COVID19 Time Series Analysis, Worldwide and U.S.

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Contents

Source data: 2019 Novel Coronavirus COVID-19 (2019-nCoV) Data Repository by Johns Hopkins CSSE; https://github.com/CSSEGISandData/COVID-19

Source code: https://github.com/opencedar/covid19

The visualizations in this document are heavily indebted to Edward Tufte and his use of sparklines—small, clutter-free time series lines—to show how many different panels or categories of data are changing through time; check out https://www.edwardtufte.com/bboard/q-and-a-fetch-msg?msg_id=0001OR.

Worldwide

Worldwide Summary

Sorted by total number of cases. Percent growth in total cases in the past seven days is last column.

Table 1: Worldwide Summary

Country_Region	days_100	conf	deaths	new_conf	conf_lag7	l7_rate
US	35	337072	9619	28222	140886	140%
Spain	35	131646	12641	5478	80110	64%
Italy	43	128948	15887	4316	97689	32%
Germany	36	100123	1584	4031	62095	60%
France	37	93773	8093	2925	40708	132%
China	75	82602	3333	59	82122	0%
Iran	40	58226	3603	2483	38309	52%
United Kingdom	26	48436	4943	5959	19780	144%

Country_Region	days_100	conf	deaths	new_conf	conf_lag7	l7_rate
Turkey	18	27069	574	3135	9217	192%
Switzerland	32	21100	715	595	14829	44%
Belgium	31	19691	1447	1260	10836	80%
Netherlands	31	17953	1771	1226	10930	64%
Canada	26	15756	259	2778	6280	152%
Austria	29	12051	204	270	8788	36%
Portugal	24	11278	295	754	5962	88%
Brazil	24	11130	486	770	4256	160%
Korea, South	46	10237	183	81	9583	8%
Israel	26	8430	49	579	4247	100%
Sweden	31	6830	401	387	3700	84%
Australia	27	5687	35	137	3984	44%
Norway	31	5687	71	137	4284	32%
Russia	20	5389	45	658	1534	252%
Ireland	23	4994	158	390	2615	92%
Czechia	24	4587	67	115	2817	64%
Denmark	27	4561	179	292	2564	76%
Chile	21	4471	34	310	2139	108%
Poland	23	4102	94	475	1862	120%
Romania	23	3864	151	251	1815	112%
Malaysia	28	3662	61	179	2470	48%
Ecuador	19	3646	180	181	1924	88%
India	23	3588	99	506	1024	252%
Philippines	23	3246	152	152	1418	128%
Pakistan	21	3157	47	339	1597	96%
Japan	45	3139	77	0	1866	68%
Luxembourg	20	2804	36	75	1950	44%
Saudi Arabia	23	2402	34	223	1299	84%
Peru	20	2281	83	535	852	168%
Indonesia	22	2273	198	181	1285	76%
Thailand	22	2169	23	102	1388	56%
Finland	24	1927	28	45	1240	56%
Serbia	18	1908	51	284	741	156%
Mexico	18	1890	79	202	848	124%
Panama	18	1801	46	128	901	100%
United Arab Emirates	19	1799	10	294	570	216%
Dominican Republic	16	1745	82	257	859	104%
Greece	24	1735	73	62	1156	52%
South Africa	19	1655	11	70	1280	28%
Qatar	26	1604	4	279	634	152%
Iceland	25	1486	4	69	1020	44%
Colombia	18	1485	35	79	702	112%
Argentina	17	1451	44	0	745	96%
Algeria	16	1320	152	69	511	160%
Singapore	37	1309	6	120	844	56%
Ukraine	12	1308	37	83	475	176%
Croatia	18	1182	15	56	713	64%
Egypt	23	1173	78	103	609	92%
Estonia	23	1097	15	58	679	60%
New Zealand	15	1039	1	89	514	104%
Morocco	15	1021	70	102	479	112%
World	26	1247995	68752	72995	706534	76%

Ln (Seven-Day-Moving-Average New Cases) Impact on Ln (New Cases)

In other words, elasticity. How does this elasticity change through time, from days since the 100th case?

An elasticity under 1 indicates that over a seven-day period, new cases are decreasing.

The black line shows the best curve fit for elasticity changing over time. All countries generally are moving to cap the rate of exponential growth. Countries above the line are doing worse than average, and those below the line are doing better than average. A rate below 1 indicates that new cases are declining over an average 7-day period.

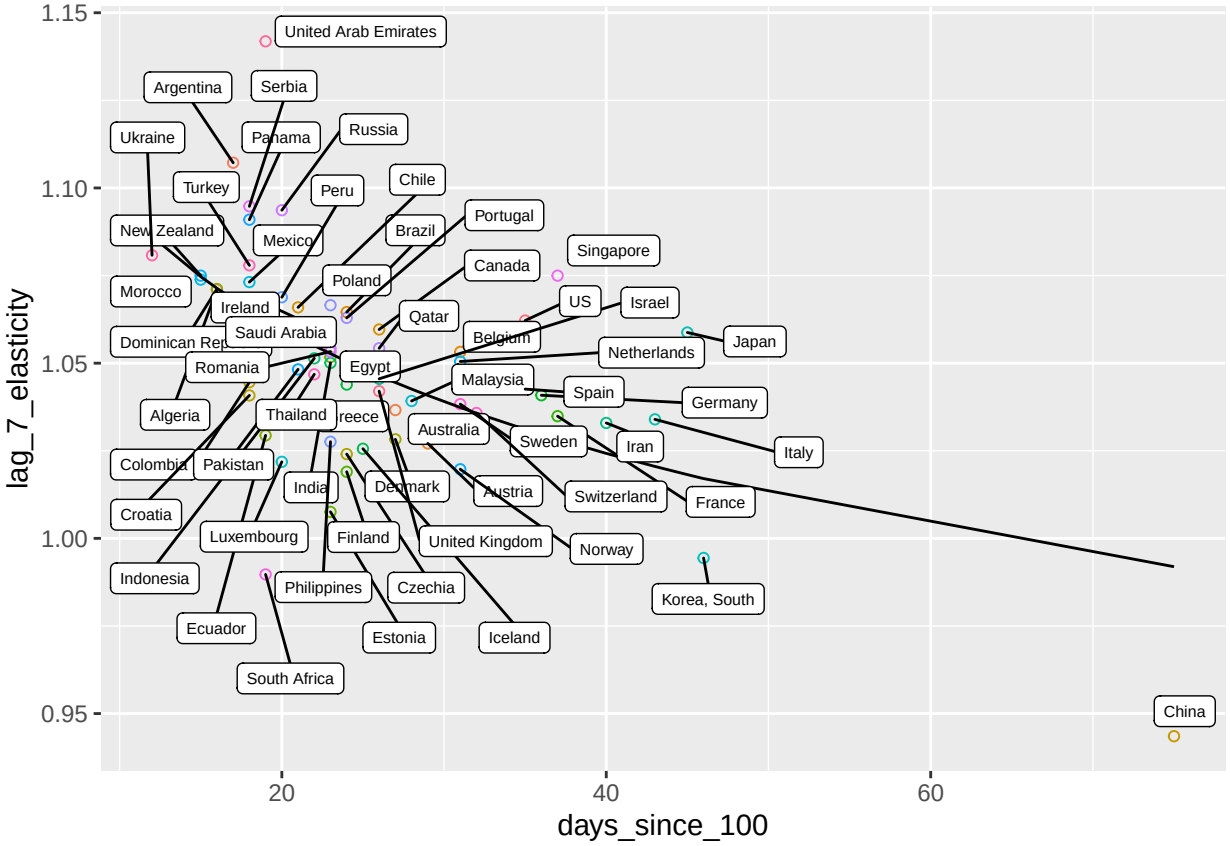


Table 2: Countries by Predicted vs. Actual Lag 7 New Case Elasticity on Today's Cases

country	days_since_100	lag_7_elasticity	prediction	residual
Ukraine	12	1.08	1.09	-0.01
Morocco	15	1.07	1.07	0.00
New Zealand	15	1.07	1.07	0.00
Algeria	16	1.07	1.07	0.00
Dominican Republic	16	1.07	1.07	0.00
Argentina	17	1.11	1.07	0.04
Croatia	18	1.04	1.07	-0.02
Colombia	18	1.04	1.07	-0.02
Mexico	18	1.07	1.07	0.01
Turkey	18	1.08	1.07	0.01
Panama	18	1.09	1.07	0.03
Serbia	18	1.09	1.07	0.03
South Africa	19	0.99	1.06	-0.07

country	days_since_100	lag_7_elasticity	prediction	residual
Ecuador	19	1.03	1.06	-0.03
United Arab Emirates	19	1.14	1.06	0.08
Luxembourg	20	1.02	1.06	-0.04
Peru	20	1.07	1.06	0.01
Russia	20	1.09	1.06	0.03
Pakistan	21	1.05	1.06	-0.01
Chile	21	1.07	1.06	0.01
Thailand	22	1.05	1.06	-0.01
Indonesia	22	1.05	1.06	0.00
Estonia	23	1.01	1.05	-0.05
Philippines	23	1.03	1.05	-0.03
India	23	1.05	1.05	0.00
Egypt	23	1.05	1.05	0.00
Romania	23	1.05	1.05	0.00
Saudi Arabia	23	1.05	1.05	0.00
Ireland	23	1.06	1.05	0.01
Poland	23	1.07	1.05	0.01
Finland	24	1.02	1.05	-0.03
Czechia	24	1.02	1.05	-0.03
Greece	24	1.04	1.05	-0.01
Portugal	24	1.06	1.05	0.01
Brazil	24	1.06	1.05	0.01
Iceland	25	1.03	1.05	-0.02
United Kingdom	26	1.04	1.05	0.00
Israel	26	1.05	1.05	0.00
Qatar	26	1.05	1.05	0.01
Canada	26	1.06	1.05	0.01
Denmark	27	1.03	1.04	-0.02
Australia	27	1.04	1.04	-0.01
Malaysia	28	1.04	1.04	0.00
Austria	29	1.03	1.04	-0.01
Norway	31	1.02	1.04	-0.02
Sweden	31	1.04	1.04	0.00
Netherlands	31	1.05	1.04	0.01
Belgium	31	1.05	1.04	0.02
Switzerland	32	1.04	1.04	0.00
Spain	35	1.04	1.03	0.01
US	35	1.06	1.03	0.03
Germany	36	1.04	1.03	0.01
France	37	1.03	1.03	0.01
Singapore	37	1.07	1.03	0.05
Iran	40	1.03	1.02	0.01
Italy	43	1.03	1.02	0.01
Japan	45	1.06	1.02	0.04
Korea, South	46	0.99	1.02	-0.02
China	75	0.94	0.99	-0.05

Comparisons with averages

Table 3: Countries by Predicted vs. Actual Lag 7 New Case Elasticity on Today's Cases

country	days_since_100	lag_7_elasticity	prediction	ww_residual
Ukraine	12	1.08	1.09	-0.01
Morocco	15	1.07	1.07	0.00
New Zealand	15	1.07	1.07	0.00
Algeria	16	1.07	1.07	0.00
Dominican Republic	16	1.07	1.07	0.00
Argentina	17	1.11	1.07	0.04
Croatia	18	1.04	1.07	-0.02
Colombia	18	1.04	1.07	-0.02
Mexico	18	1.07	1.07	0.01
Turkey	18	1.08	1.07	0.01
Panama	18	1.09	1.07	0.03
Serbia	18	1.09	1.07	0.03
South Africa	19	0.99	1.06	-0.07
Ecuador	19	1.03	1.06	-0.03
United Arab Emirates	19	1.14	1.06	0.08
Luxembourg	20	1.02	1.06	-0.04
Peru	20	1.07	1.06	0.01
Russia	20	1.09	1.06	0.03
Pakistan	21	1.05	1.06	-0.01
Chile	21	1.07	1.06	0.01
Thailand	22	1.05	1.06	-0.01
Indonesia	22	1.05	1.06	0.00
Estonia	23	1.01	1.05	-0.05
Philippines	23	1.03	1.05	-0.03
India	23	1.05	1.05	0.00
Egypt	23	1.05	1.05	0.00
Romania	23	1.05	1.05	0.00
Saudi Arabia	23	1.05	1.05	0.00
Ireland	23	1.06	1.05	0.01
Poland	23	1.07	1.05	0.01
Finland	24	1.02	1.05	-0.03
Czechia	24	1.02	1.05	-0.03
Greece	24	1.04	1.05	-0.01
Portugal	24	1.06	1.05	0.01
Brazil	24	1.06	1.05	0.01
Iceland	25	1.03	1.05	-0.02
United Kingdom	26	1.04	1.05	0.00
Israel	26	1.05	1.05	0.00
Qatar	26	1.05	1.05	0.01
Canada	26	1.06	1.05	0.01
Denmark	27	1.03	1.04	-0.02
Australia	27	1.04	1.04	-0.01
Malaysia	28	1.04	1.04	0.00
Austria	29	1.03	1.04	-0.01
Norway	31	1.02	1.04	-0.02
Sweden	31	1.04	1.04	0.00
Netherlands	31	1.05	1.04	0.01
Belgium	31	1.05	1.04	0.02
Switzerland	32	1.04	1.04	0.00

country	days_since_100	lag_7_elasticity	prediction	ww_residual
Spain	35	1.04	1.03	0.01
US	35	1.06	1.03	0.03
Germany	36	1.04	1.03	0.01
France	37	1.03	1.03	0.01
Singapore	37	1.07	1.03	0.05
Iran	40	1.03	1.02	0.01
Italy	43	1.03	1.02	0.01
Japan	45	1.06	1.02	0.04
Korea, South	46	0.99	1.02	-0.02
China	75	0.94	0.99	-0.05

Forecast New Cases by Country

We estimate new cases by date, to see when countries will peak, based on the worldwide curve fit.

Table 4: Forecast Peak New Cases by Country

country	total_cases	peak_new_cases	date	population	perc_pop_infected
China	83,035	15,133	2020-02-13	1,378,665,000	0.0%
Italy	260,009	6,557	2020-03-21	60,600,590	0.4%
Thailand	7,363	188	2020-03-22	68,863,514	0.0%
Switzerland	46,910	1,321	2020-03-23	8,372,098	0.6%
Luxembourg	5,698	234	2020-03-25	582,972	1.0%
Spain	363,451	9,630	2020-03-25	46,443,959	0.8%
Austria	22,344	1,321	2020-03-26	8,747,358	0.3%
Estonia	2,820	134	2020-03-26	1,316,481	0.2%
Malaysia	11,133	235	2020-03-26	31,187,265	0.0%
Germany	291,618	6,933	2020-03-27	82,667,685	0.4%
Norway	10,891	386	2020-03-27	5,232,929	0.2%
South Africa	2,901	243	2020-03-27	55,908,865	0.0%
Australia	13,856	497	2020-03-28	24,127,159	0.1%
Belgium	92,946	1,850	2020-03-28	11,348,159	0.8%
Philippines	9,904	538	2020-03-31	103,320,222	0.0%
Colombia	6,072	159	2020-04-01	48,653,419	0.0%
Croatia	3,797	96	2020-04-01	4,170,600	0.1%
Ecuador	10,019	508	2020-04-01	16,385,068	0.1%
India	23,038	601	2020-04-01	1,324,171,354	0.0%
Greece	5,703	129	2020-04-02	10,746,740	0.1%
Iceland	3,590	99	2020-04-02	334,252	1.1%
Israel	32,542	765	2020-04-02	8,547,100	0.4%
Sweden	23,716	621	2020-04-02	9,903,122	0.2%
Algeria	10,557	185	2020-04-03	40,606,052	0.0%
Denmark	13,085	373	2020-04-03	5,731,118	0.2%
Indonesia	10,202	196	2020-04-03	261,115,456	0.0%
Romania	21,057	445	2020-04-03	19,705,301	0.1%
Finland	4,923	267	2020-04-04	5,495,096	0.1%
France	322,872	25,646	2020-04-04	66,896,109	0.5%
Japan	31,186	522	2020-04-04	126,994,511	0.0%
Morocco	8,253	128	2020-04-04	35,276,786	0.0%
Canada	121,989	2,778	2020-04-05	36,286,425	0.3%
Dominican Republic	12,262	257	2020-04-05	10,648,791	0.1%
Pakistan	14,100	339	2020-04-05	193,203,476	0.0%

country	total_cases	peak_new_cases	date	population	perc_pop_infected
Peru	24,425	535	2020-04-05	31,773,839	0.1%
Qatar	12,222	279	2020-04-05	2,569,804	0.5%
Saudi Arabia	12,320	223	2020-04-05	32,275,687	0.0%
United Kingdom	188,127	5,959	2020-04-05	65,637,239	0.3%
Netherlands	73,301	1,264	2020-04-15	17,018,408	0.4%
Ireland	26,359	460	2020-04-16	4,773,095	0.6%
Portugal	67,225	1,177	2020-04-21	10,324,611	0.7%
Ukraine	12,028	201	2020-04-21	45,004,645	0.0%
Chile	32,571	535	2020-04-23	17,909,754	0.2%
New Zealand	7,844	116	2020-04-23	4,692,700	0.2%
Brazil	106,763	1,851	2020-04-25	207,652,865	0.1%
Mexico	17,572	268	2020-04-25	127,540,423	0.0%
Poland	37,523	595	2020-04-25	37,948,016	0.1%
US	3,475,049	71,979	2020-04-27	323,127,513	1.1%
Turkey	386,326	7,727	2020-04-28	79,512,426	0.5%
Panama	30,778	438	2020-05-08	4,034,119	0.8%
Serbia	58,586	876	2020-05-13	7,057,412	0.8%
United Arab Emirates	879,963	31,287	2020-05-15	9,269,612	9.5%
Singapore	20,412	214	2020-05-20	5,607,283	0.4%
Argentina	68,368	852	2020-05-31	43,847,430	0.2%

Forecast New Cases WW Total

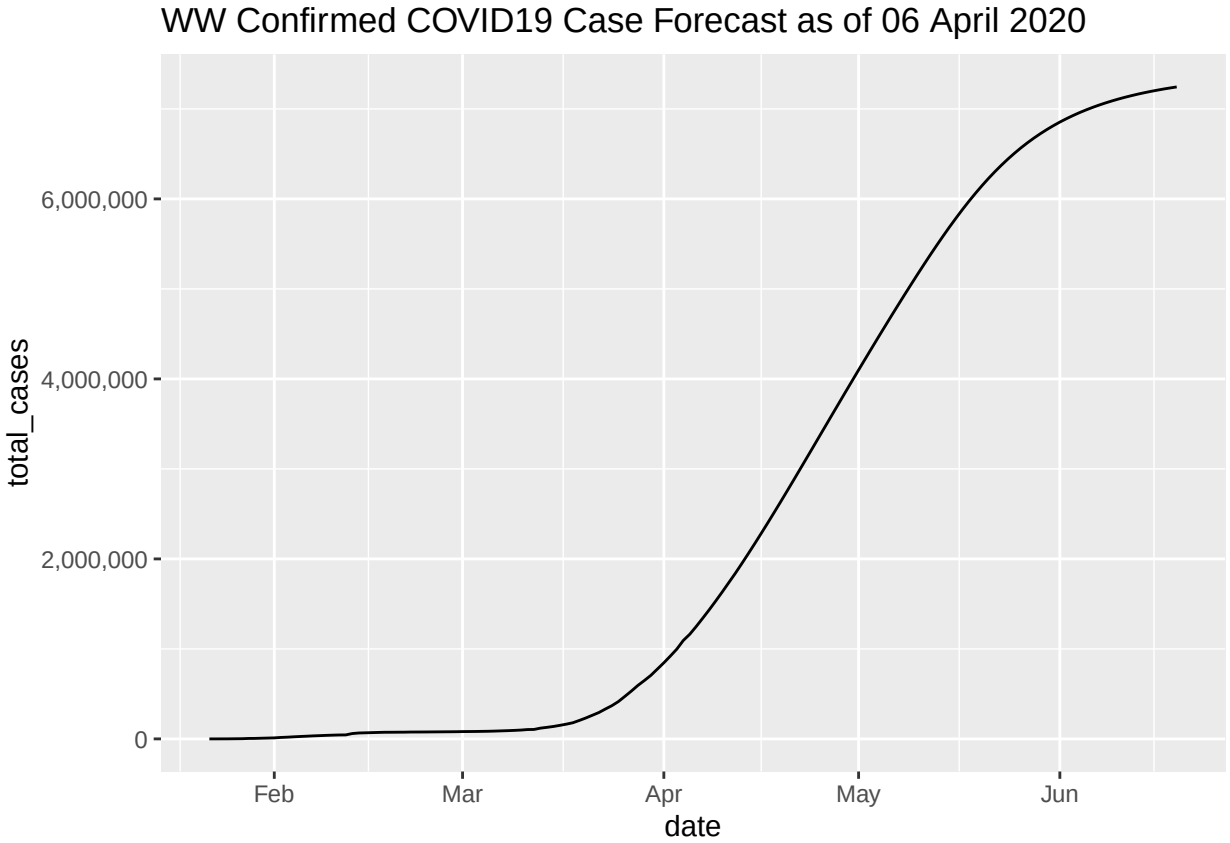
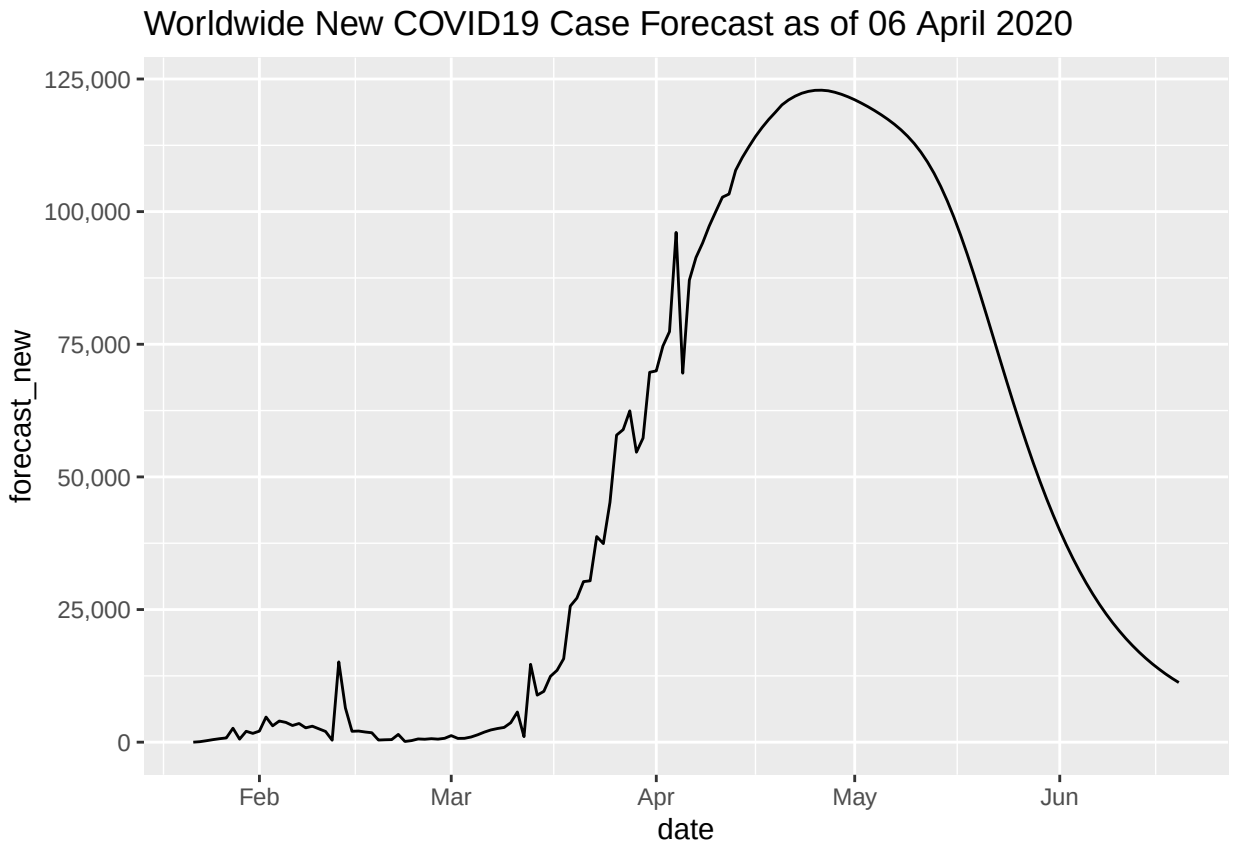


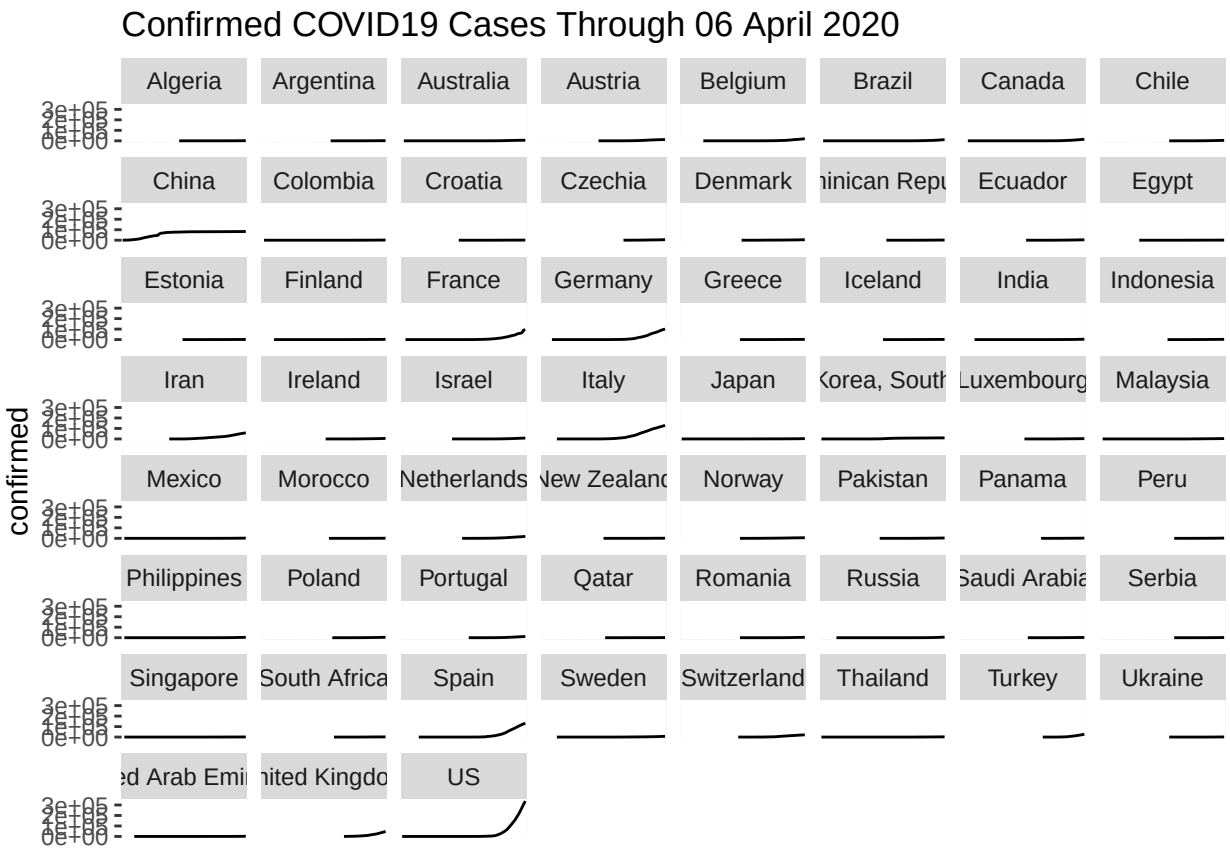
Table 5: Peak Daily New Cases Worldwide and Total on That Day

date	forecast_new	total_cases
2020-04-26	122,889	3,489,098



Sparklines

Confirmed Cases

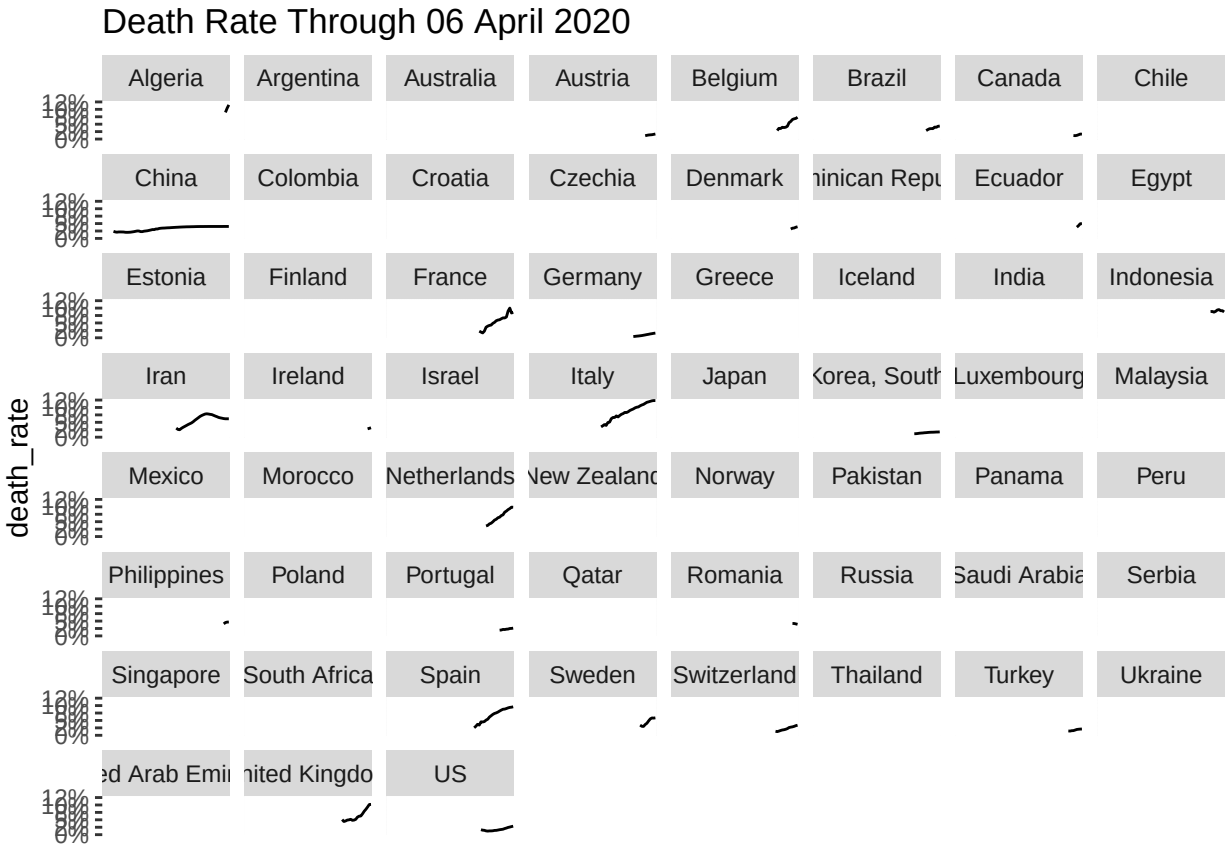


Deaths


Cumulative COVID19 Deaths Through 06 April 2020
deaths
Algeria
Argentina
Australia
Austria
Belgium
Brazil
Canada
Chile
China
Colombia
Croatia
Czechia
Denmark
Ecuador
Egypt
Estonia
Finland
France
Germany
Greece
Iceland
India
Indonesia
Iran
Ireland
Israel
Italy
Japan
Luxembourg
Malaysia
Mexico
Morocco
Netherlands
Norway
Pakistan
Panama
Peru
Philippines
Poland
Portugal
Qatar
Romania
Russia
Serbia
Singapore
South Africa
Spain
Sweden
Switzerland
Thailand
Turkey
Ukraine
US
0
5000
10000
15000

Confirmed Growth Rate 5-Day Moving Average

Death Rate



U.S. Analysis

State Summary

Sorted by total number of cases. Percent growth in total cases in the past seven days is last column.

Table 6: State-by-State Summary

Province_State	days_100	conf	deaths	new_conf	conf_lag7	l7_rate	death_rate
New York	29	123160	4159	9327	59648	106%	3.38%
New Jersey	21	37505	917	3381	13386	180%	2.45%
Michigan	18	15718	617	1493	5488	186%	3.93%
California	28	15034	348	2197	5852	157%	2.31%
Louisiana	21	13010	477	514	3540	268%	3.67%
Massachusetts	25	12500	231	764	4955	152%	1.85%
Florida	22	12350	221	805	4246	191%	1.79%
Pennsylvania	20	11589	151	1145	3432	238%	1.30%
Illinois	21	11259	274	902	4596	145%	2.43%
Washington	30	7825	336	578	4465	75%	4.29%
Texas	20	7209	136	653	2792	158%	1.89%
Georgia	21	6647	211	487	2651	151%	3.17%
Connecticut	18	5675	189	399	1993	185%	3.33%
Colorado	23	4950	140	762	2307	115%	2.83%
Indiana	16	4411	127	458	1513	192%	2.88%

Province_State	days_100	conf	deaths	new_conf	conf_lag7	l7_rate	death_rate
Ohio	18	4043	119	304	1653	145%	2.94%
Tennessee	18	3633	53	311	1720	111%	1.46%
Maryland	18	3617	67	492	1239	192%	1.85%
North Carolina	18	2649	38	163	1191	122%	1.43%
Virginia	17	2640	52	233	890	197%	1.97%
Arizona	16	2486	64	299	919	171%	2.57%
Missouri	14	2347	44	37	915	157%	1.87%
Wisconsin	18	2320	74	290	1164	99%	3.19%
South Carolina	17	2049	44	132	774	165%	2.15%
Nevada	17	1855	46	113	920	102%	2.48%
Alabama	16	1765	45	151	825	114%	2.55%
Mississippi	16	1638	43	183	759	116%	2.63%
Utah	16	1608	8	173	720	123%	0.50%
Oklahoma	13	1254	46	93	429	192%	3.67%
Idaho	11	1078	10	56	281	284%	0.93%
Oregon	17	1068	27	169	548	95%	2.53%
District of Columbia	15	1002	22	100	342	193%	2.20%
Kentucky	15	955	45	38	438	118%	4.71%
Minnesota	17	935	29	70	503	86%	3.10%
Rhode Island	14	922	25	116	294	214%	2.71%
Iowa	14	869	18	82	336	159%	2.07%
Arkansas	16	837	16	94	426	96%	1.91%
Kansas	13	751	22	53	330	128%	2.93%
Delaware	13	673	14	80	232	190%	2.08%
New Mexico	13	670	12	136	237	183%	1.79%
New Hampshire	14	621	9	81	214	190%	1.45%
Vermont	12	512	22	51	235	118%	4.30%
Puerto Rico	9	475	20	23	127	274%	4.21%
Maine	14	470	10	14	253	86%	2.13%
Hawaii	10	371	4	20	149	149%	1.08%
Nebraska	8	364	8	43	108	237%	2.20%
West Virginia	8	324	3	42	113	187%	0.93%
Montana	10	286	6	21	154	86%	2.10%
South Dakota	7	240	2	28	90	167%	0.83%
North Dakota	7	207	3	21	98	111%	1.45%
Wyoming	6	197	0	10	86	129%	0.00%
Alaska	8	185	6	14	102	81%	3.24%
Guam	1	112	4	19	56	100%	3.57%
US	16	336870	9614	28220	140734	139%	2.85%

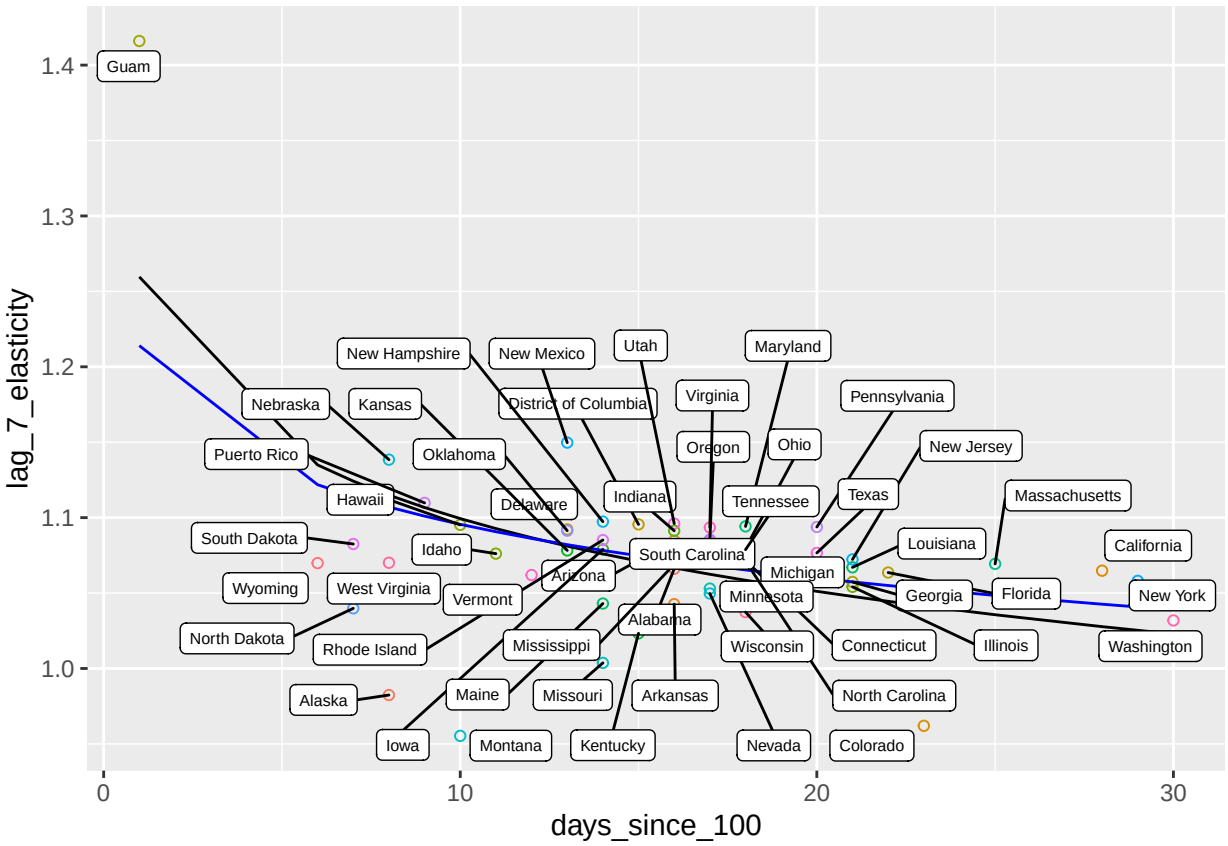
Ln (Seven-Day-Moving-Average New Cases) Impact on Ln (New Cases)

In other words, elasticity. How does this elasticity change through time, from days since the 50th case?

An elasticity under 1 indicates that over a seven-day period, new cases are decreasing.

The black line is the best fit for elasticity for the states that have had 100 cases as they progress. Above the line: worse than average; below-the-line: better than average.

The blue line is the best fit for elasticity for countries across the world. It's apparent that the U.S. is not doing as well as the rest of the world in containing exponential growth–probably due to initial testing failures.



Comparisons with U.S. and worldwide averages

Some states are doing better than worldwide averages when taking into account days since 100th case. Most are doing worse.

Table 7: States by Predicted vs. Actual Lag 7 New Case Elasticity on Today's Cases

state	days_since_100	lag_7_elasticity	prediction_us	prediction_ww	us_residual	ww_residual
Guam	1	1.42	1.26	1.21	0.16	0.20
Wyoming	6	1.07	1.13	1.12	-0.07	-0.05
North Dakota	7	1.04	1.12	1.11	-0.08	-0.07
South Dakota	7	1.08	1.12	1.11	-0.04	-0.03
Alaska	8	0.98	1.11	1.11	-0.13	-0.12
West Virginia	8	1.07	1.11	1.11	-0.04	-0.04
Nebraska	8	1.14	1.11	1.11	0.02	0.03
Puerto Rico	9	1.11	1.11	1.10	0.00	0.01
Montana	10	0.96	1.10	1.10	-0.14	-0.14
Hawaii	10	1.10	1.10	1.10	0.00	0.00
Idaho	11	1.08	1.09	1.09	-0.02	-0.01
Vermont	12	1.06	1.09	1.09	-0.02	-0.02
Kansas	13	1.08	1.08	1.08	0.00	0.00
Oklahoma	13	1.09	1.08	1.08	0.01	0.01
Delaware	13	1.09	1.08	1.08	0.01	0.01
New Mexico	13	1.15	1.08	1.08	0.07	0.07
Missouri	14	1.00	1.08	1.08	-0.07	-0.07
Maine	14	1.04	1.08	1.08	-0.03	-0.04

state	days_since_100	lag_7_elasticity	prediction_us	prediction_ww	us_residual	ww_residual
Iowa	14	1.08	1.08	1.08	0.00	0.00
Rhode Island	14	1.09	1.08	1.08	0.01	0.01
New Hampshire	14	1.10	1.08	1.08	0.02	0.02
Kentucky	15	1.02	1.07	1.07	-0.05	-0.05
District of Columbia	15	1.10	1.07	1.07	0.02	0.02
Arkansas	16	1.04	1.07	1.07	-0.02	-0.03
Alabama	16	1.07	1.07	1.07	0.00	-0.01
Mississippi	16	1.07	1.07	1.07	0.00	0.00
Arizona	16	1.08	1.07	1.07	0.02	0.01
Indiana	16	1.09	1.07	1.07	0.02	0.02
Utah	16	1.10	1.07	1.07	0.03	0.02
Nevada	17	1.05	1.06	1.07	-0.01	-0.02
Minnesota	17	1.05	1.06	1.07	-0.01	-0.02
South Carolina	17	1.08	1.06	1.07	0.02	0.02
Oregon	17	1.09	1.06	1.07	0.02	0.02
Virginia	17	1.09	1.06	1.07	0.03	0.03
Wisconsin	18	1.04	1.06	1.07	-0.02	-0.03
North Carolina	18	1.07	1.06	1.07	0.01	0.01
Connecticut	18	1.07	1.06	1.07	0.01	0.01
Michigan	18	1.08	1.06	1.07	0.02	0.01
Tennessee	18	1.08	1.06	1.07	0.02	0.01
Ohio	18	1.08	1.06	1.07	0.02	0.01
Maryland	18	1.09	1.06	1.07	0.04	0.03
Texas	20	1.08	1.05	1.06	0.03	0.02
Pennsylvania	20	1.09	1.05	1.06	0.04	0.03
Illinois	21	1.05	1.05	1.06	0.01	0.00
Georgia	21	1.06	1.05	1.06	0.01	0.00
Louisiana	21	1.07	1.05	1.06	0.02	0.01
New Jersey	21	1.07	1.05	1.06	0.02	0.01
Florida	22	1.06	1.04	1.06	0.02	0.01
Colorado	23	0.96	1.04	1.05	-0.08	-0.09
Massachusetts	25	1.07	1.04	1.05	0.03	0.02
California	28	1.06	1.03	1.04	0.04	0.02
New York	29	1.06	1.03	1.04	0.03	0.02
Washington	30	1.03	1.02	1.04	0.01	-0.01

Forecast New Cases by State

We estimate new cases by date, to see when states will peak, based on the worldwide curve fit. The reasoning is that testing rates increasing wildly recently in the U.S. have falsely inflated elasticity.

Table 8: Forecast Peak New Cases by State

State	Peak Cases	Peak Deaths	Max Case Date	Max Death Date	Population
Alaska	17	1	2020-03-29	2020-04-01	735,132
Nevada	294	12	2020-03-29	2020-04-01	2,790,136
Georgia	1,121	45	2020-03-31	2020-04-03	9,992,167
Kentucky	149	6	2020-03-31	2020-04-03	4,395,295
Idaho	210	8	2020-04-02	2020-04-05	1,612,136
Maine	73	3	2020-04-02	2020-04-05	1,328,302
Montana	33	1	2020-04-02	2020-04-05	1,015,165
Washington	781	31	2020-04-02	2020-04-05	6,971,406

State	Peak Cases	Peak Deaths	Max Case Date	Max Death Date	Population
Alabama	262	10	2020-04-03	2020-04-06	4,833,722
Minnesota	77	3	2020-04-04	2020-04-07	5,420,380
Missouri	446	18	2020-04-04	2020-04-07	6,044,171
Vermont	72	3	2020-04-04	2020-04-07	626,630
West Virginia	45	2	2020-04-04	2020-04-07	1,854,304
Arkansas	94	4	2020-04-05	2020-04-08	2,959,373
Colorado	762	30	2020-04-05	2020-04-08	5,268,367
Wisconsin	290	12	2020-04-05	2020-04-08	5,742,713
New York	15,869	635	2020-04-17	2020-04-20	19,651,127
Illinois	1,599	64	2020-04-20	2020-04-23	12,882,135
New Jersey	8,832	353	2020-04-21	2020-04-24	8,899,339
Louisiana	2,939	118	2020-04-22	2020-04-25	4,625,470
Mississippi	242	10	2020-04-25	2020-04-28	2,991,207
Connecticut	1,173	47	2020-04-26	2020-04-29	3,596,080
Kansas	115	5	2020-04-26	2020-04-29	2,893,957
Florida	2,709	108	2020-04-28	2020-05-01	19,552,860
Michigan	4,908	196	2020-04-28	2020-05-01	9,895,622
Iowa	159	6	2020-04-29	2020-05-02	3,090,416
Massachusetts	3,192	128	2020-04-29	2020-05-02	6,692,824
Hawaii	71	3	2020-05-02	2020-05-05	1,404,054
North Carolina	500	20	2020-05-02	2020-05-05	9,848,060
Rhode Island	220	9	2020-05-03	2020-05-06	1,051,511
Delaware	209	8	2020-05-05	2020-05-08	925,749
District of Columbia	367	15	2020-05-06	2020-05-09	646,449
California	4,796	192	2020-05-07	2020-05-10	38,332,521
Pennsylvania	14,026	561	2020-05-07	2020-05-10	12,773,801
Tennessee	849	34	2020-05-07	2020-05-10	6,495,978
Arizona	905	36	2020-05-08	2020-05-11	6,626,624
Ohio	1,363	55	2020-05-08	2020-05-11	11,570,808
Oklahoma	442	18	2020-05-08	2020-05-11	3,850,568
Indiana	2,654	106	2020-05-09	2020-05-12	6,570,902
Texas	2,924	117	2020-05-09	2020-05-12	26,448,193
South Carolina	698	28	2020-05-10	2020-05-13	4,774,839
Maryland	3,225	129	2020-05-13	2020-05-16	5,928,814
Oregon	268	11	2020-05-13	2020-05-16	3,930,065
New Hampshire	246	10	2020-05-14	2020-05-17	1,323,459
Utah	893	36	2020-05-15	2020-05-18	2,900,872
New Mexico	6,724	269	2020-05-17	2020-05-20	2,085,287
Virginia	2,169	87	2020-05-17	2020-05-20	8,260,405
Nebraska	570	23	2020-05-30	2020-06-02	1,868,516

Table 9: Forecast Total New Cases by State

State	Total Cases	Total Deaths	Population	% Population Infected
Alaska	571	23	735,132	0.1%
Nevada	9,511	380	2,790,136	0.3%
Georgia	51,267	2,050	9,992,167	0.5%
Kentucky	3,301	132	4,395,295	0.1%
Idaho	10,775	431	1,612,136	0.7%
Maine	2,132	85	1,328,302	0.2%
Montana	688	27	1,015,165	0.1%

State	Total Cases	Total Deaths	Population	% Population Infected
Washington	27,389	1,095	6,971,406	0.4%
Alabama	15,567	622	4,833,722	0.3%
Minnesota	5,097	204	5,420,380	0.1%
Missouri	5,887	235	6,044,171	0.1%
Vermont	3,434	137	626,630	0.5%
West Virginia	2,384	95	1,854,304	0.1%
Arkansas	3,912	156	2,959,373	0.1%
Colorado	9,155	366	5,268,367	0.2%
Wisconsin	9,545	382	5,742,713	0.2%
New York	643,084	25,723	19,651,127	3.3%
Illinois	81,294	3,251	12,882,135	0.6%
New Jersey	341,397	13,656	8,899,339	3.8%
Louisiana	128,847	5,154	4,625,470	2.8%
Mississippi	15,377	615	2,991,207	0.5%
Connecticut	61,614	2,464	3,596,080	1.7%
Kansas	8,094	324	2,893,957	0.3%
Florida	148,878	5,955	19,552,860	0.8%
Michigan	225,578	9,023	9,895,622	2.3%
Iowa	11,071	442	3,090,416	0.4%
Massachusetts	162,189	6,487	6,692,824	2.4%
Hawaii	5,426	217	1,404,054	0.4%
North Carolina	32,631	1,305	9,848,060	0.3%
Rhode Island	14,239	569	1,051,511	1.4%
Delaware	13,840	553	925,749	1.5%
District of Columbia	21,258	850	646,449	3.3%
California	288,070	11,521	38,332,521	0.8%
Pennsylvania	566,129	22,645	12,773,801	4.4%
Tennessee	54,566	2,182	6,495,978	0.8%
Arizona	56,913	2,276	6,626,624	0.9%
Ohio	84,832	3,393	11,570,808	0.7%
Oklahoma	28,905	1,156	3,850,568	0.8%
Indiana	140,807	5,632	6,570,902	2.1%
Texas	175,924	7,036	26,448,193	0.7%
South Carolina	45,748	1,829	4,774,839	1.0%
Maryland	168,010	6,720	5,928,814	2.8%
Oregon	20,454	818	3,930,065	0.5%
New Hampshire	17,697	707	1,323,459	1.3%
Utah	55,830	2,233	2,900,872	1.9%
New Mexico	209,402	8,376	2,085,287	10.0%
Virginia	130,208	5,207	8,260,405	1.6%
Nebraska	38,905	1,555	1,868,516	2.1%

Forecast New Cases U.S. Total

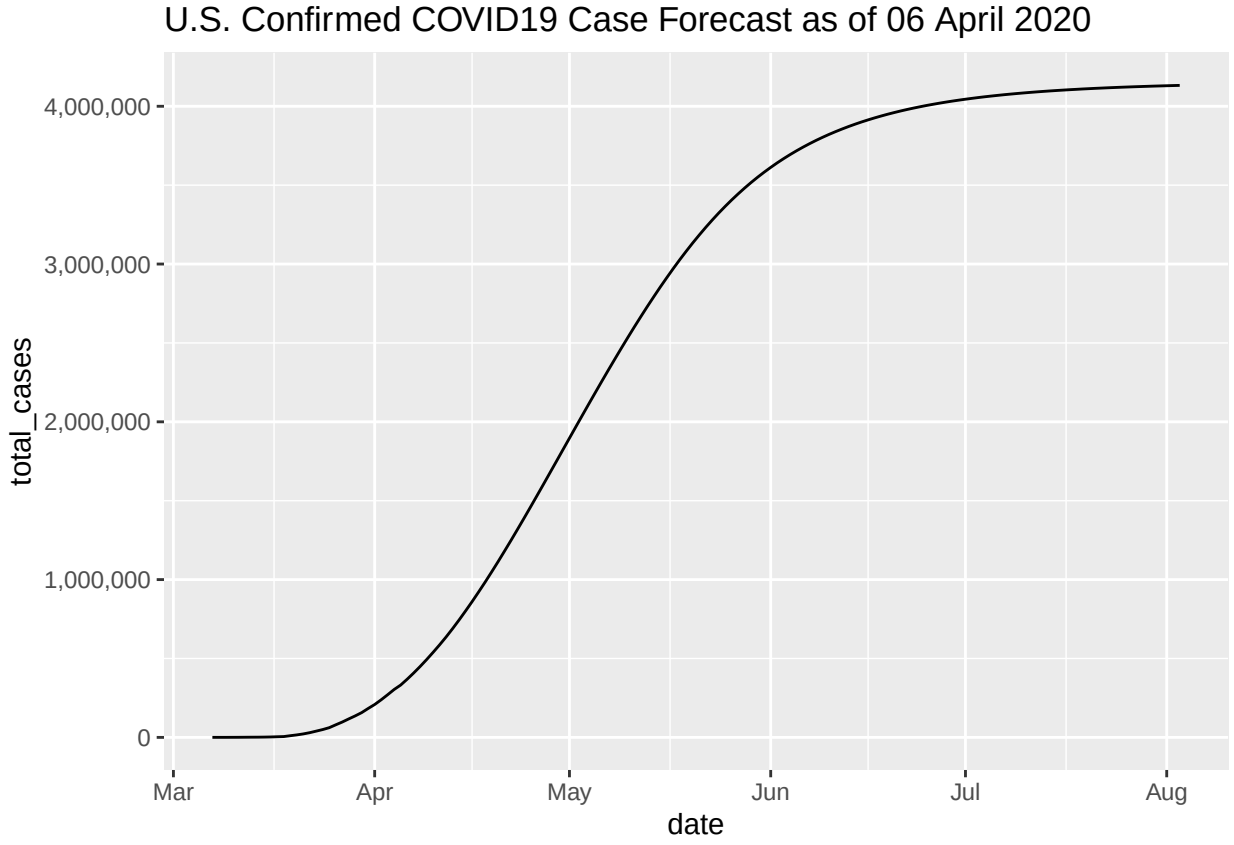


Table 10: Peak Daily New Cases in U.S. and Total on That Day

date	forecast_new	deaths_new	total_cases	total_deaths
2020-04-30	73,180	2897.4	1,823,359	64171.92

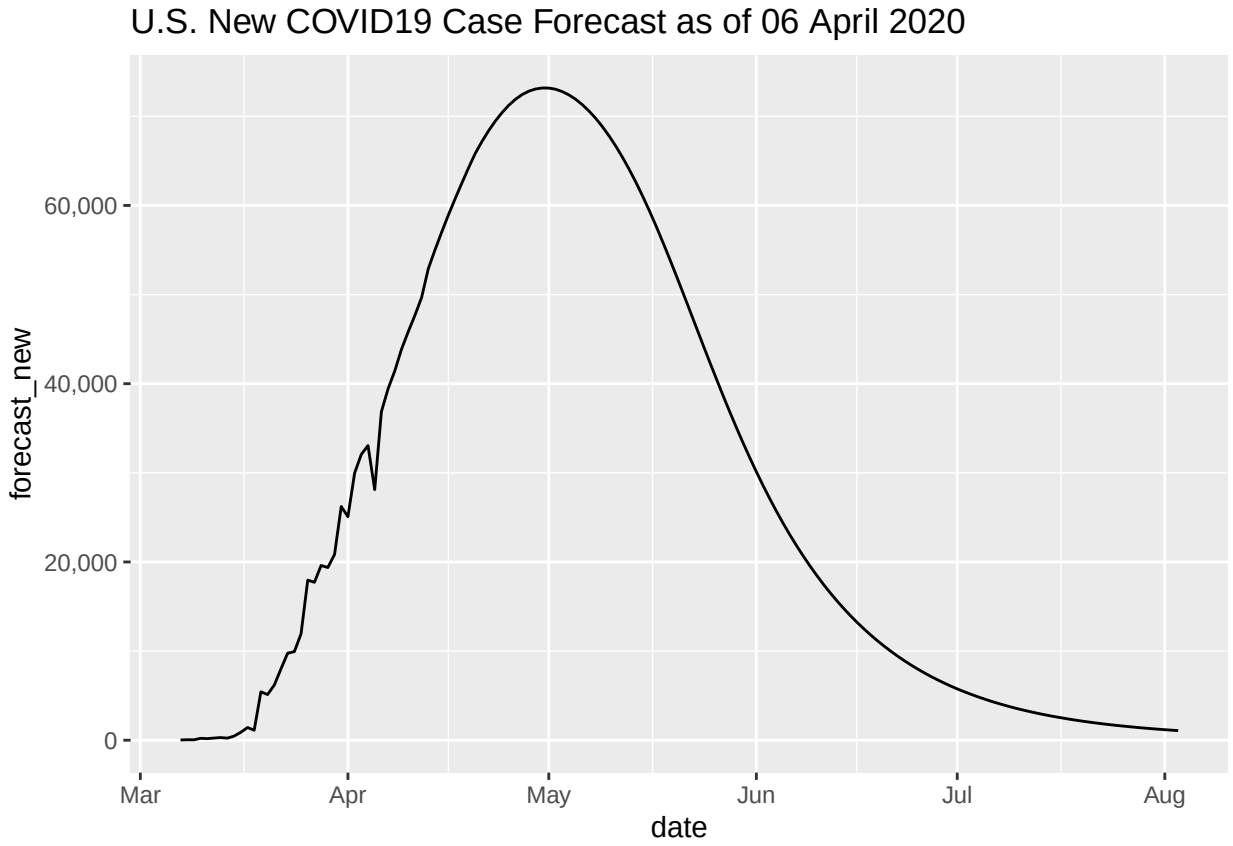
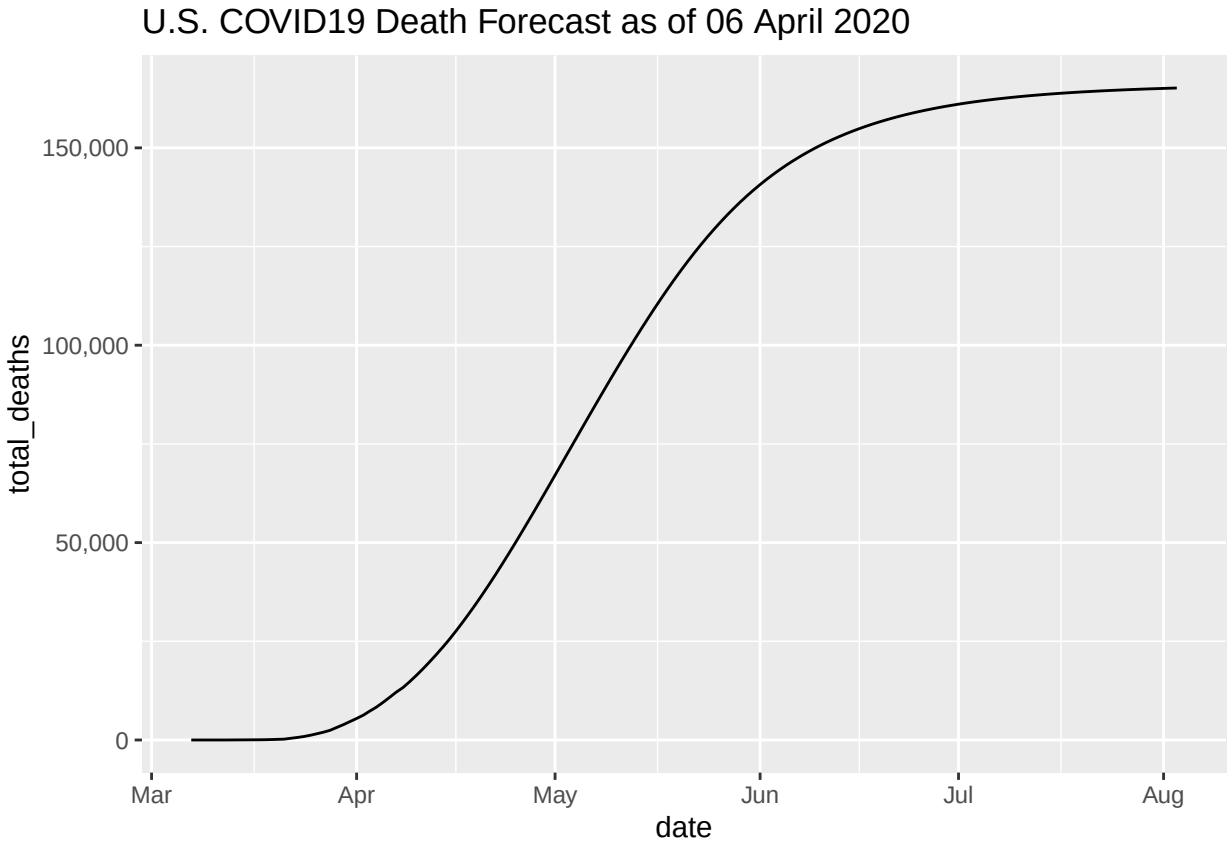


Table 11: Peak Daily Deaths in U.S. and Total on That Day

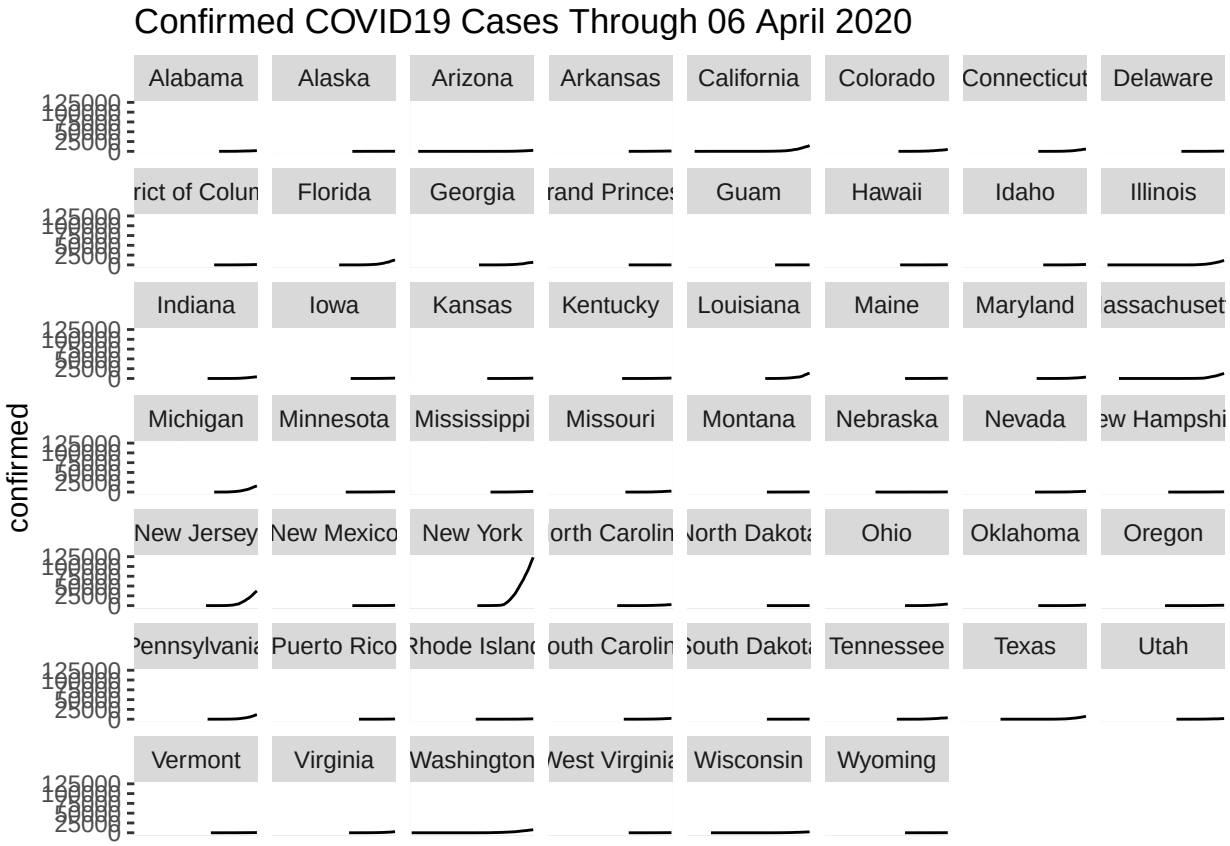
date	forecast_new	deaths_new	total_cases	total_deaths
2020-05-03	72782	2,927	2,042,359	72934.36



Sparklines

We only look at states with more than one hundred cases today. For moving average growth rates, we only look at states with deaths and recoveries over 25.

Confirmed Cases



Deaths


Cumulative COVID19 Deaths Through 06 April 2020
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Utah
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Wisconsin
Wyoming
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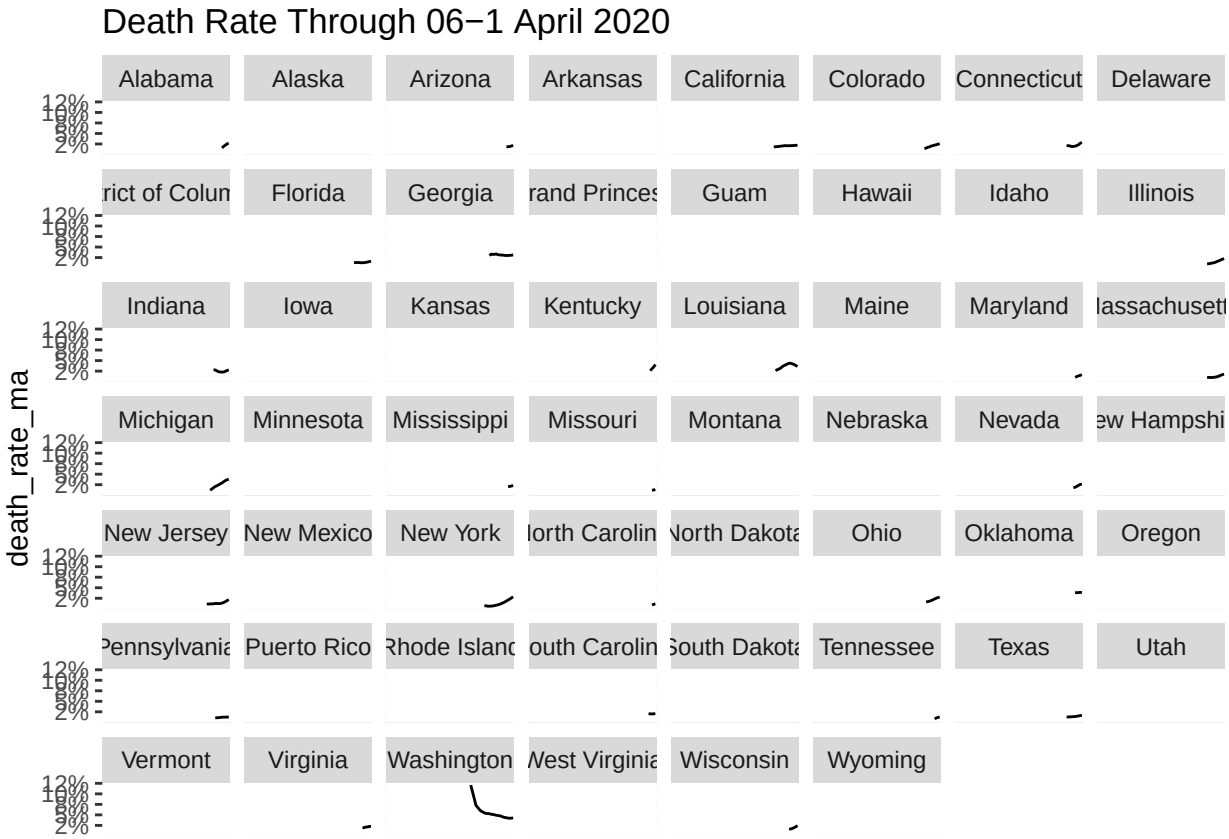
Confirmed Growth Rate 5-Day Moving Average

Death Rate 5-Day Moving Average

Only states with >25 deaths are shown


Death Rate Through 06−1 April 2020
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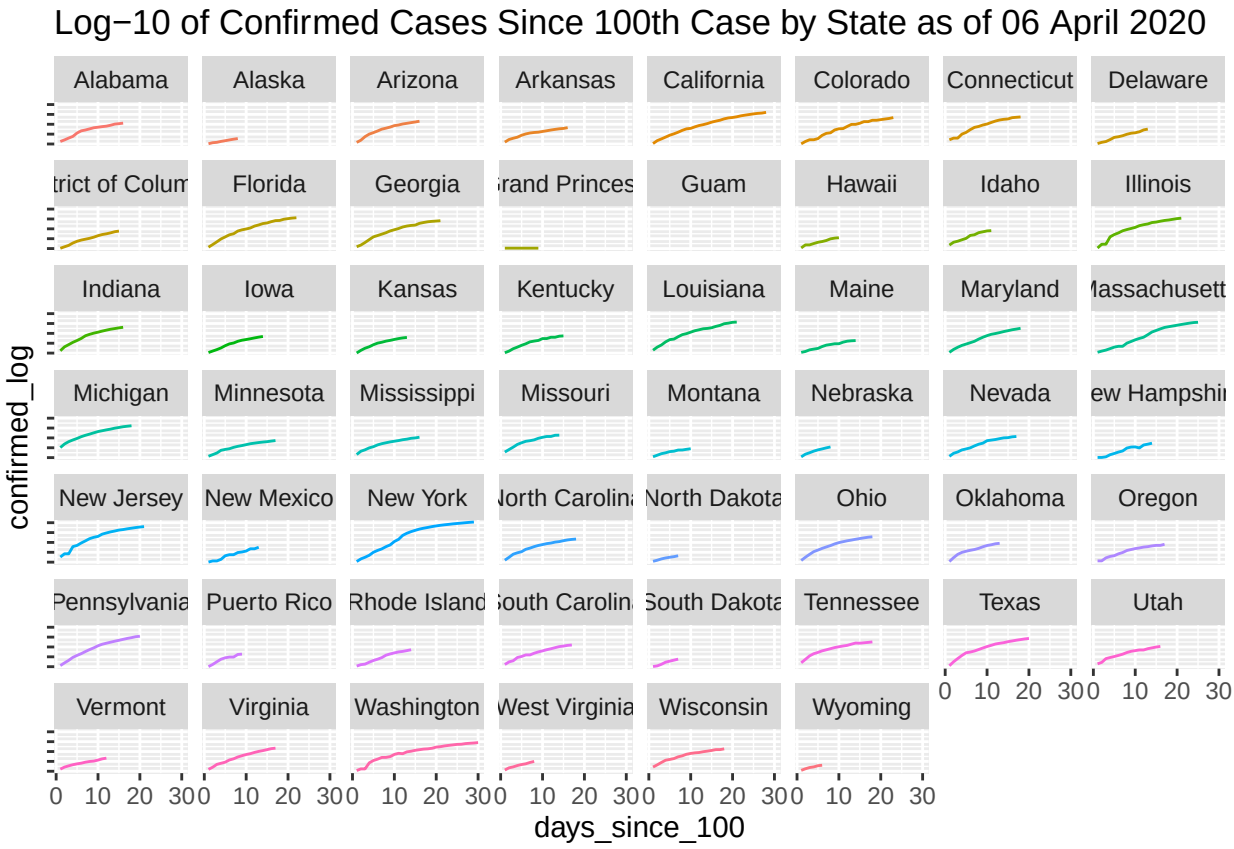
Tennessee
Texas
Utah
Vermont
Virginia
Washington
West Virginia
Wisconsin
Wyoming
12%
10%
8%
6%
4%
2%

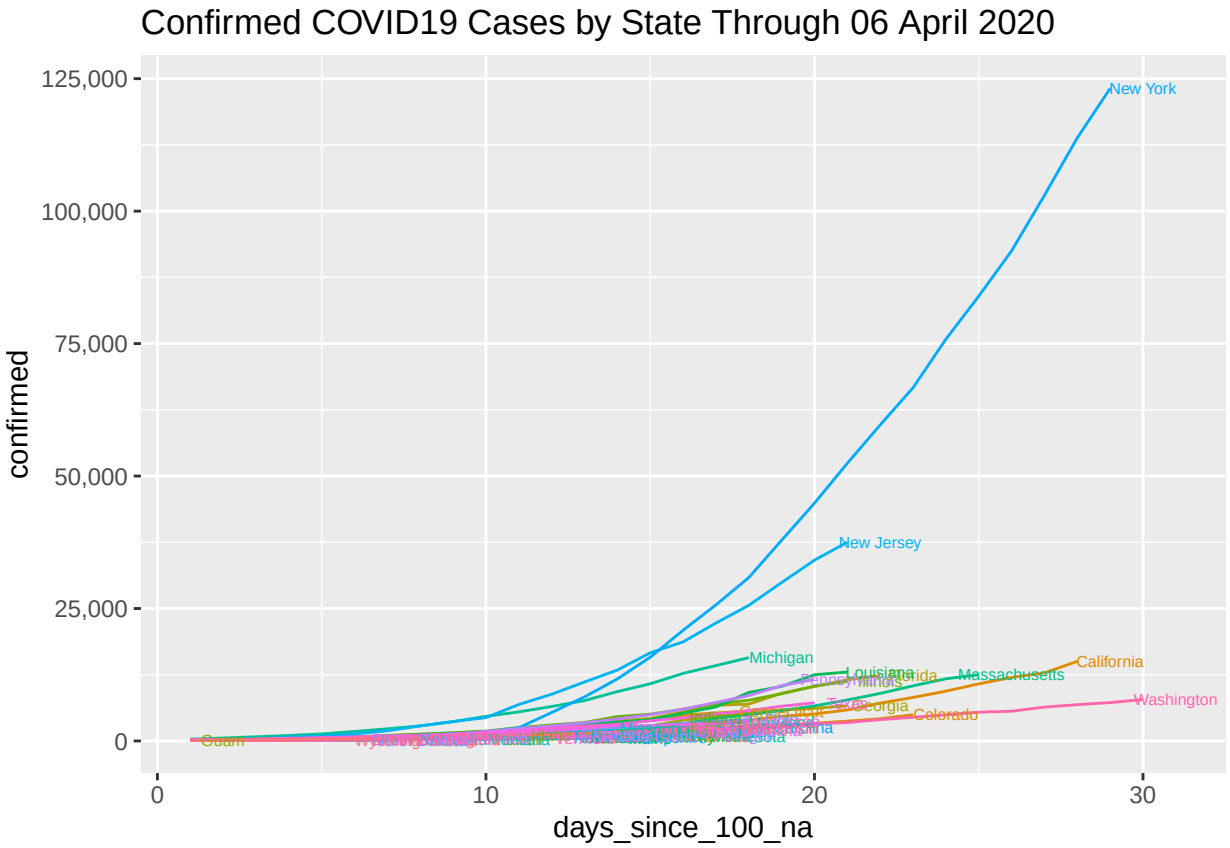
Log / Time for States After 100th Case

Log-10 by States: Confirmed Cases by Day After 50th Confirmed Case



Zero at Fifty Cases

Confirmed Cases



Testing Data

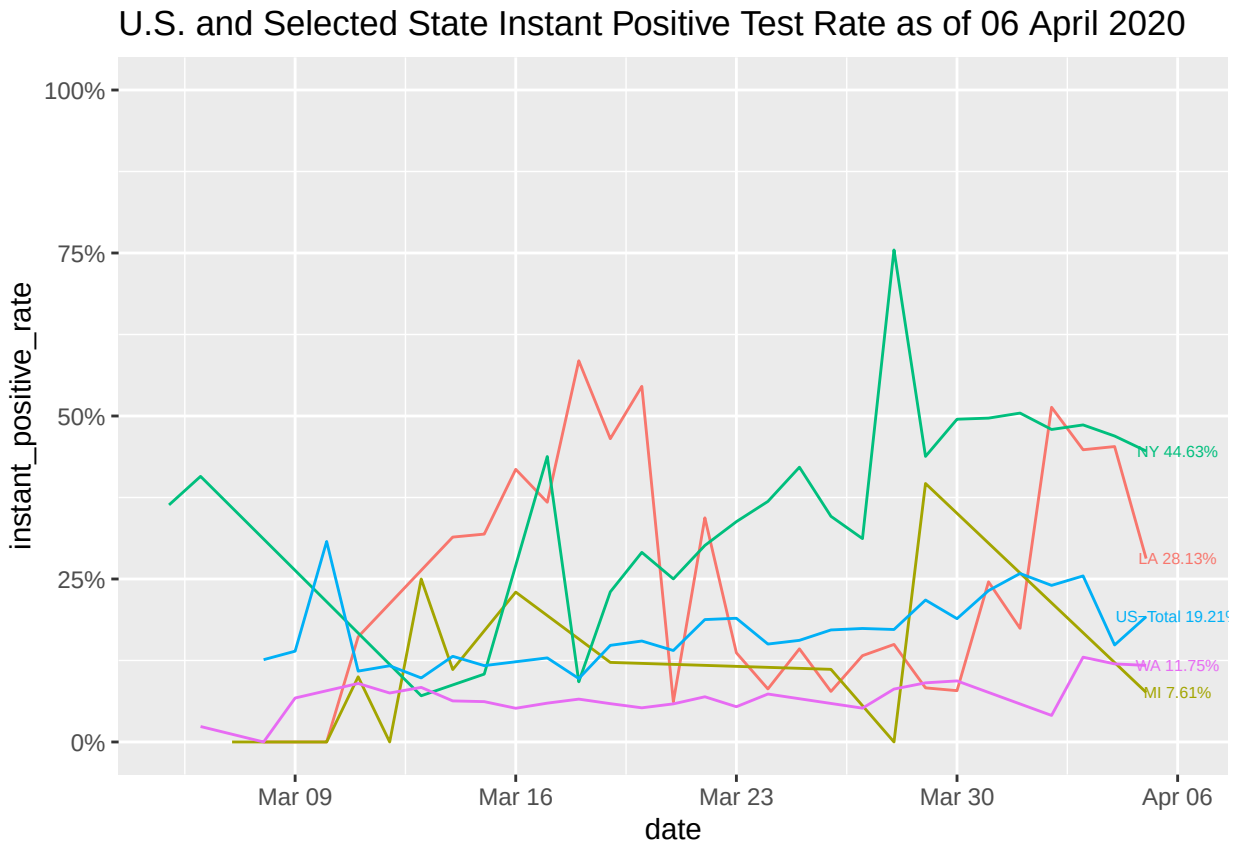
State-by-State Testing Summary

States are sorted descending by total tested. Cum Pos Rate is the cumulative positive rate since the pandemic began; instant positive rate is the current daily testing rate. Instant positive trend is instant positive rate / cumulative positive rate.

Table 12: State-by-State Testing Summary

State	Pos	Cum Tested	Cum Pos Rate	Pos Increase	Tested Increase	Instant Pos Rate	Instant Pos Trend
NY	122,031	302,280	40.4%	8,327	18,659	44.6%	10.5%
CA	13,438	116,533	11.5%	1,412	2,833	49.8%	332.2%
FL	12,151	113,404	10.7%	1,040	11,337	9.2%	-14.4%
WA	7,591	87,918	8.6%	625	5,319	11.8%	36.1%
NJ	37,505	82,166	45.6%	3,381	6,810	49.6%	8.8%
PA	11,510	77,771	14.8%	1,493	7,741	19.3%	30.3%
MA	12,500	71,937	17.4%	764	3,137	24.4%	40.2%
TX	6,812	70,938	9.6%	702	7,187	9.8%	1.7%
LA	13,010	60,325	21.6%	514	1,827	28.1%	30.5%
IL	11,256	58,983	19.1%	899	5,402	16.6%	-12.8%
MI	15,718	45,748	34.4%	1,493	19,630	7.6%	-77.9%
TN	3,633	45,300	8.0%	312	3,909	8.0%	-0.5%

State	Pos	Cum Tested	Cum Pos Rate	Pos Increase	Tested Increase	Instant Pos Rate	Instant Pos Trend
OH	4,043	43,756	9.2%	304	1,885	16.1%	74.5%
NC	2,585	40,045	6.5%	183	1,272	14.4%	122.9%
UT	1,605	30,892	5.2%	177	2,849	6.2%	19.6%
MD	3,609	28,337	12.7%	484	2,727	17.7%	39.4%
GA	6,647	27,832	23.9%	487	1,538	31.7%	32.6%
WI	2,267	27,436	8.3%	155	1,465	10.6%	28.0%
AZ	2,269	27,410	8.3%	250	250	100.0%	1 108.0%
MO	2,367	27,249	8.7%	76	2,344	3.2%	-62.7%
MN	935	26,777	3.5%	70	1,354	5.2%	48.1%
CO	4,565	23,900	19.1%	392	1,829	21.4%	12.2%
VA	2,637	23,671	11.1%	230	2,119	10.9%	-2.6%
CT	5,675	23,270	24.4%	399	1,241	32.2%	31.8%
IN	4,411	22,652	19.5%	458	2,852	16.1%	-17.5%
SC	2,049	18,976	10.8%	132	662	19.9%	84.7%
OR	999	18,925	5.3%	100	1,491	6.7%	27.1%
NV	1,836	16,831	10.9%	94	668	14.1%	29.0%
NM	543	16,828	3.2%	48	1,196	4.0%	24.4%
KY	917	16,663	5.5%	86	1,091	7.9%	43.2%
AL	1,796	13,078	13.7%	216	2,225	9.7%	-29.3%
HI	351	12,955	2.7%	32	677	4.7%	74.5%
AR	830	11,242	7.4%	87	872	10.0%	35.1%
IA	868	10,841	8.0%	82	601	13.6%	70.4%
ID	1,077	10,261	10.5%	64	1,391	4.6%	-56.2%
WV	324	8,838	3.7%	42	1,152	3.6%	-0.5%
KS	747	8,223	9.1%	49	645	7.6%	-16.4%
RI	922	8,103	11.4%	116	1,713	6.8%	-40.5%
NH	621	8,032	7.7%	81	527	15.4%	98.8%
MS	1,638	7,218	22.7%	183	630	29.0%	28.0%
DE	673	6,994	9.6%	80	527	15.2%	57.8%
DC	998	6,834	14.6%	96	396	24.2%	66.0%
ND	207	6,787	3.0%	21	580	3.6%	18.7%
MT	286	6,603	4.3%	21	426	4.9%	13.8%
VT	512	6,582	7.8%	51	738	6.9%	-11.2%
ME	470	6,558	7.2%	14	14	100.0%	1 295.3%
AK	185	6,284	2.9%	14	244	5.7%	94.9%
NE	363	5,921	6.1%	42	542	7.7%	26.4%
SD	240	5,593	4.3%	28	369	7.6%	76.8%
PR	475	3,548	13.4%	23	1,031	2.2%	-83.3%
WY	197	3,237	6.1%	10	105	9.5%	56.5%
OK	1,252	2,653	47.2%	93	132	70.5%	49.3%
GU	112	605	18.5%	19	40	47.5%	156.6%
VI	42	248	16.9%	2	24	8.3%	-50.8%
MP	8	21	38.1%	0	0	NaN%	NaN%
AS	0	20	0.0%	0	0	NaN%	NaN%



Hospitalization Summary

State-by-state hospitalization data are still VERY spotty as of April 5th. Most states are not reporting.

Table 13: State-by-State Hospitalization and ICU Data

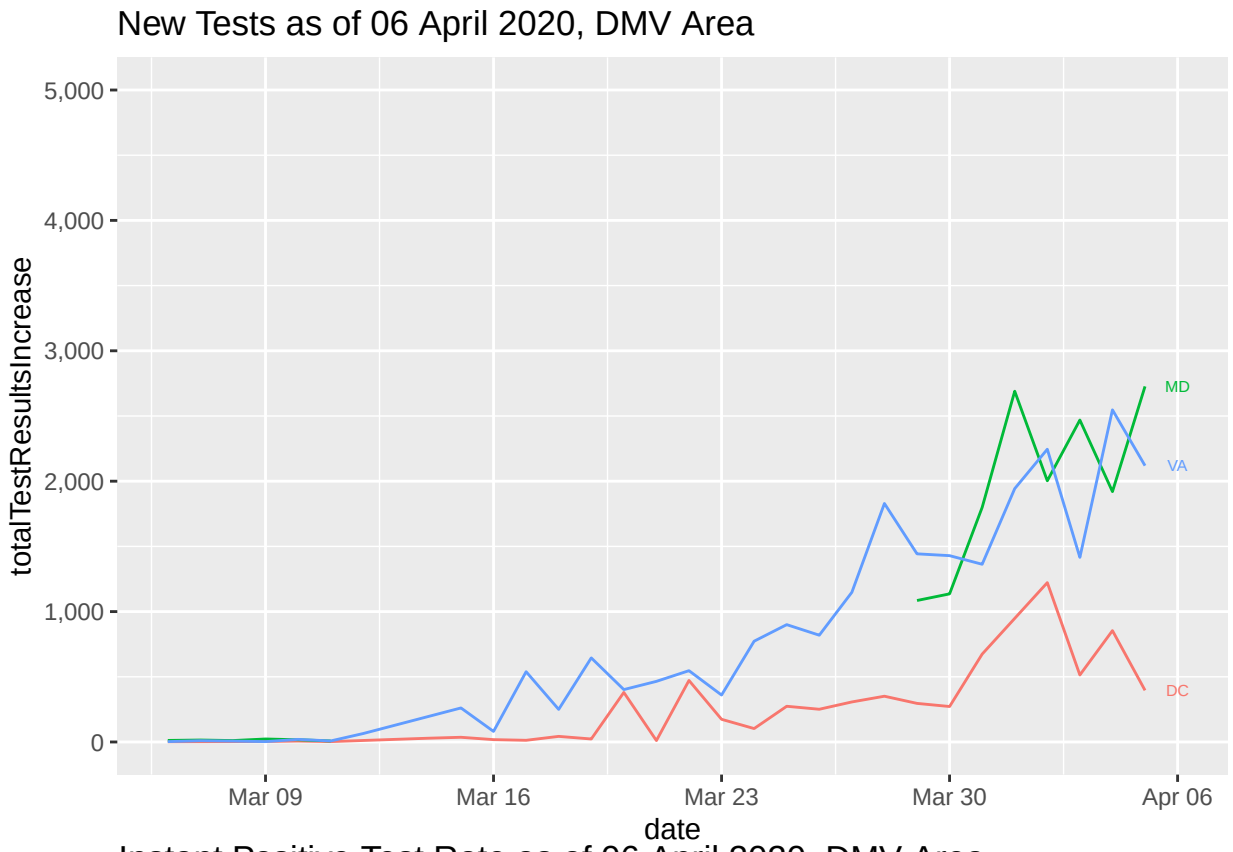
State	Positive	Hospitalized	In ICU	Recovered	Dead	% Hospitalized	% ICU (of Hospitalized)	% Recovered
NY	122,031	16,479	4,376	12,187	4,159	13.5%	26.6%	10.0%
CA	13,438	2,398	1,040	NA	319	17.8%	43.4%	NA%
LA	13,010	1,803	NA	NA	477	13.9%	NA%	NA%
CT	5,675	1,142	NA	NA	189	20.1%	NA%	NA%
MO	2,367	424	NA	NA	34	17.9%	NA%	NA%
NC	2,585	261	NA	NA	31	10.1%	NA%	NA%
MN	935	106	48	451	29	11.3%	45.3%	48.2%
RI	922	103	33	35	25	11.2%	32.0%	3.8%
DE	673	101	NA	71	14	15.0%	NA%	10.5%
IA	868	91	NA	188	22	10.5%	NA%	21.7%
AR	853	67	NA	100	16	7.9%	NA%	11.7%
NM	624	45	NA	130	12	7.2%	NA%	20.8%
VT	512	29	NA	15	22	5.7%	NA%	2.9%
ND	207	20	NA	63	3	9.7%	NA%	30.4%
AK	185	NA	NA	NA	6	NA%	NA%	NA%
AL	1,841	NA	NA	NA	45	NA%	NA%	NA%
AZ	2,269	NA	NA	NA	64	NA%	NA%	NA%
CO	4,950	NA	NA	NA	140	NA%	NA%	NA%
DC	998	NA	NA	258	22	NA%	NA%	25.9%
FL	12,350	NA	NA	NA	221	NA%	NA%	NA%

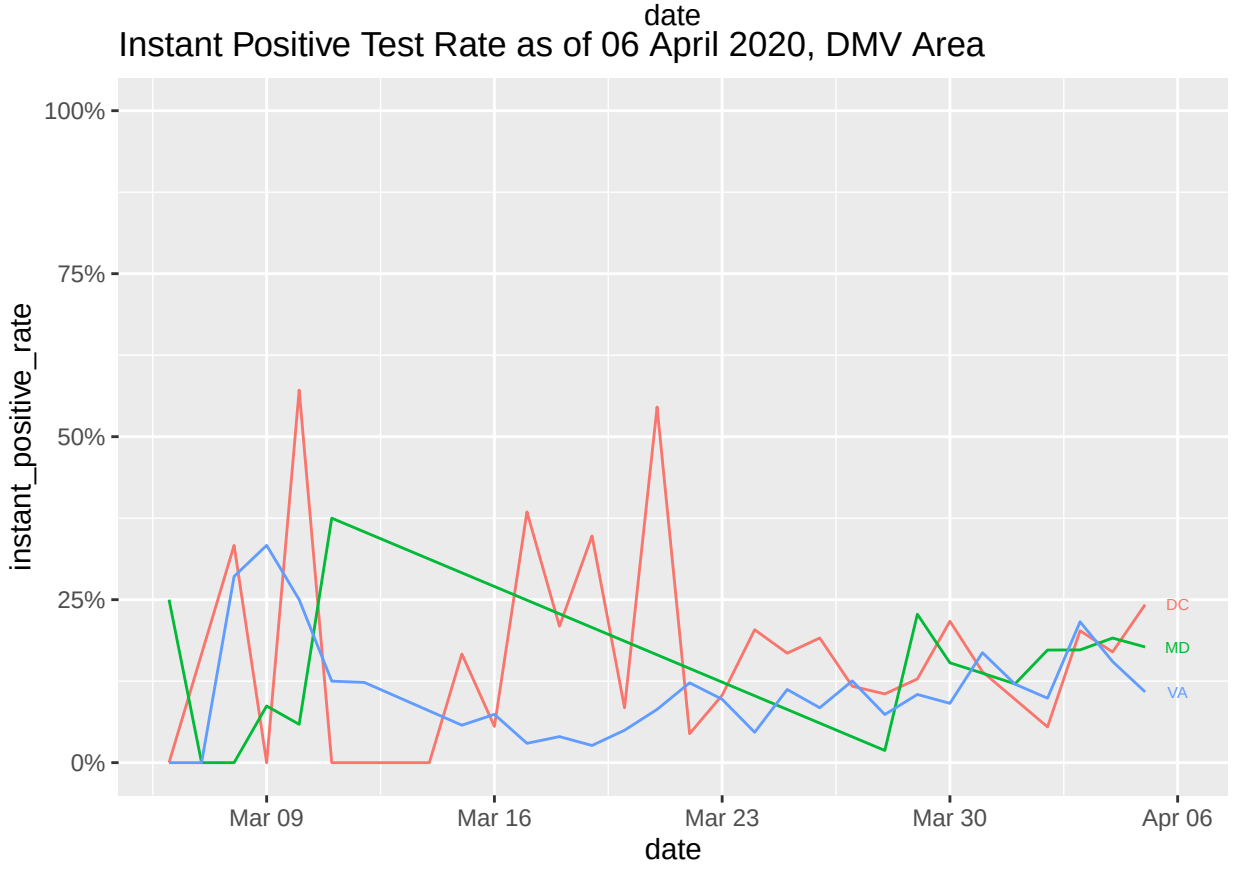
State	Positive	Hospitalized	In ICU	Recovered	Dead	% Hospitalized	% ICU (of Hospitalized)	% Recovered
GA	6,742	NA	NA	NA	219	NA%	NA%	NA%
HI	371	NA	NA	85	4	NA%	NA%	22.9%
ID	1,101	NA	NA	NA	10	NA%	NA%	NA%
IL	11,256	NA	NA	NA	274	NA%	NA%	NA%
IN	4,411	NA	NA	NA	127	NA%	NA%	NA%
KS	747	NA	NA	NA	22	NA%	NA%	NA%
KY	955	NA	NA	NA	45	NA%	NA%	NA%
MA	12,500	NA	NA	NA	231	NA%	NA%	NA%
MD	3,609	NA	NA	159	67	NA%	NA%	4.4%
ME	470	NA	NA	156	10	NA%	NA%	33.2%
MI	15,718	NA	NA	NA	617	NA%	NA%	NA%
MS	1,638	NA	NA	NA	43	NA%	NA%	NA%
MT	298	NA	NA	NA	6	NA%	NA%	NA%
NE	367	NA	NA	NA	8	NA%	NA%	NA%
NH	669	NA	NA	147	9	NA%	NA%	22.0%
NJ	37,505	NA	NA	NA	917	NA%	NA%	NA%
NV	1,836	NA	NA	NA	46	NA%	NA%	NA%
OH	4,043	NA	NA	NA	119	NA%	NA%	NA%
OK	1,252	NA	NA	NA	46	NA%	NA%	NA%
OR	1,068	NA	NA	NA	27	NA%	NA%	NA%
PA	11,510	NA	NA	NA	150	NA%	NA%	NA%
SC	2,049	NA	NA	NA	44	NA%	NA%	NA%
SD	240	NA	NA	84	2	NA%	NA%	35.0%
TN	3,633	NA	NA	295	44	NA%	NA%	8.1%
TX	6,812	NA	NA	38	127	NA%	NA%	0.6%
UT	1,605	NA	NA	NA	8	NA%	NA%	NA%
VA	2,637	NA	NA	NA	51	NA%	NA%	NA%
WA	7,984	NA	NA	NA	338	NA%	NA%	NA%
WI	2,267	NA	NA	NA	68	NA%	NA%	NA%
WV	324	NA	NA	NA	3	NA%	NA%	NA%
WY	200	NA	NA	50	0	NA%	NA%	25.0%
PR	475	NA	NA	NA	20	NA%	NA%	NA%
AS	0	NA	NA	NA	0	NA%	NA%	NA%
GU	112	NA	NA	23	4	NA%	NA%	20.5%
MP	8	NA	NA	NA	1	NA%	NA%	NA%
VI	42	NA	NA	34	1	NA%	NA%	81.0%

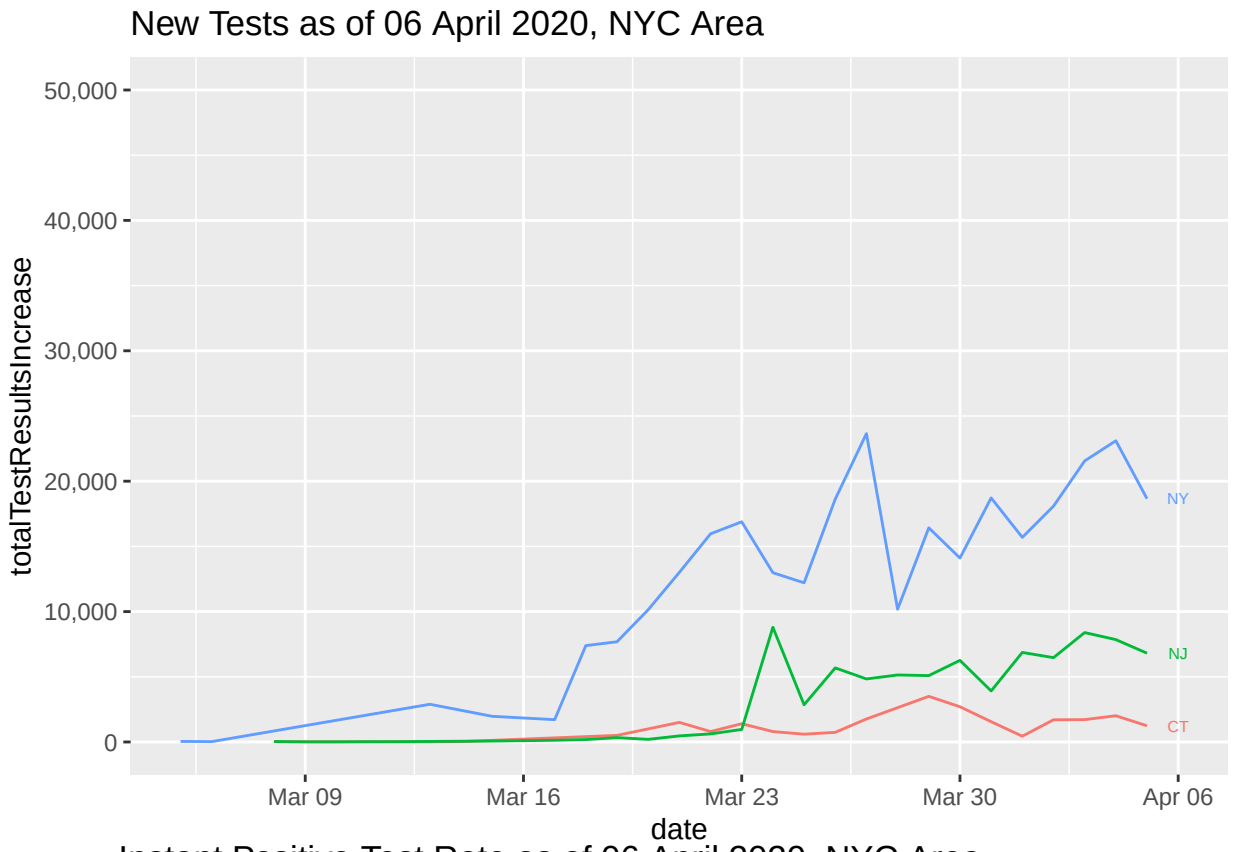
Selected States Drill-Down

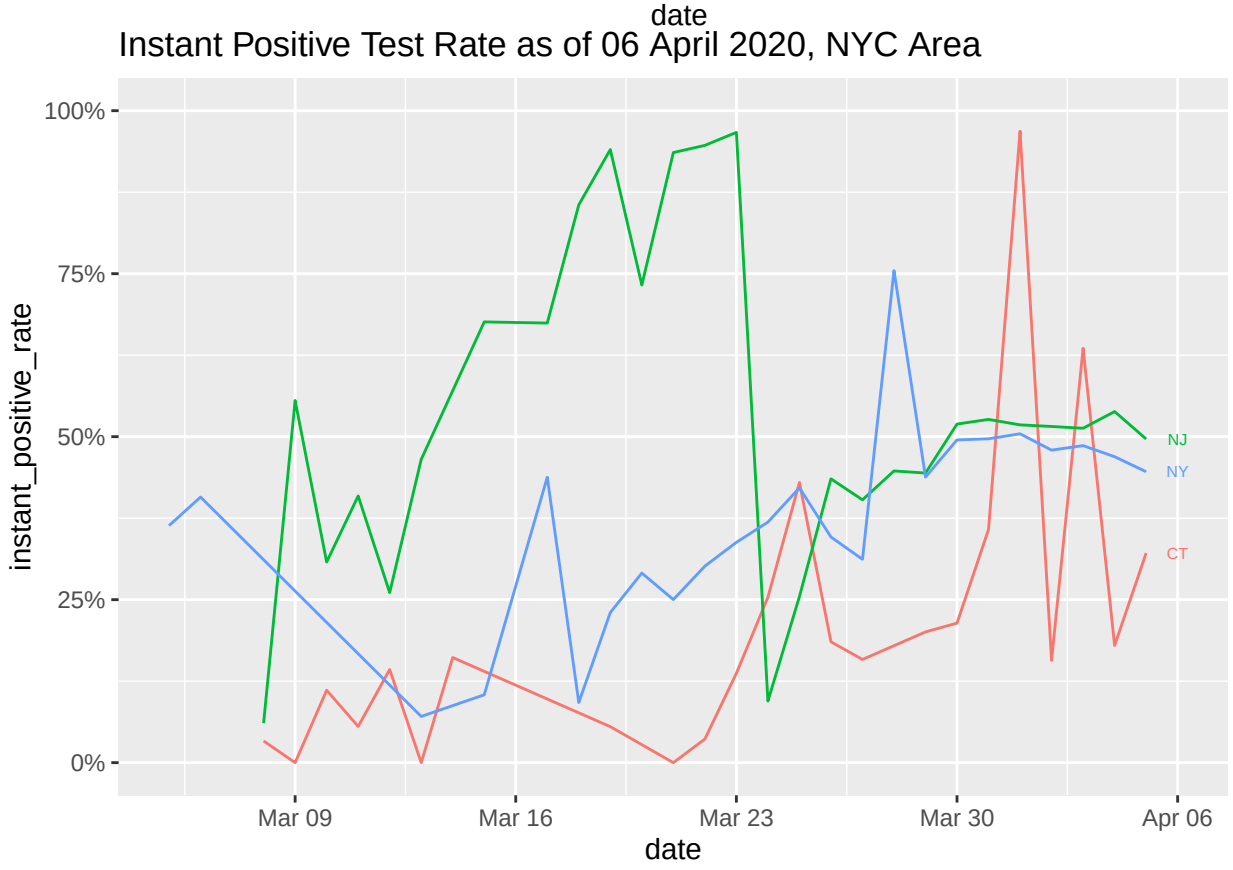
New York State has been the U.S. epicenter so far. New York is also testing much more than most states, but at the same time, its positive rate is very high (around 50% as of early March), indicating that people being tested are high-likelihood cases; as such it should be assumed that there remain a very large population of untested positive patients.

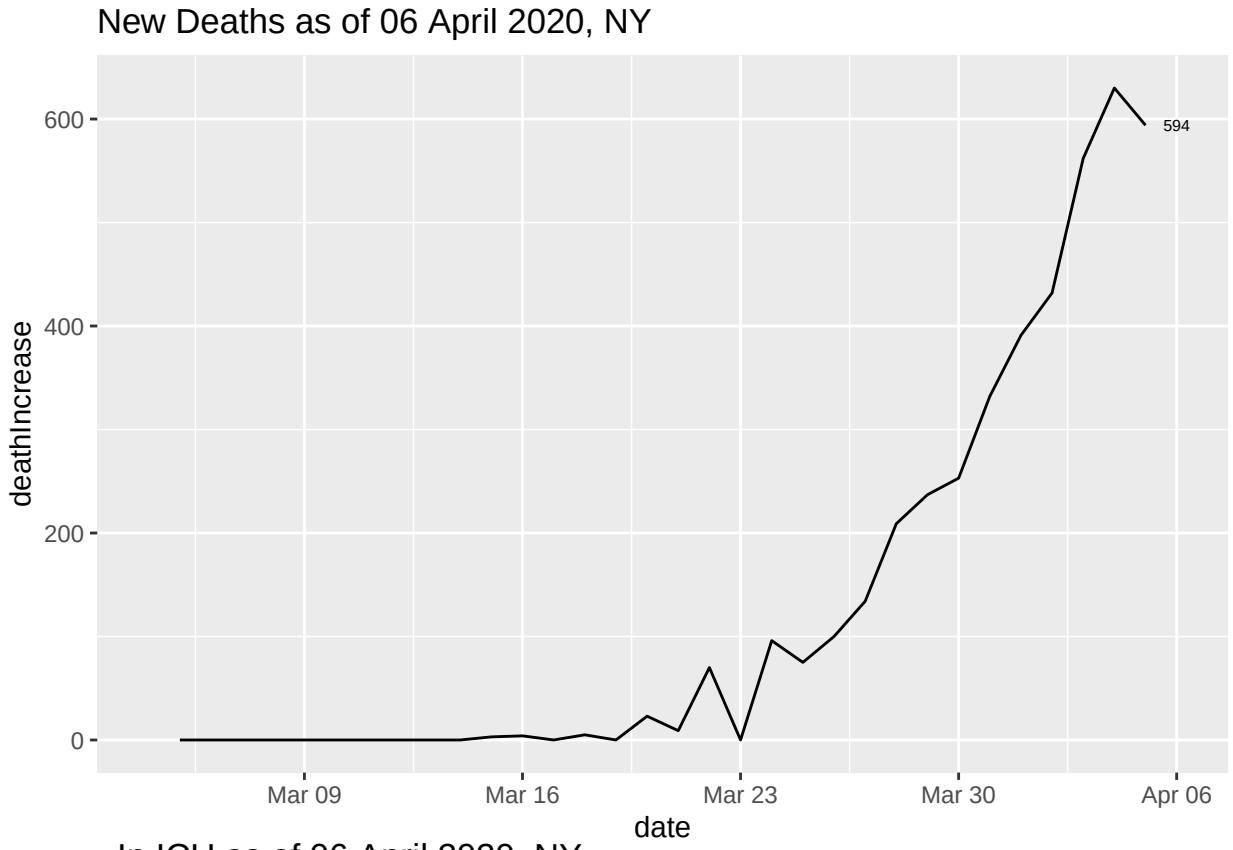
The DMV (D.C., Maryland, Virginia) might be a coming hotspot. Watching instant positive test rates will be a key leading indicator of hospitalizations and ICU beds in the coming week.

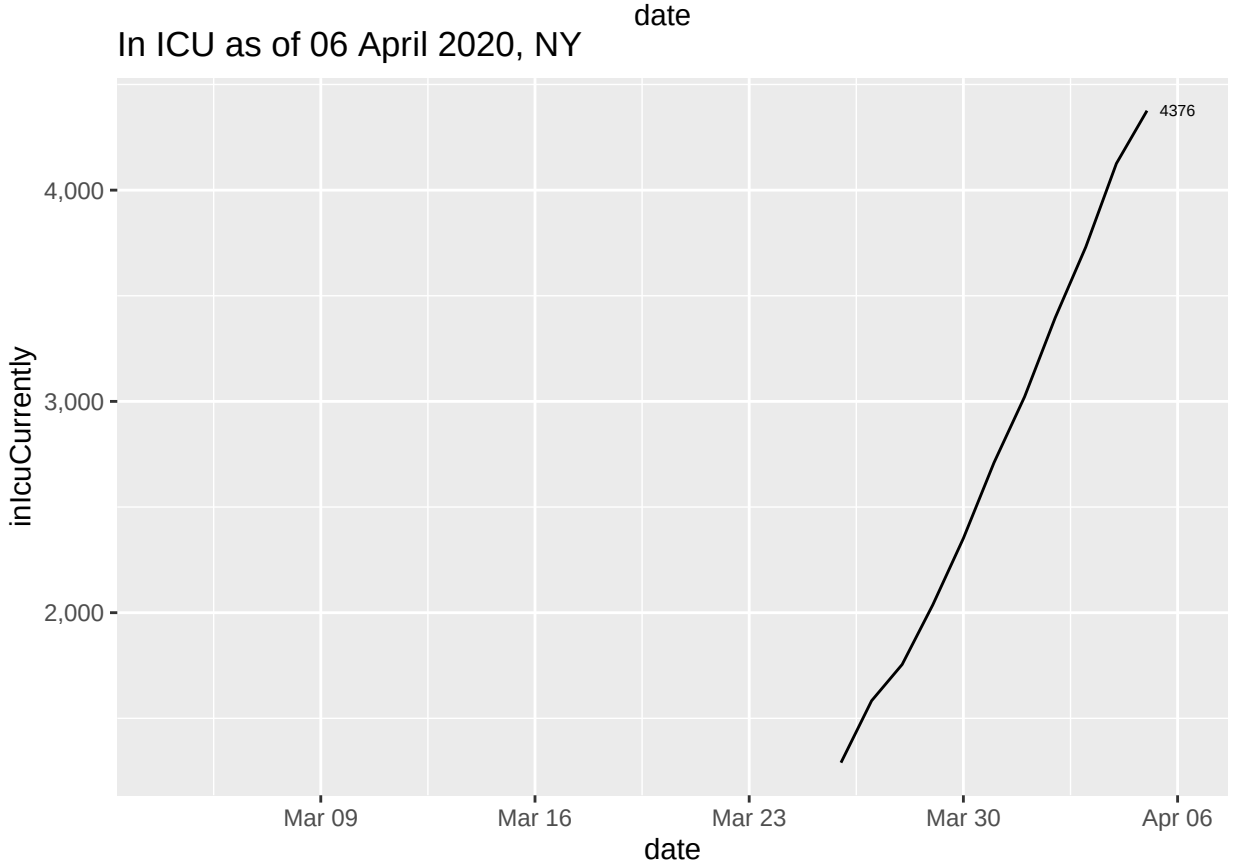

New Tests as of 06 April 2020, DMV Area
totalTestResultsIncrease
5,000
4,000
3,000
2,000
1,000
0
Mar 09
Mar 16
Mar 23
Mar 30
Apr 06
date
MD
VA
DC

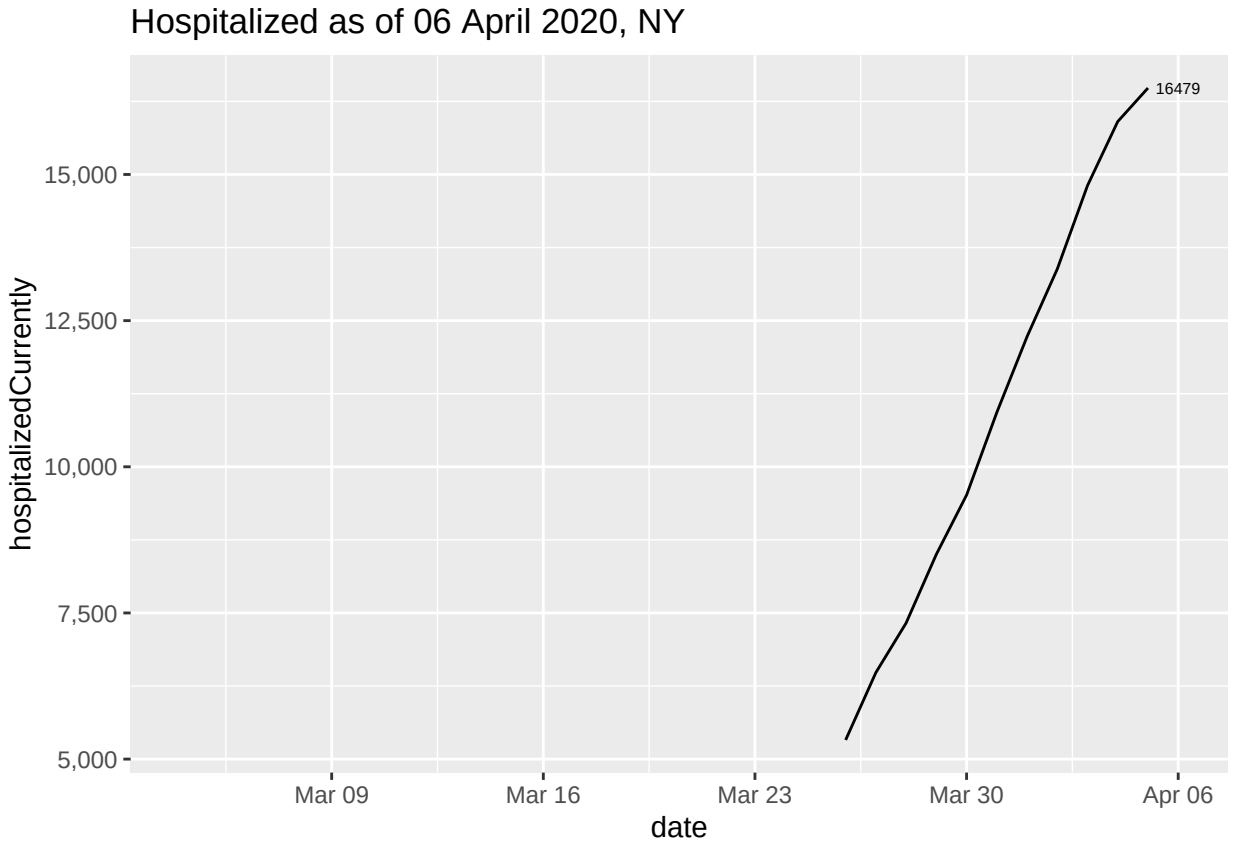

Instant Positive Test Rate as of 06 April 2020, DMV Area
instant_positive_rate
100%
75%
50%
25%
0%
Mar 09
Mar 16
Mar 23
Mar 30
Apr 06
date
DC
MD
VA


New Tests as of 06 April 2020, NYC Area
totalTestResultsIncrease
50,000
40,000
30,000
20,000
10,000
0
Mar 09
Mar 16
Mar 23
Mar 30
Apr 06
date
NY
NJ
CT


Instant Positive Test Rate as of 06 April 2020, NYC Area
instant_positive_rate
100%
75%
50%
25%
0%
Mar 09
Mar 16
Mar 23
Mar 30
Apr 06
date
NJ
NY
CT


New Deaths as of 06 April 2020, NY
600
400
200
0
deathIncrease
594
Mar 09
Mar 16
Mar 23
Mar 30
Apr 06
date


In ICU as of 06 April 2020, NY
4,000
3,000
2,000
inIcuCurrently
4376
Mar 09
Mar 16
Mar 23
Mar 30
Apr 06
date


Hospitalized as of 06 April 2020, NY
16479
15,000
12,500
10,000
7,500
5,000
hospitalizedCurrently
Mar 09
Mar 16
Mar 23
Mar 30
Apr 06
date