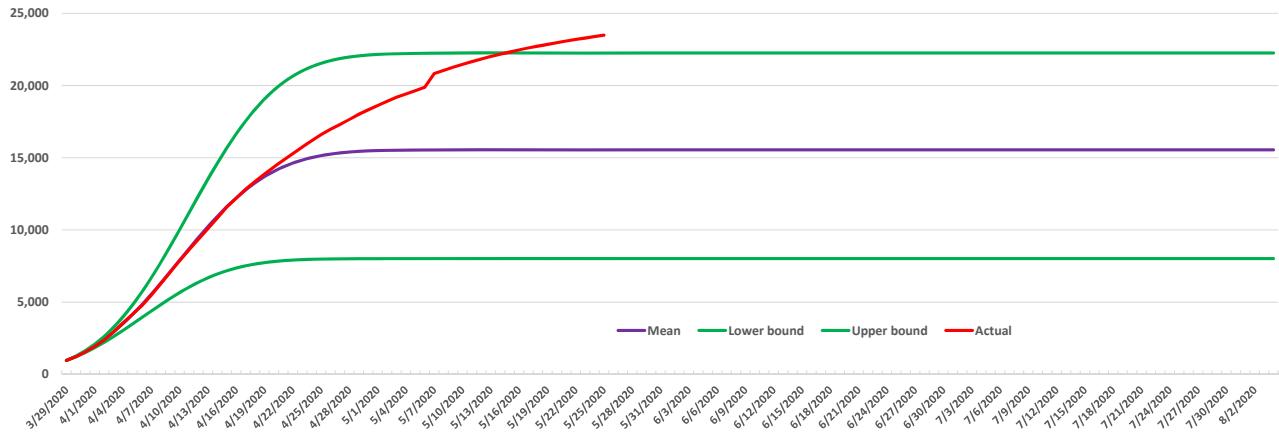
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Oklahoma COVID 19 Daily Death Projections March 26



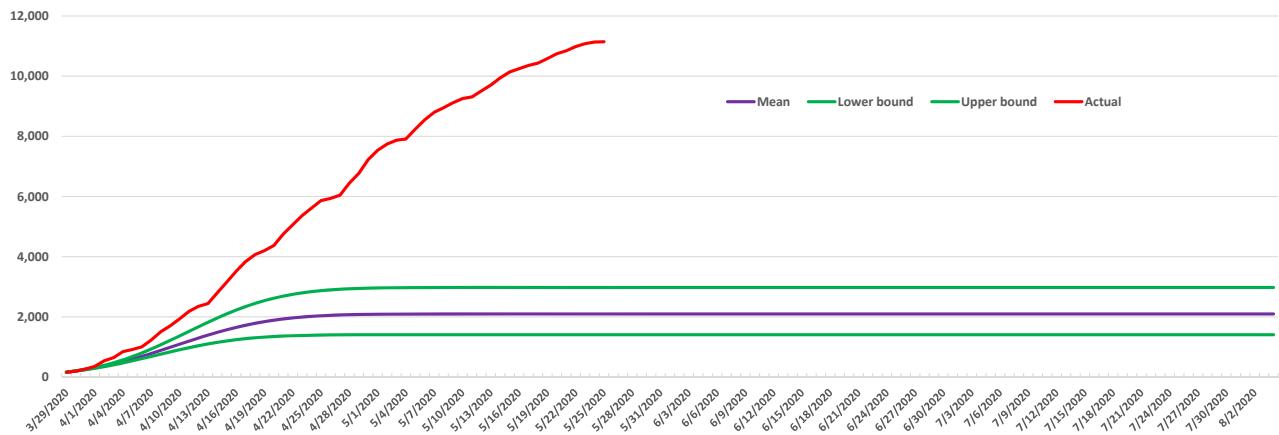
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New York COVID 19 Cumulative Death Projections



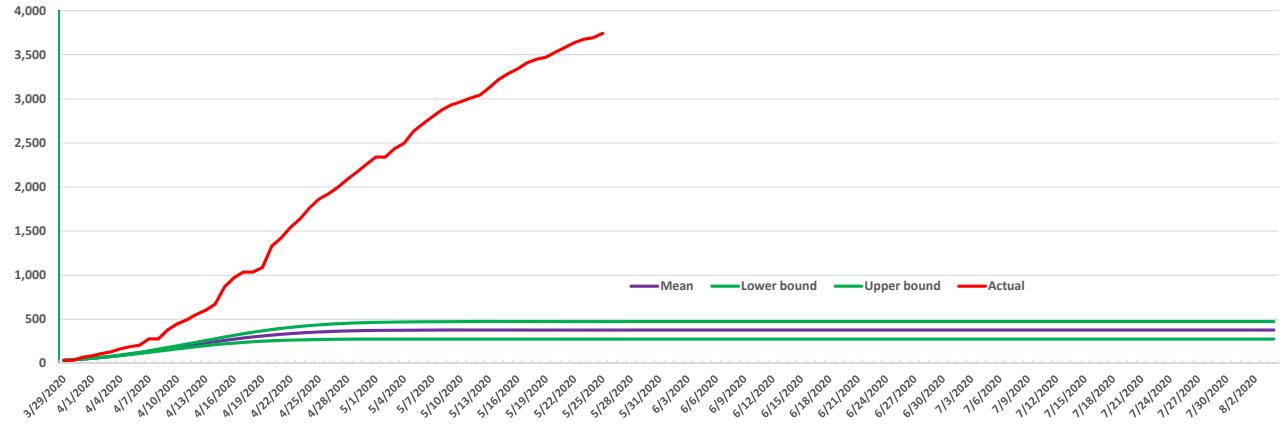
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New Jersey COVID 19 Cumulative Death Projections



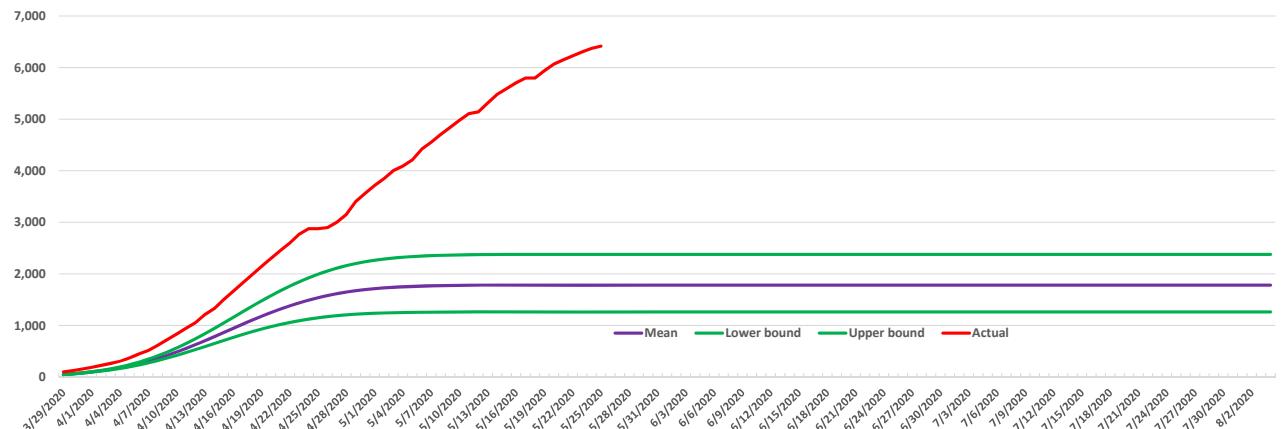
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Connecticut COVID 19 Cumulative Death Projections



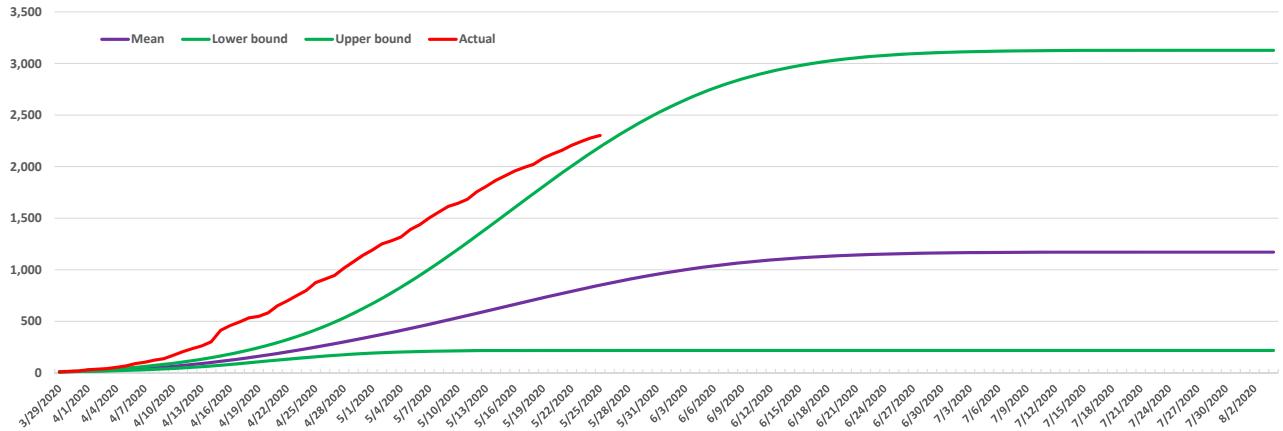
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Massachusetts COVID 19 Cumulative Death Projections



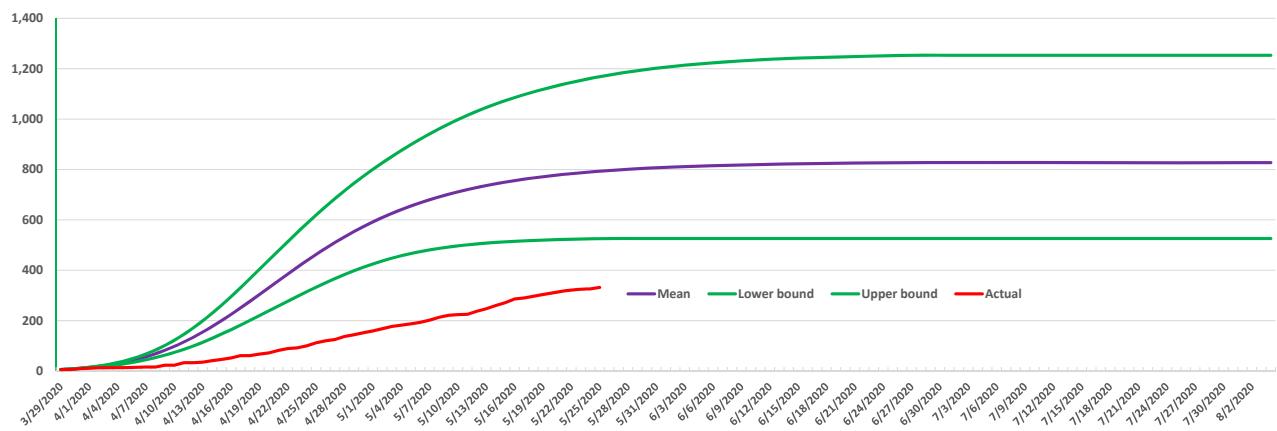
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Maryland COVID 19 Daily Death Projections March 26



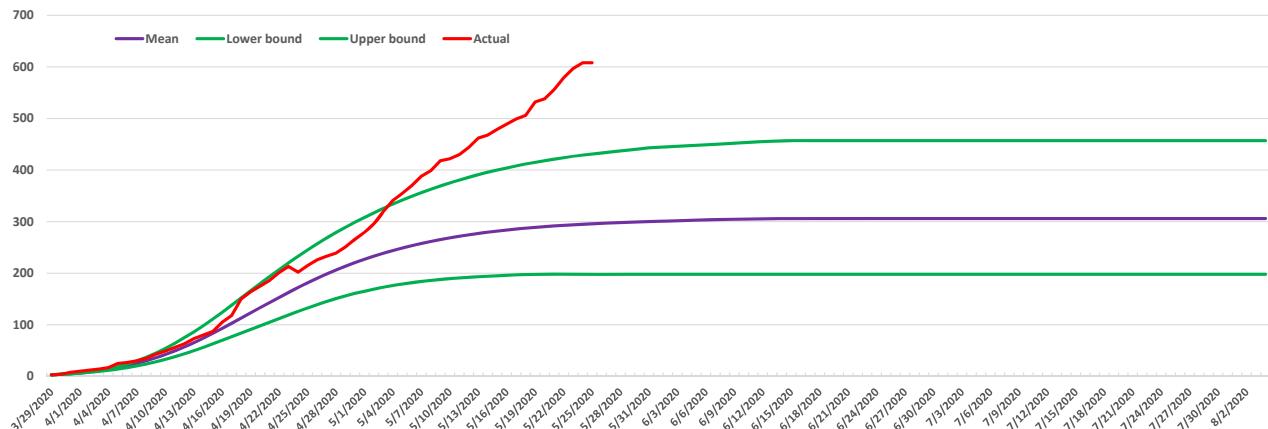
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Delaware COVID 19 Cumulative Death Projections



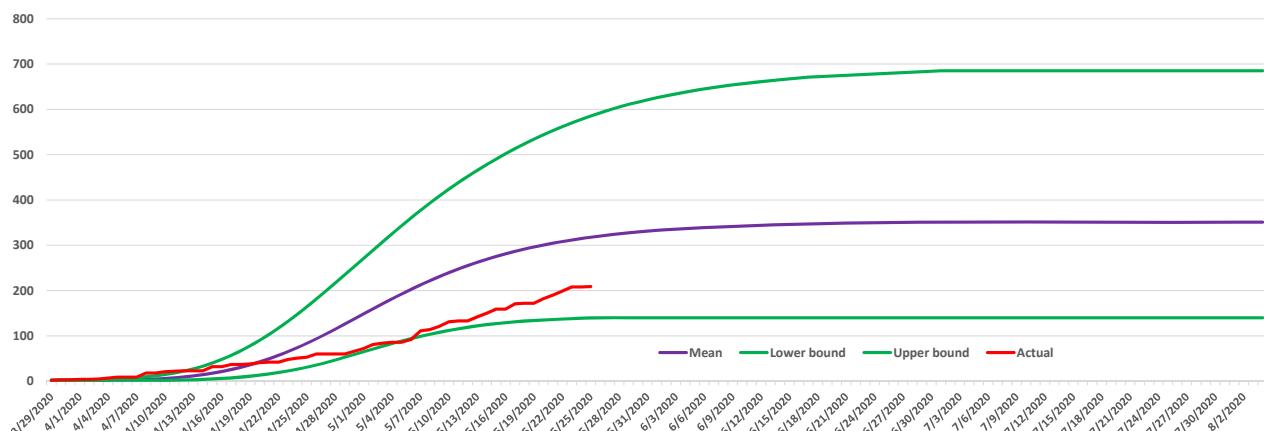
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Rhode Island COVID 19 Cumulative Death Projections March 26



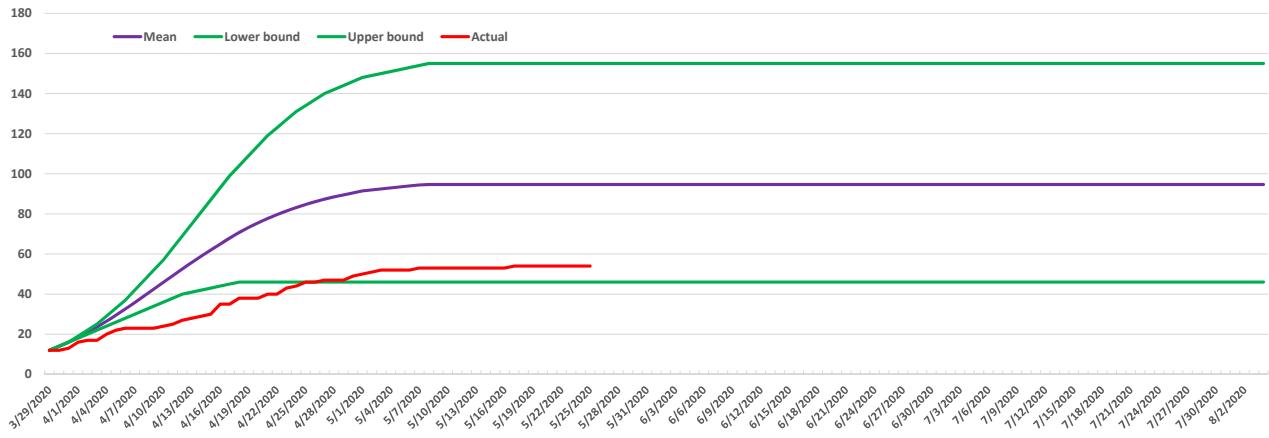
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New Hampshire COVID 19 Cumulative Death Projections



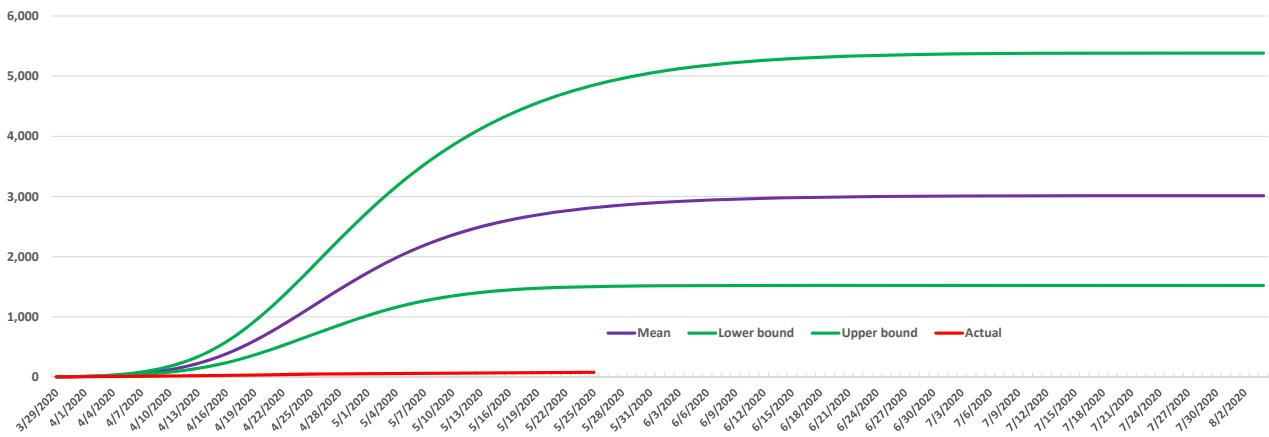
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Vermont COVID 19 Cumulative Death Projections March 26



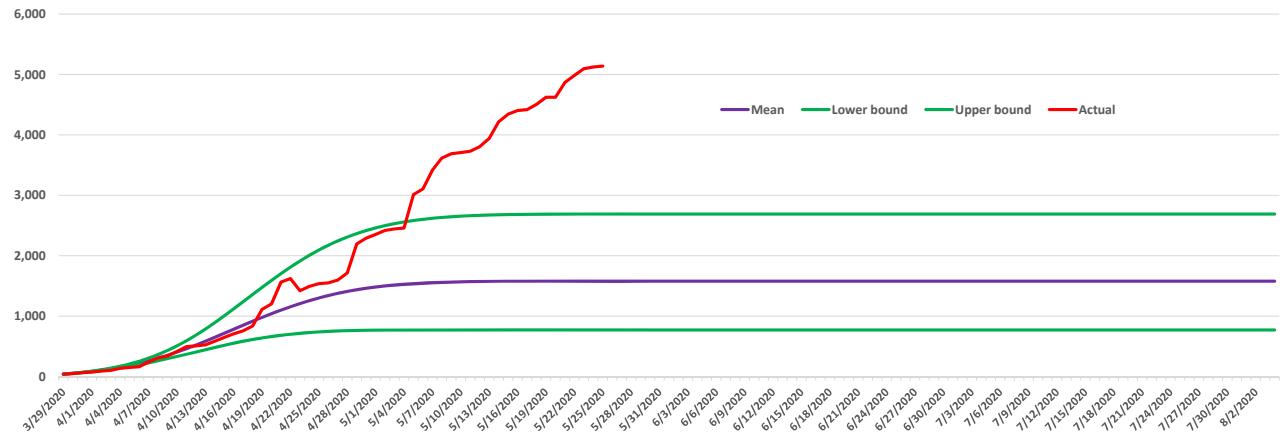
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Maine COVID 19 Cumulative Death Projections



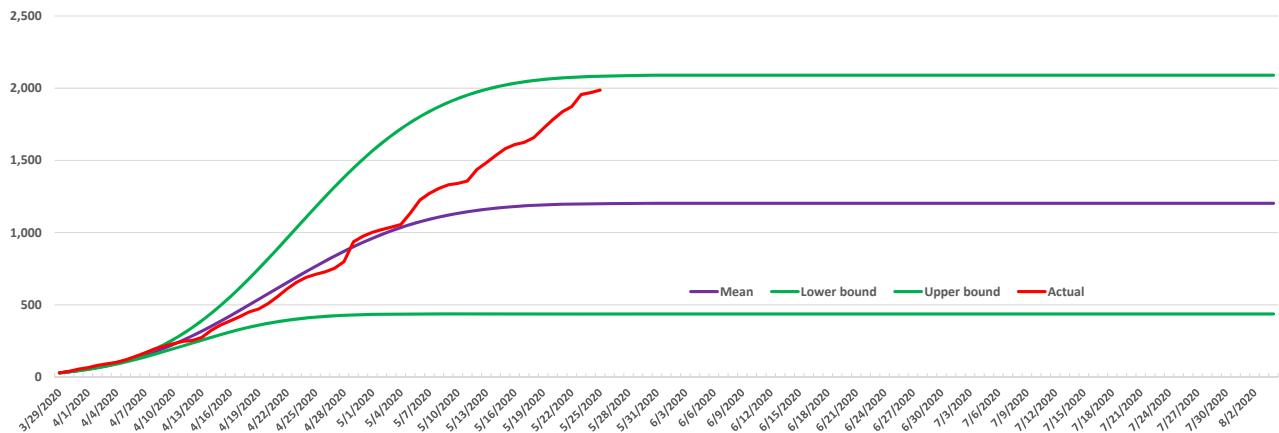
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Pennsylvania COVID 19 Cumulative Death Projections



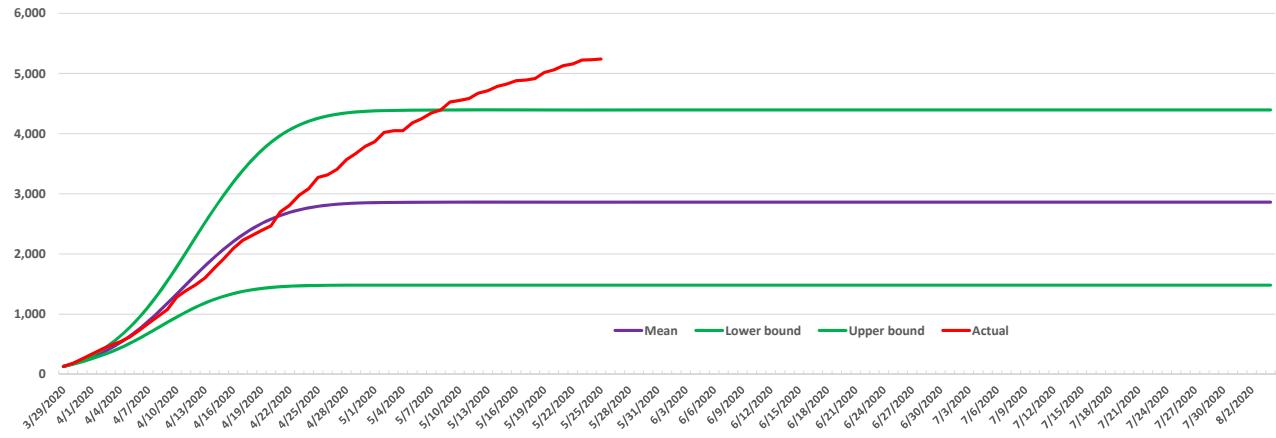
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Ohio COVID 19 Cumulative Death Projections March 26



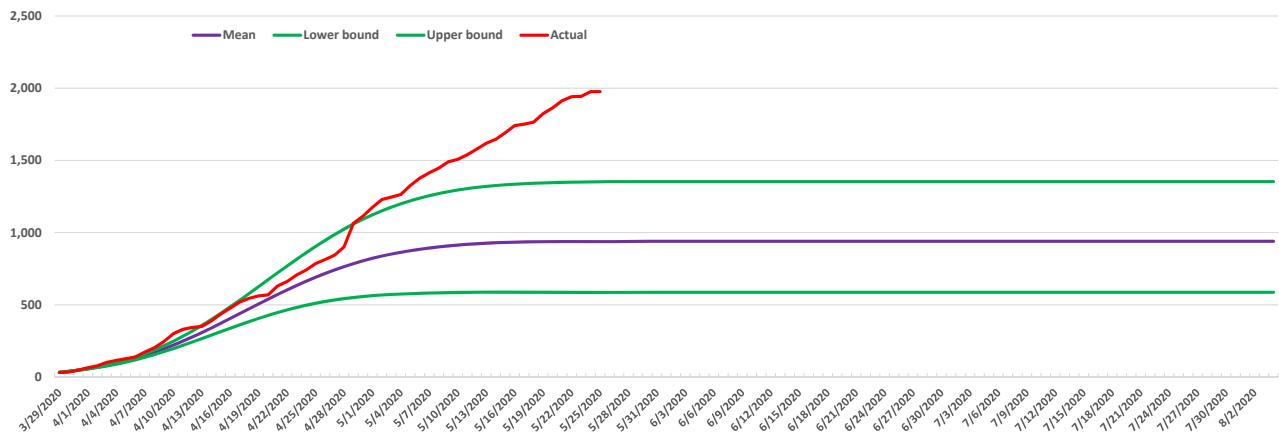
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Michigan COVID 19 Cumulative Death Projections



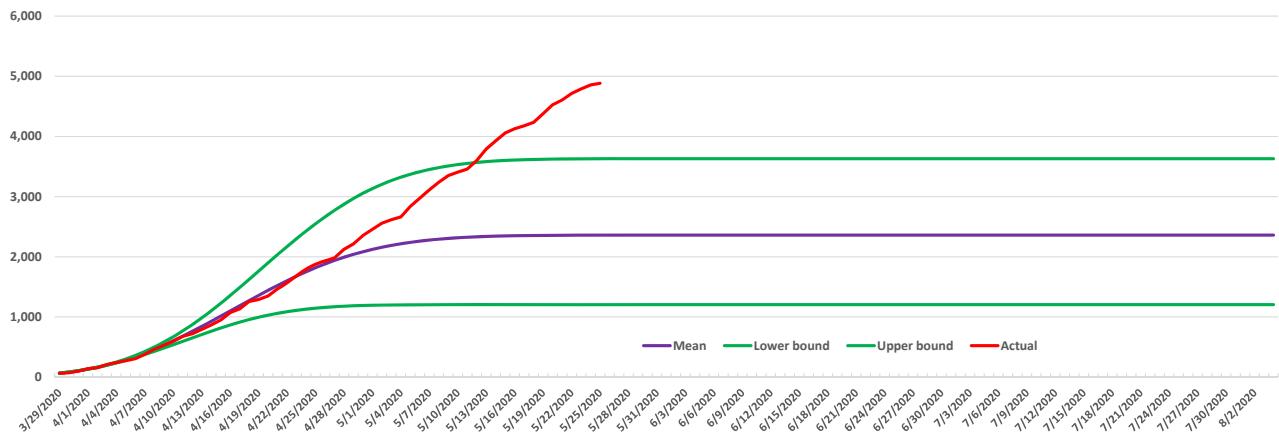
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Indiana COVID 19 Cumulative Death Projections March 26



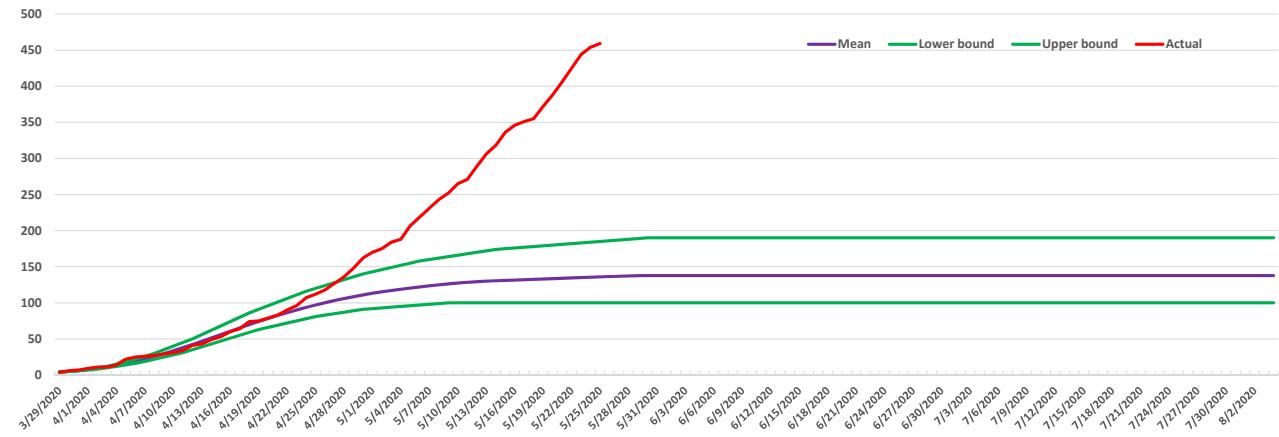
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Illinois COVID 19 Cumulative Death Projections March 26



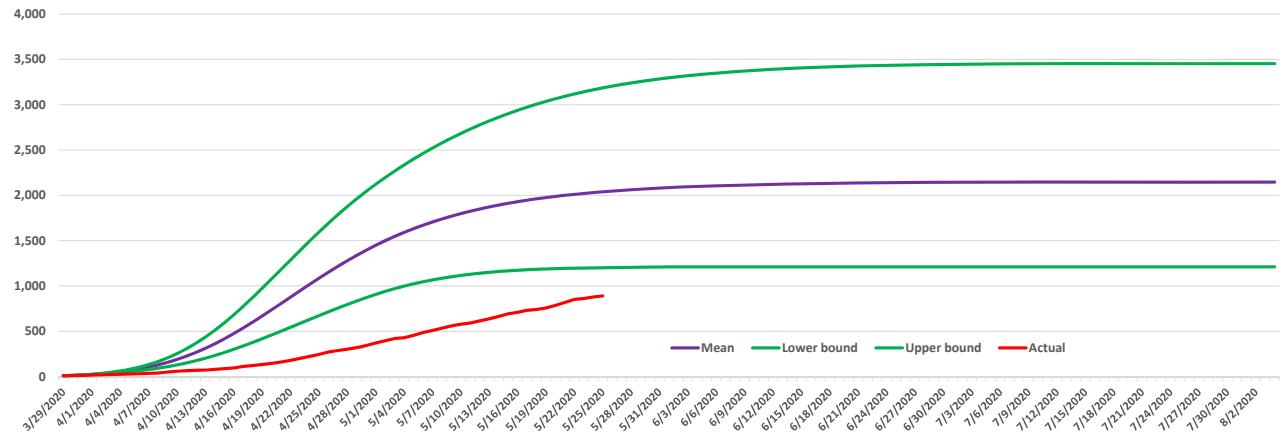
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Iowa COVID 19 Daily Death Projections March 26



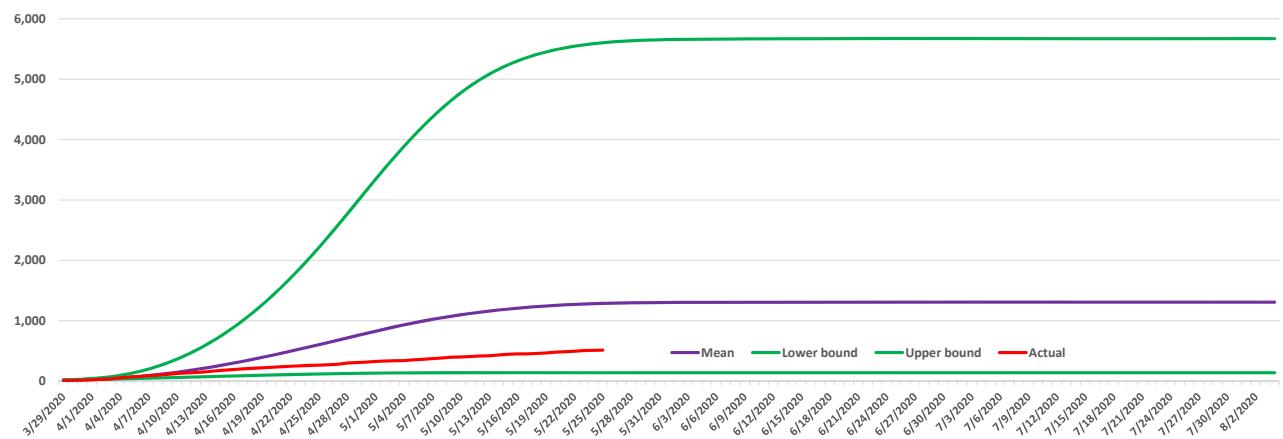
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Minnesota COVID 19 Cumulative Death Projections



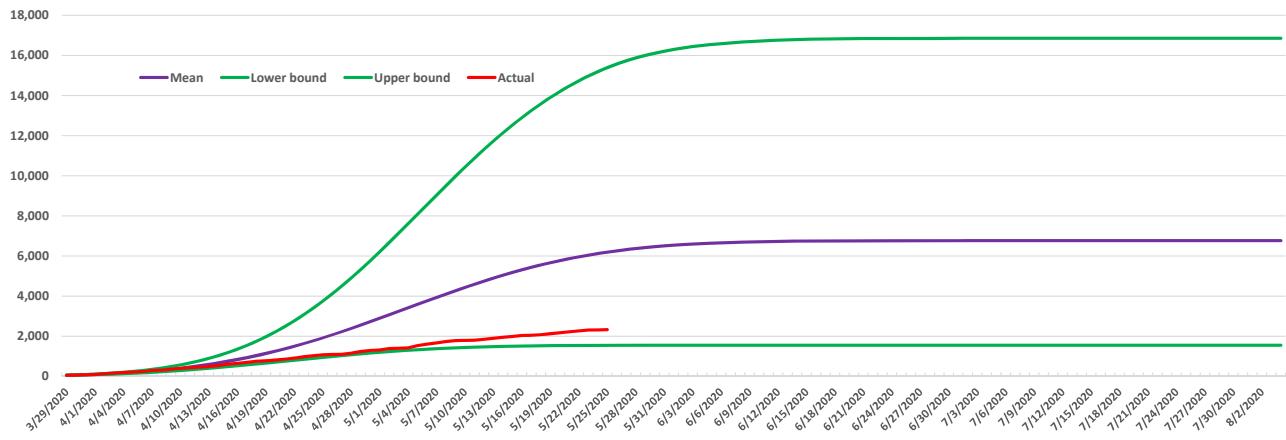
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Wisconsin COVID 19 Cumulative Death Projections



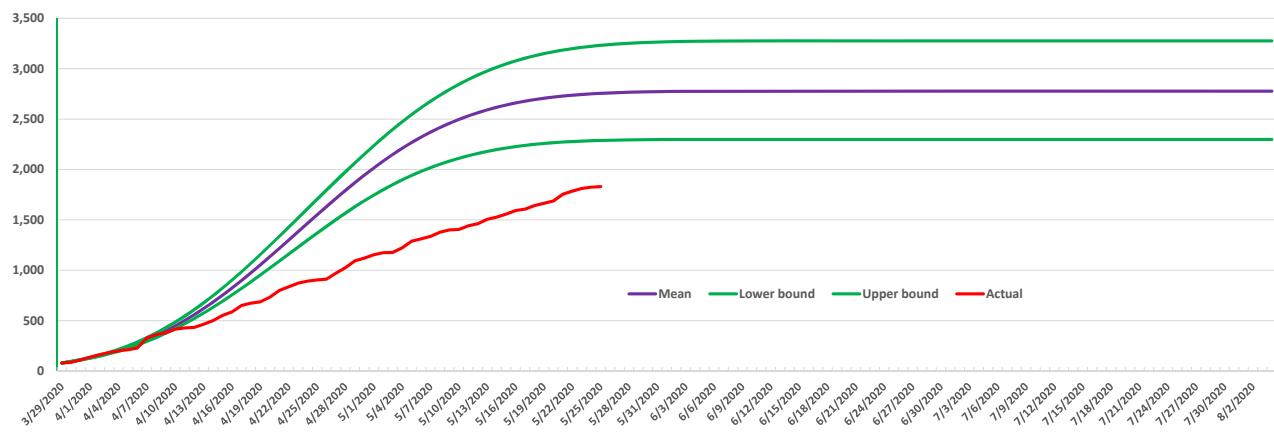
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Florida COVID 19 Cumulative Death Projections March 26



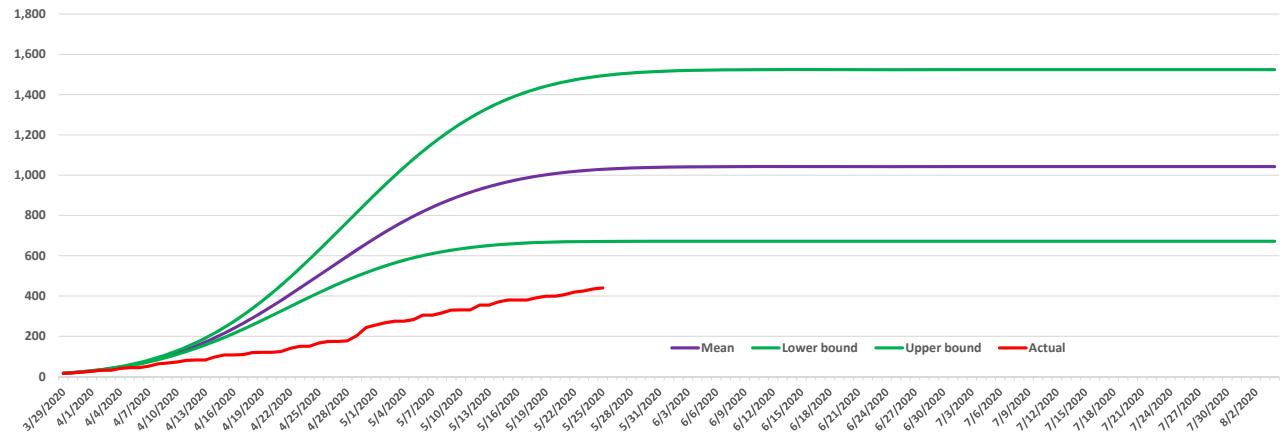
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Georgia COVID 19 Cumulative Death Projections



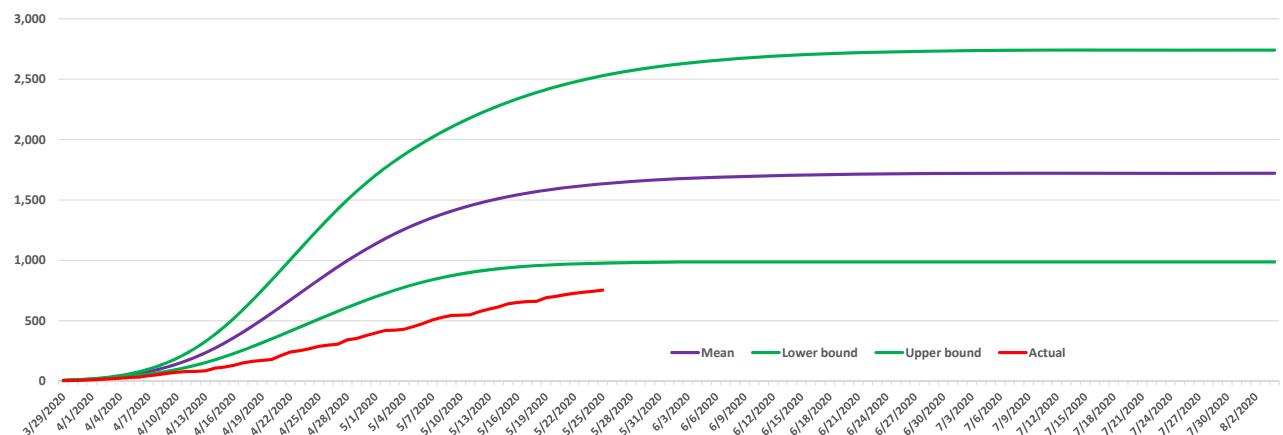
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South Carolina COVID 19 Cumulative Death Projections



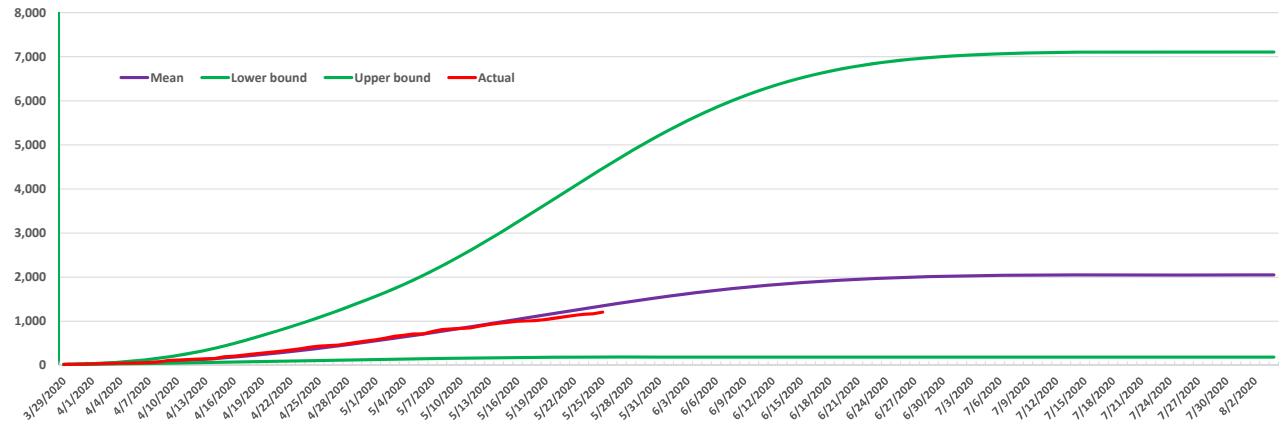
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North Carolina COVID 19 Cumulative Death Projections



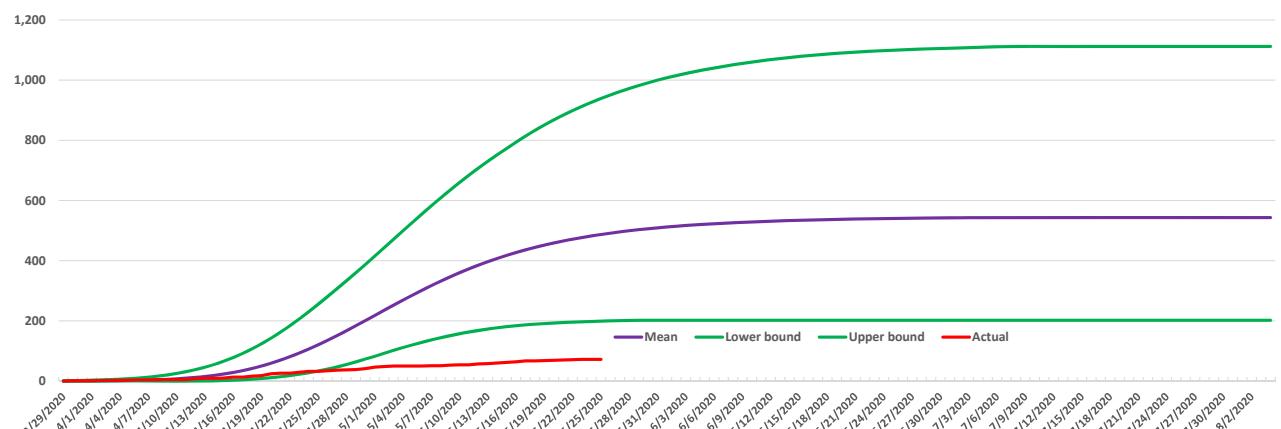
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Virginia COVID 19 Cumulative Death Projections



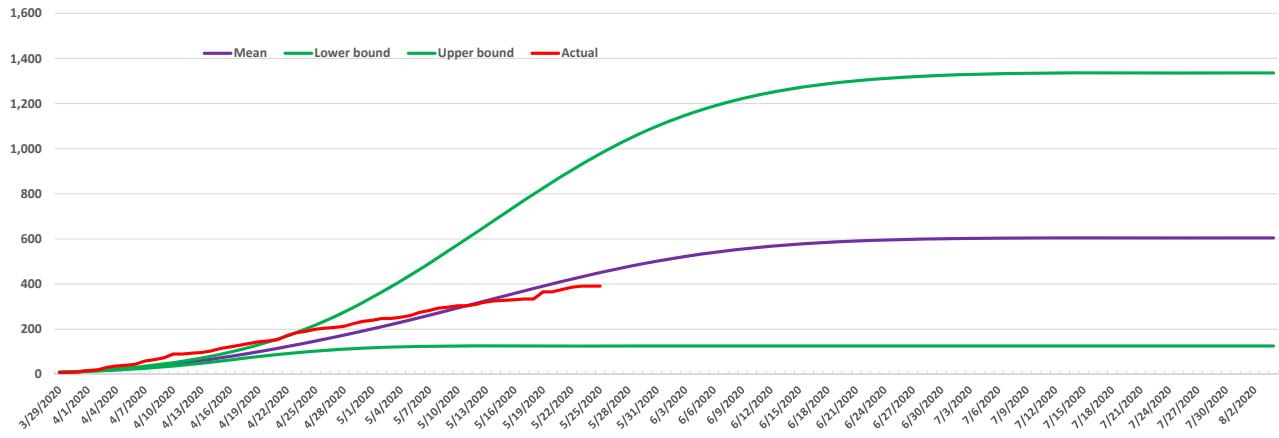
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West Virginia COVID 19 Cumulative Death Projections



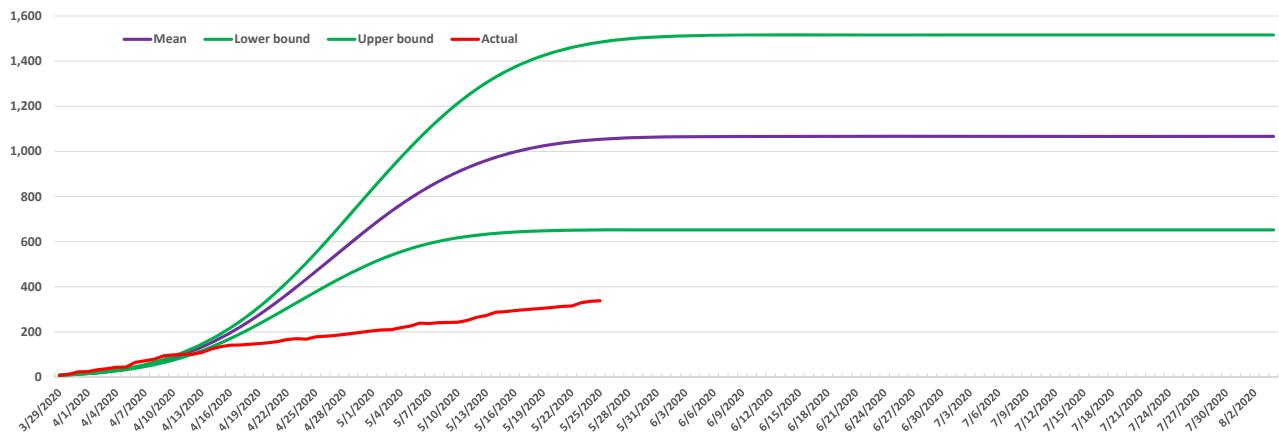
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Kentucky COVID 19 Cumulative Death Projections March 26



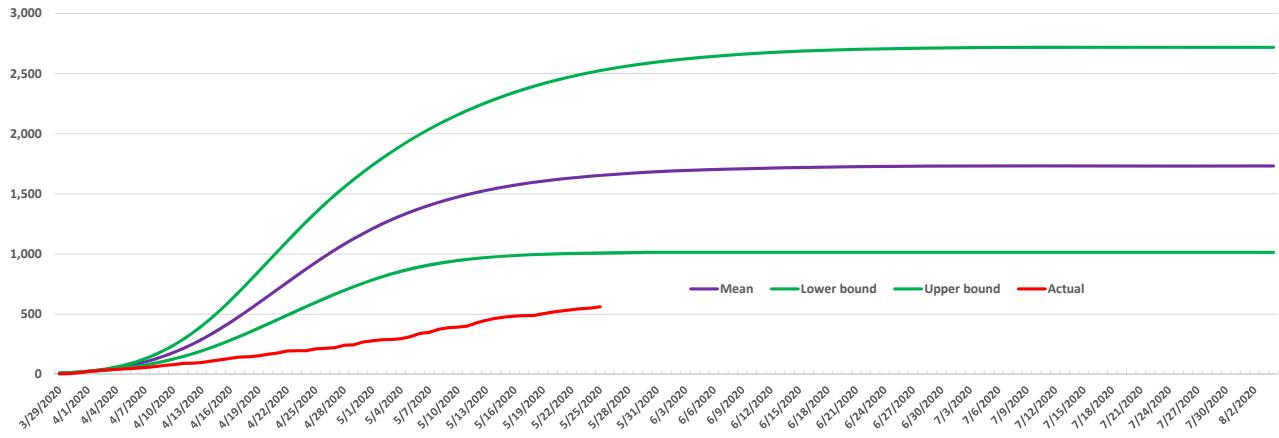
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Tennessee COVID 19 Cumulative Death Projections March 26



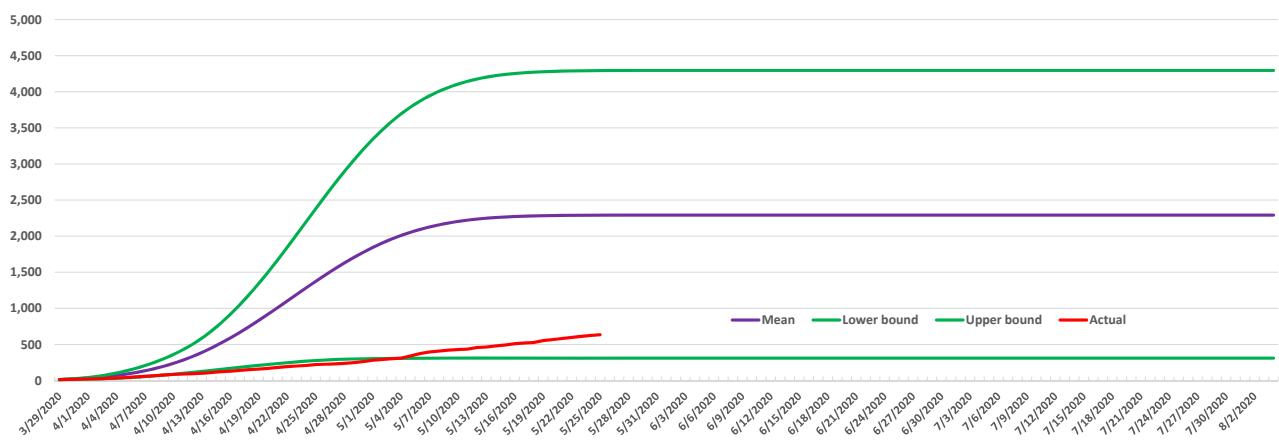
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Alabama COVID 19 Cumulative Death Projections March 26



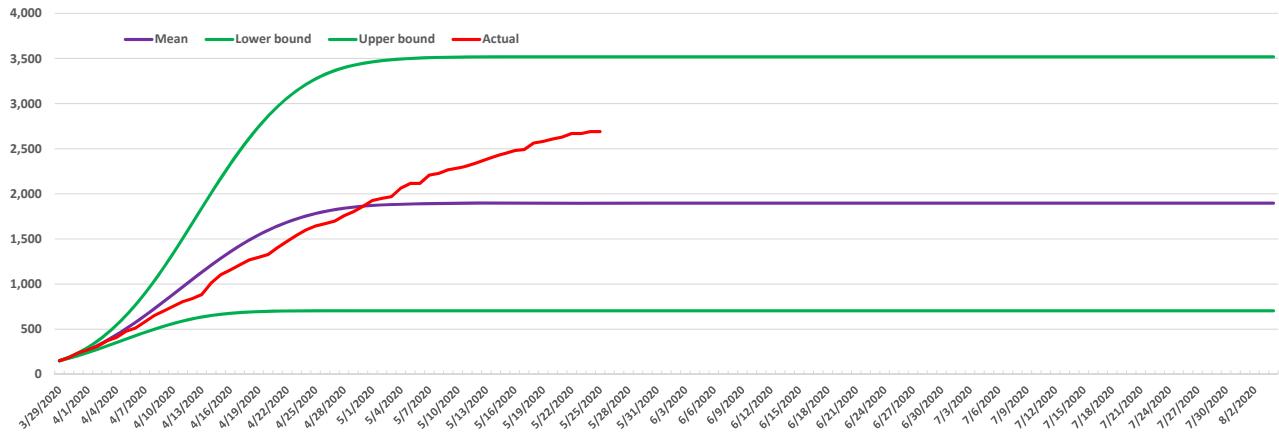
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Mississippi COVID 19 Daily Death Projections March 26



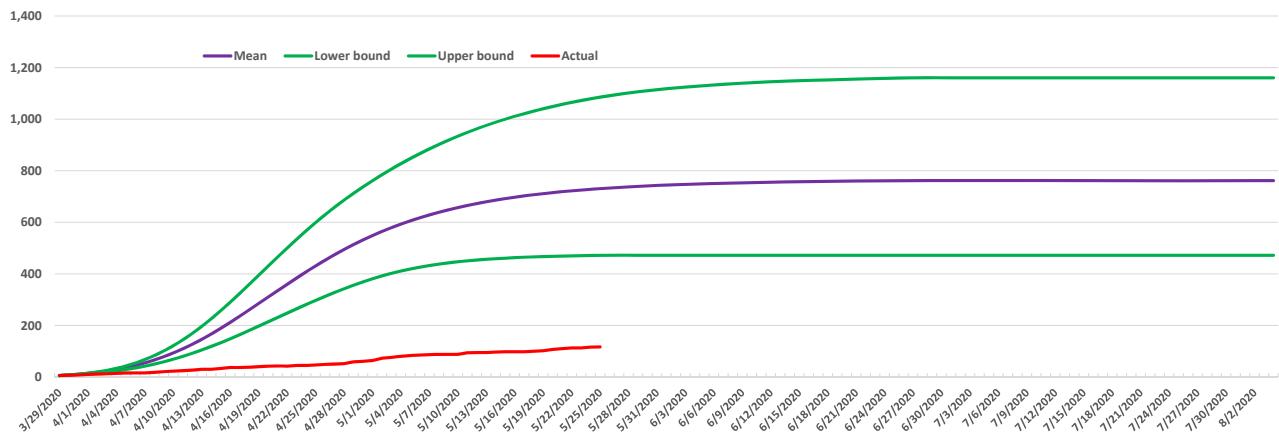
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Louisiana COVID 19 Daily Death Projections March 26



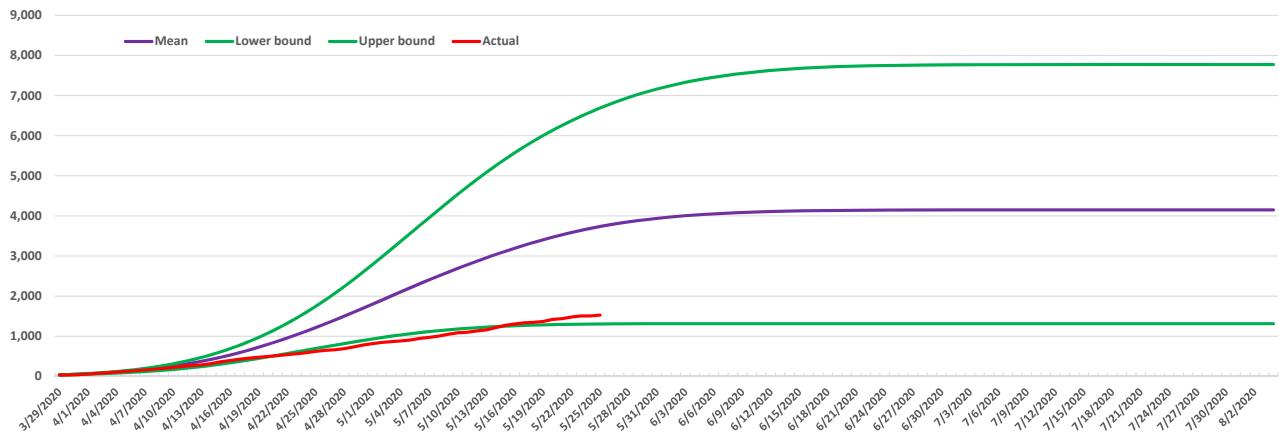
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Arkansas COVID 19 Cumulative Death Projections March 26



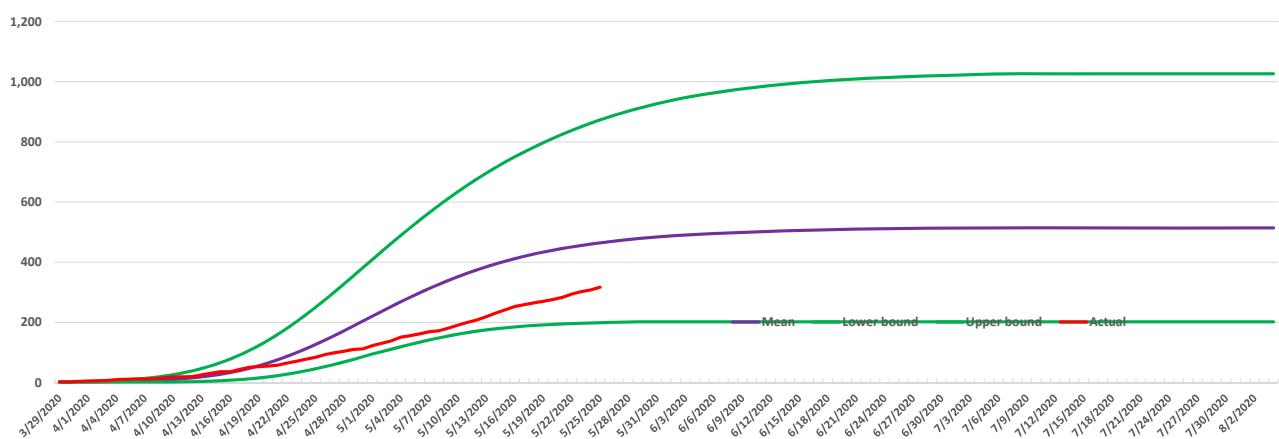
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Texas COVID 19 Daily Death Projections March 26



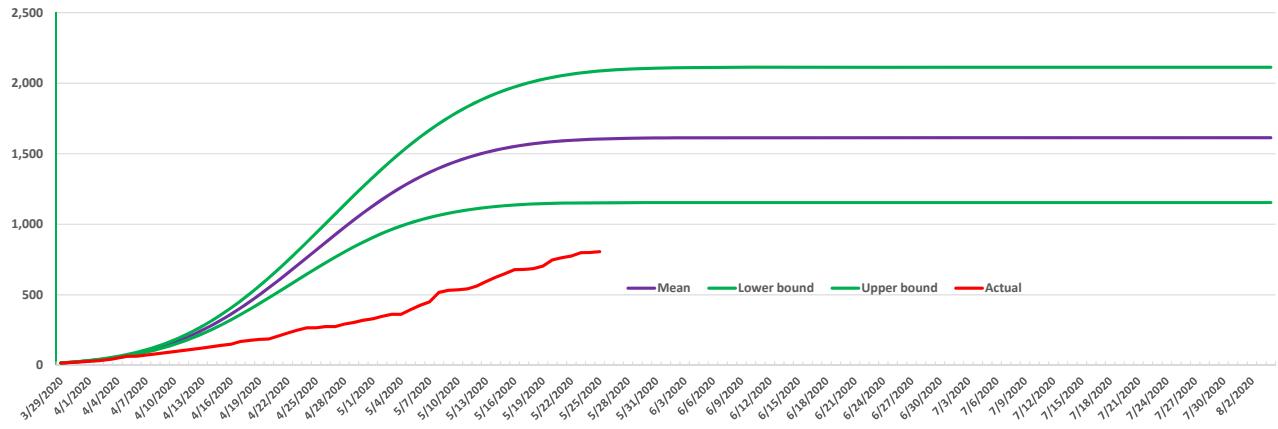
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New Mexico COVID 19 Daily Death Projections March 26



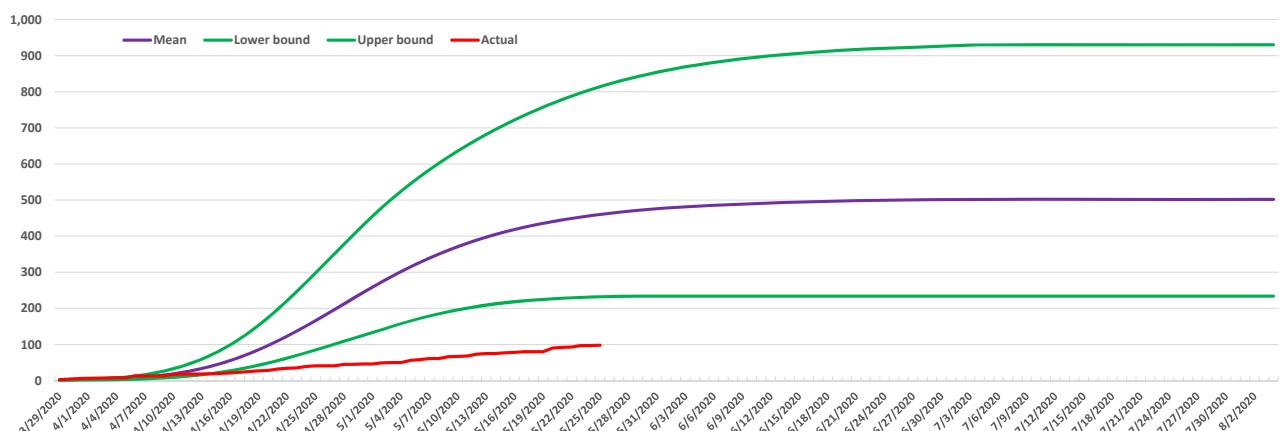
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Arizona COVID 19 Cumulative Death Projections



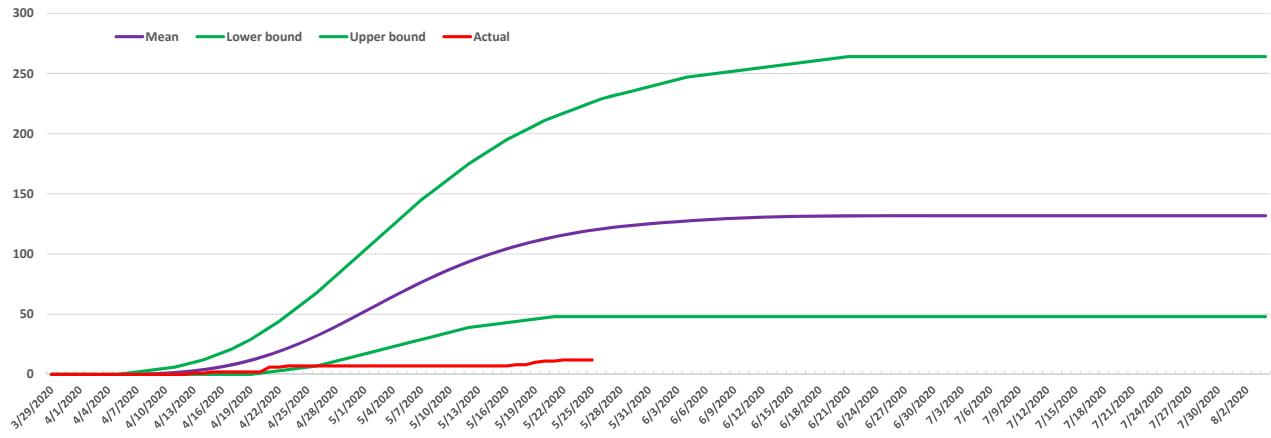
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Utah COVID 19 Daily Death Projections March 26



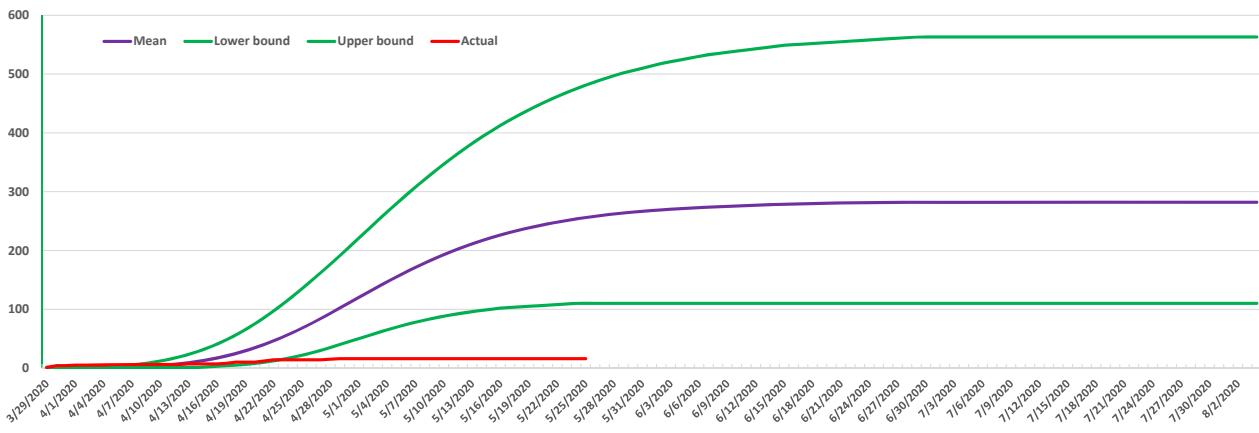
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Wyoming COVID 19 Cumulative Death Projections March 26



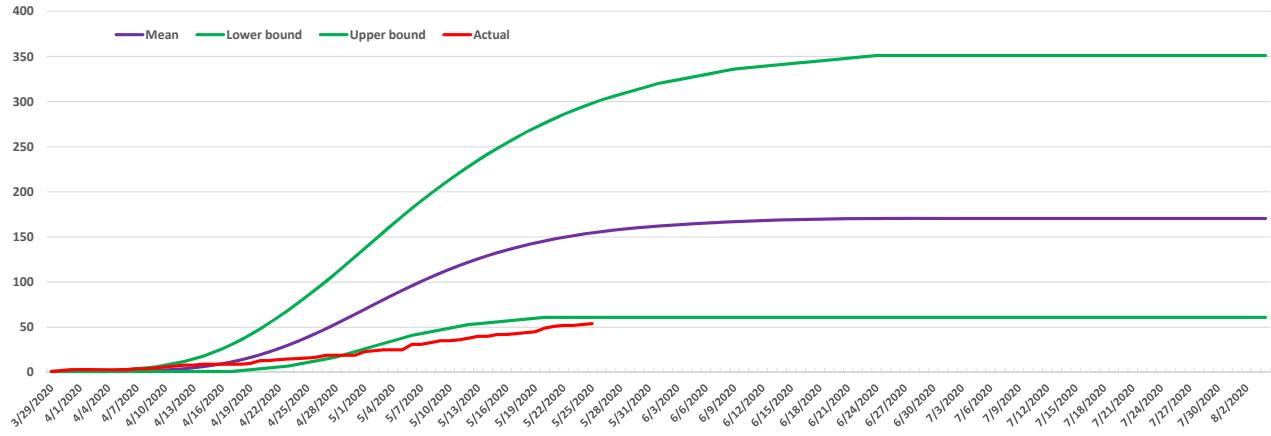
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Montana COVID 19 Cumulative Death Projections



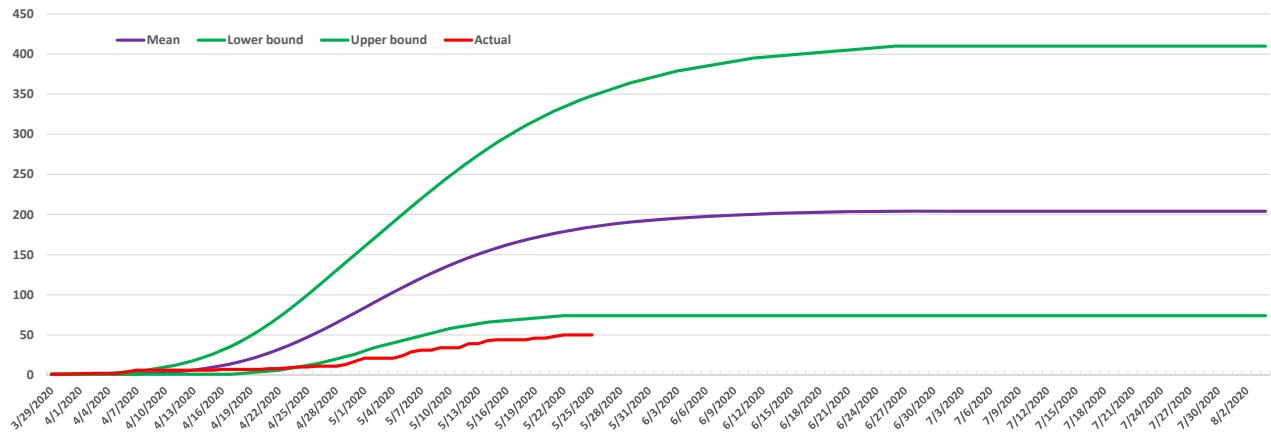
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North Dakota COVID 19 Cumulative Death Projections March 26



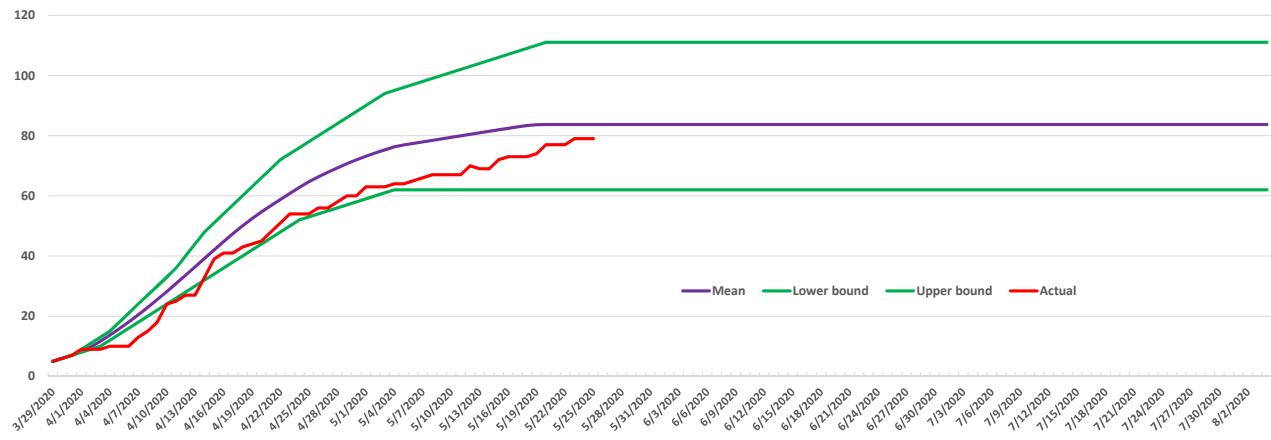
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South Dakota COVID 19 Daily Death Projections March 26



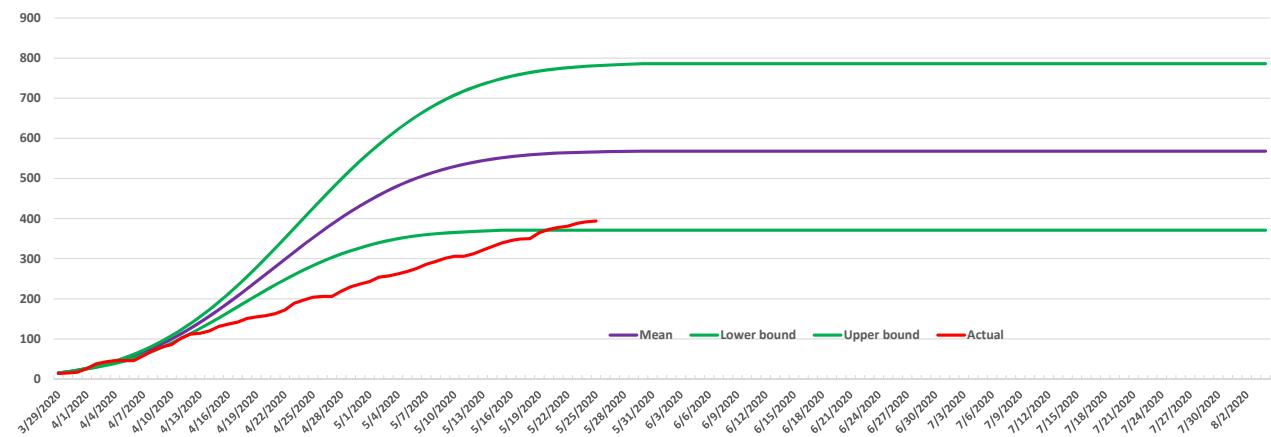
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Idaho COVID 19 Cumulative Death Projections March 26



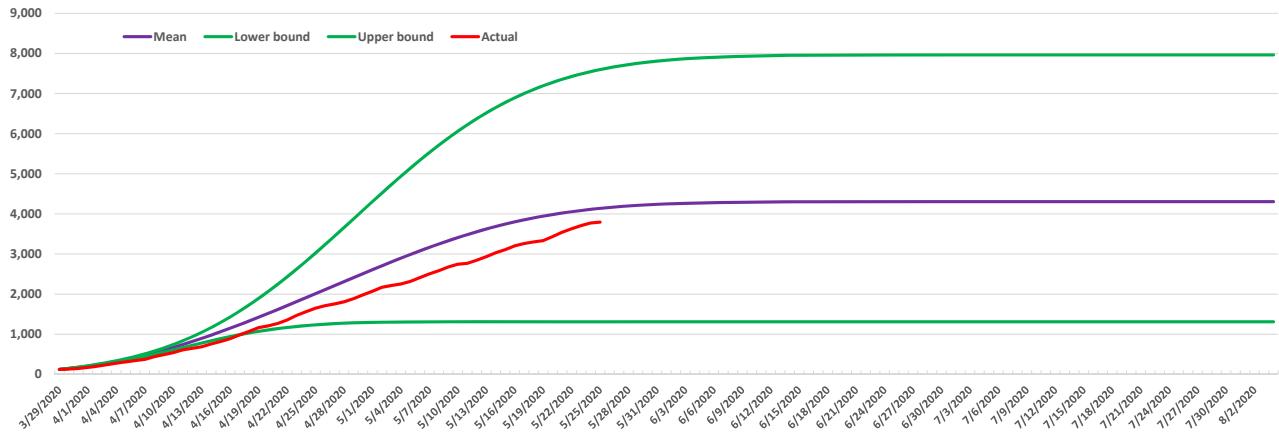
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Nevada COVID 19 Cumulative Death Projections



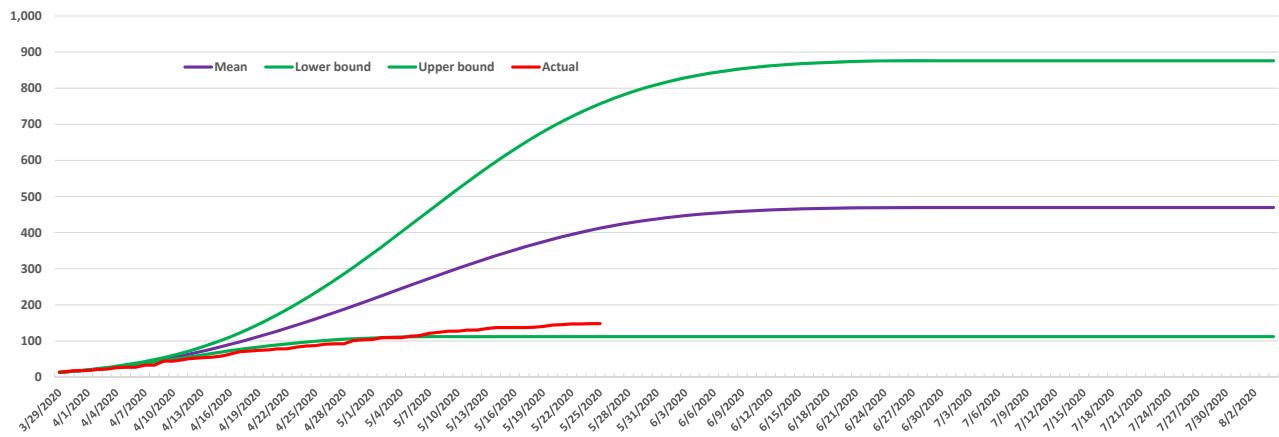
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California COVID 19 Cumulative Death Projections March 26



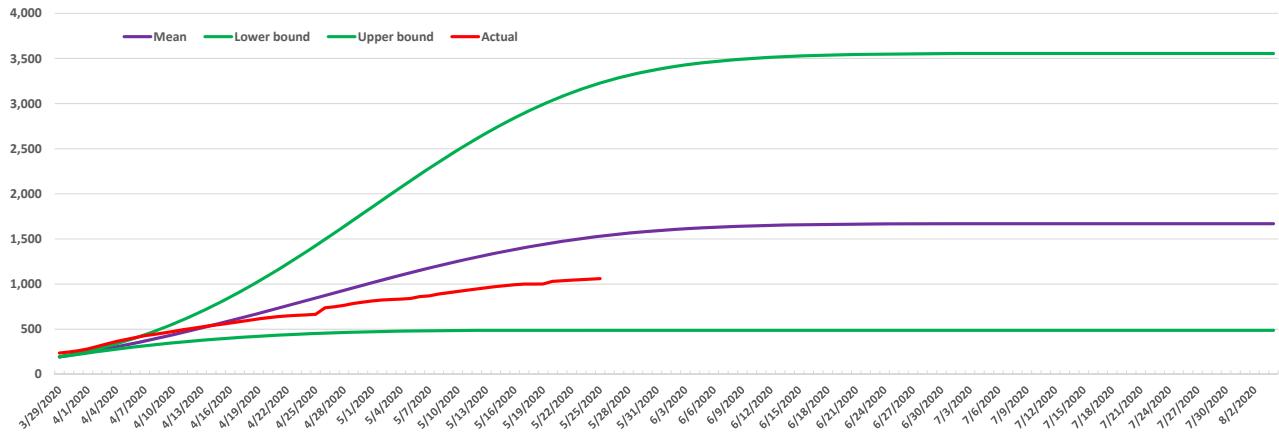
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Oregon COVID 19 Cumulative Death Projections March 26



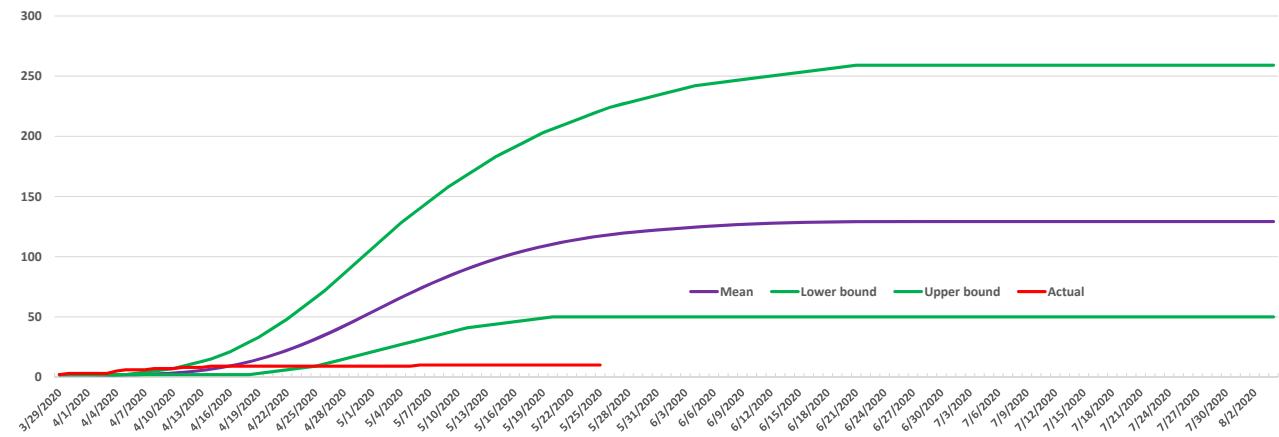
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Washington COVID 19 Cumulative Death Projections March 26



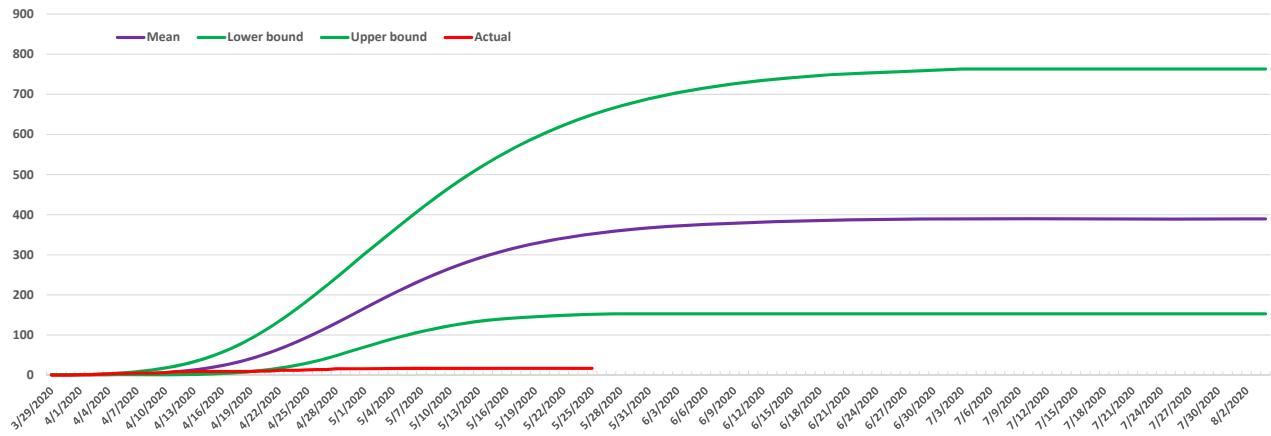
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Alaska COVID 19 Cumulative Death Projections March 26



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Hawaii COVID 19 Daily Death Projections March 26



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