

COVID-19 Dashboard

Issue # 52
Sunday, May 17, 2020

Day's Highlights

"Strategic Guidance in an Era of Unprecedented Change"

Measure	Desired Change	Yesterday in the U.S.
Number of Tests	Increase	365,000 tests/day reported on Friday and Saturday
Test-Positivity Rate	Decline	7.0% for past 2 days; 6.7% for past 7 days
Number of Cases	Plateau	New Cases down 14.0% week-over-week
Deaths % of Total Cases	Decline	Steady at 6.0%
Number of Deaths / 1M Population	Plateau	272.2
Recoveries : Death	Increase	3.76

- The U.S continued to broaden its testing, with an average of 365,000 the past two days; the test-positive rate was 7.0%. For the week, tests averaged 348,000 per day, with a 6.7% test-positive rate.
- The U.S. testing rate for the past week is now just about at the minimum suggested by Harvard scientists, as cited in a recent [NY Times article](#) (150 per 1M per day v. 152). Connecticut, Illinois, New Jersey, New Mexico, New York and Rhode Island all exceed this benchmark
- For the past week only 11 states (AZ, DE, IA, IL, MA, MD, MN, ND, NE, PA and VA) and the District of Columbia failed to meet or beat the [World Health Organization](#)'s suggested threshold of 10% or fewer test-positive results. By that measure, the remaining states appear to be adequately testing for the virus.
- Only 12 states (CT, DE, IA, MA, MD, MN, IA, NE, NJ, NY, RI and VA) and the District of Columbia reported new daily infection rates of 100 or more during the past week
- We are monitoring states that have met criticism for re-opening early, particularly Florida and Wisconsin. (In Wisconsin, the state Supreme Court invalidated the Governor's stay-home order last week. Their bars subsequently re-opened Wednesday evening.) Thus far, both states are showing low test-positive and new infection rates.
- We analyzed the case and death information for the 100 most populous counties, to see if we could "explain" the wide differences in case and deaths rates between the counties. We found statistically significant relationships for the following:
 - Peak New Daily Infection rates, based on: % of commuters using shared transportation and African American % of the population
 - Cases Per Million, based on: % of commuters using shared transportation, poverty rates and African American % of the population
 - Deaths per 1 Million, based on: population density, % of commuters using shared transportation and % of the population 65 years old & older
- Stay home orders and their timing could be not statistically established as having a non-zero impact, still, they strengthened the models (improved r^2) for deaths per 1 Million and deaths per case

COUNTRY-BY-COUNTRY INFORMATION

Countries Included

"Strategic Guidance in an Era of Unprecedented Change"

- In Mid-March, we began tracking the twenty countries with the most coronavirus cases; in mid-April, we expanded it to the thirty countries with the most cases
- Since that time, 13 countries have moved ahead of South Korea in total cases
- We continue to track the 30 countries, which still account for 89.5% of total cases worldwide
- Case and death information is sourced from the [World Health Organization](#), which is accessed daily; analysis by Health Industry Advisor LLC

Country-by-Country Comparative Statistics

"Strategic Guidance in an Era of Unprecedented Change"

As of May 16

Country	Total Cases	Rank	Cases per 1M Population	Rank2	Deaths	Rank3	Death Rate	Rank4	Deaths per 1 Million Population	Rank5	5-day Moving Average Case Growth Rate	Rank6	Tests per 1M Population	Rank7	New Daily Infections Per 1M Population (5-Day M.A.)	Rank8
USA	1,507,773	(1)	4,555	(5)	90,113	(1)	6.0%	(14)	272.2	(9)	1.7%	(12)	36,127	(13)	69.3	(5)
Austria	16,201	(29)	1,799	(20)	629	(25)	3.9%	(20)	69.8	(18)	0.4%	(25)	39,710	(8)	5.8	(24)
Belgium	54,989	(15)	4,745	(3)	9,005	(7)	16.4%	(1)	777.0	(1)	0.6%	(20)	57,302	(4)	29.5	(14)
Brazil	233,142	(5)	1,097	(24)	15,633	(6)	6.7%	(11)	73.5	(17)	6.6%	(1)	3,462	(25)	51.8	(9)
Canada	75,864	(14)	2,010	(16)	5,679	(10)	7.5%	(10)	150.5	(12)	1.6%	(13)	33,567	(14)	30.9	(12)
Chile	41,428	(19)	2,167	(14)	421	(26)	1.0%	(27)	22.0	(22)	6.6%	(2)	18,346	(18)	106.2	(2)
China	82,941	(13)	58	(30)	4,633	(13)	5.6%	(16)	3.2	(29)	0.0%	(30)	N/A	N/A	0.0	(30)
Ecuador	32,763	(21)	1,857	(18)	2,688	(17)	8.2%	(9)	152.4	(11)	2.1%	(11)	5,301	(24)	29.9	(13)
France	179,365	(7)	2,748	(11)	27,625	(4)	15.4%	(2)	423.2	(5)	0.2%	(27)	21,218	(15)	5.9	(23)
Germany	176,244	(8)	2,104	(15)	8,027	(8)	4.6%	(17)	95.8	(14)	0.4%	(24)	37,585	(11)	8.4	(21)
India	90,648	(11)	66	(29)	2,871	(16)	3.2%	(21)	2.1	(30)	5.1%	(5)	1,548	(28)	2.9	(26)
Iran	118,392	(10)	1,410	(23)	6,937	(9)	5.9%	(15)	82.6	(15)	1.6%	(14)	8,022	(23)	20.7	(15)
Ireland	24,048	(26)	4,870	(2)	1,533	(21)	6.4%	(12)	310.4	(8)	0.8%	(18)	52,488	(5)	37.3	(11)
Israel	16,608	(27)	1,919	(17)	268	(28)	1.6%	(26)	31.0	(21)	0.1%	(29)	57,733	(3)	2.5	(27)
Italy	224,760	(6)	3,717	(6)	31,763	(3)	14.1%	(4)	525.3	(3)	0.4%	(23)	48,698	(6)	15.3	(18)
Japan	16,237	(28)	128	(28)	725	(24)	4.5%	(18)	5.7	(25)	0.5%	(22)	1,900	(26)	0.6	(28)
Mexico	45,032	(17)	349	(25)	4,767	(12)	10.6%	(7)	37.0	(20)	5.2%	(4)	1,271	(29)	15.0	(19)
Netherlands	43,870	(18)	2,560	(13)	5,670	(11)	12.9%	(5)	330.9	(7)	0.5%	(21)	16,809	(20)	12.4	(20)
Pakistan	38,799	(20)	176	(27)	834	(23)	2.1%	(25)	3.8	(27)	4.6%	(7)	1,631	(27)	6.5	(22)
Peru	88,541	(12)	2,685	(12)	2,523	(19)	2.8%	(22)	76.5	(16)	5.2%	(3)	19,156	(16)	101.9	(3)
Portugal	28,810	(24)	2,825	(10)	1,203	(22)	4.2%	(19)	118.0	(13)	0.8%	(17)	58,828	(2)	19.7	(16)
Russia	272,043	(3)	1,814	(19)	2,537	(18)	0.9%	(28)	16.9	(23)	4.2%	(8)	45,614	(7)	69.9	(4)
Saudi Arabia	52,016	(16)	1,494	(22)	302	(27)	0.6%	(29)	8.7	(24)	4.9%	(6)	14,457	(22)	61.1	(6)
Singapore	27,356	(25)	4,676	(4)	22	(30)	0.1%	(30)	3.8	(28)	2.8%	(9)	15,773	(21)	119.6	(1)
South Korea	11,037	(30)	215	(26)	262	(29)	2.4%	(24)	5.1	(26)	0.2%	(26)	38,371	(10)	0.5	(29)
Spain	276,505	(2)	5,914	(1)	27,563	(5)	10.0%	(8)	589.5	(2)	0.6%	(19)	64,977	(1)	41.9	(10)
Sweden	29,677	(23)	2,939	(9)	3,674	(15)	12.4%	(6)	363.8	(6)	2.2%	(10)	17,589	(19)	53.1	(7)
Switzerland	30,572	(22)	3,570	(7)	1,879	(20)	6.1%	(13)	219.4	(10)	0.1%	(28)	39,247	(9)	5.4	(25)
Turkey	148,067	(9)	1,756	(21)	4,096	(14)	2.8%	(23)	48.6	(19)	1.2%	(16)	18,874	(17)	18.6	(17)
UK	240,161	(4)	3,538	(8)	34,466	(2)	14.4%	(3)	507.7	(4)	1.5%	(15)	36,696	(12)	52.4	(8)

Note: China does not report test volumes

© 2020 [Health Industry Advisor LLC](#) analysis, using data from the [World Health Organization](#)

“Strategic Guidance in an Era of Unprecedented Change”

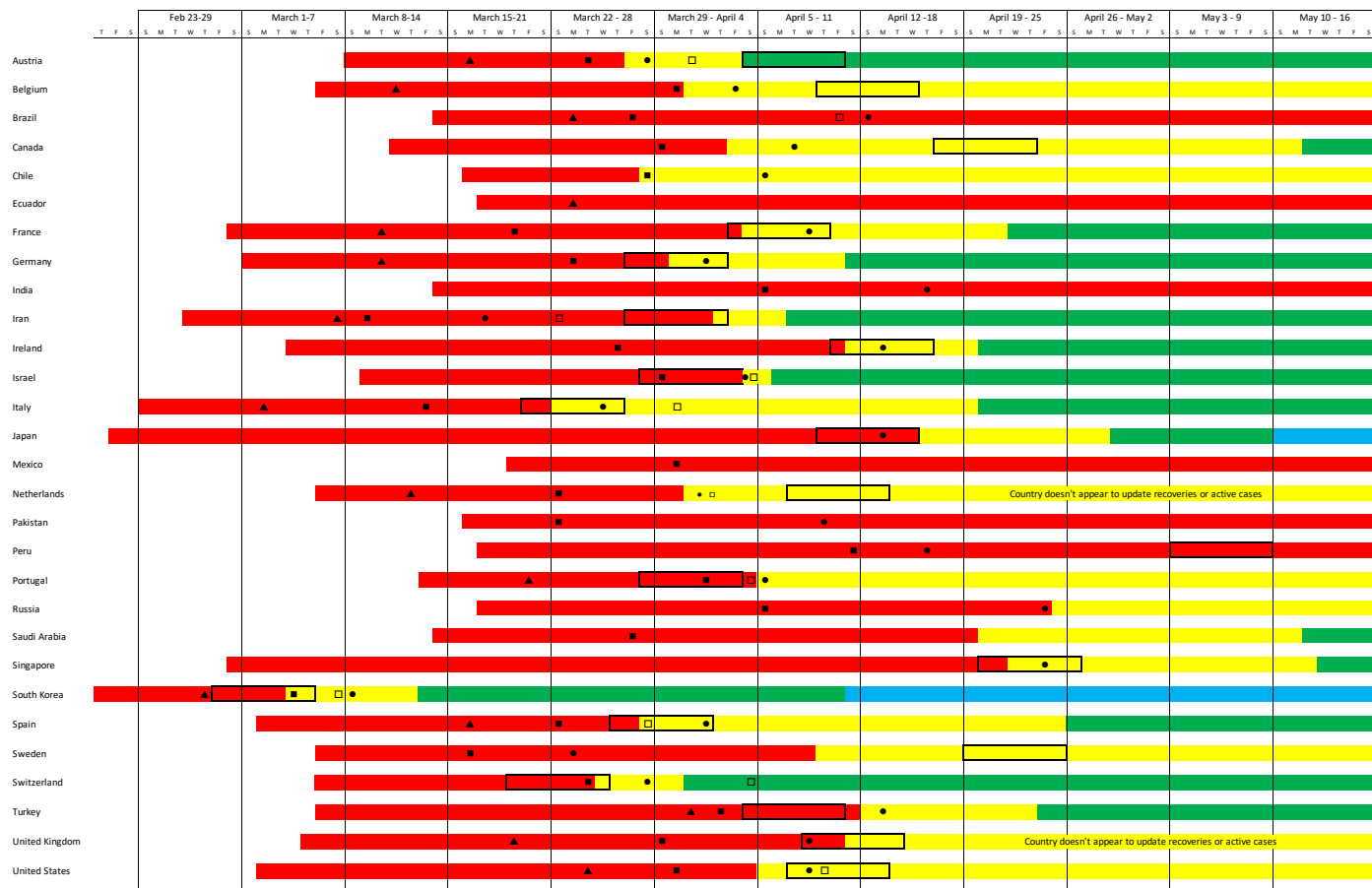
This graphic on the following page illustrates when the country first recorded 100 total cases (start of the “contagion” phase); when growth stopped following an exponential pattern (start of the “containment” phase); and, when peak total cases were recorded (start of the “recovery” phase). It uses symbols to indicate when average daily case growth rates fell (and were sustained) below certain benchmarks, as well as when deaths stopped growing exponentially.

Legend:

Phase		Daily Case Increase (5-Day Moving Average)	Death Rate
	Contagion 100th Case to End of Exponential Growth	 Stabilized < 35%	 No Longer Increasing Exponentially
	Containment End of Exponential Growth to Peak Active Cases	 Stabilized < 20%	
	Recovery Post-Peak Active Cases	 Stabilized < 10%	<u>Peak Infections</u>
	Clear Per IHME Standard, clear to relax social distancing		 Peak 7-Day Average New Daily Infections

Country-by-Country Virus Progression

"Strategic Guidance in an Era of Unprecedented Change"



© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

Country-By-Country Listing of Countries By Total Cases

"Strategic Guidance in an Era of Unprecedented Change"

When we first expanded our tracking to 30 countries in mid-April, they represented the most countries with cases in the world. Since that time, Austria, Israel, Japan and South Korea have dropped in the rankings. These countries have moved up:

- Bangladesh
- Belarus
- Columbia
- Dominican Republic
- Indonesia
- Kuwait
- Poland
- Qatar
- Philippines
- Romania
- South Africa
- UAE
- Ukraine

The original 30 still account for ~90% of all cases worldwide.

Rank	Country	16-May	Rank	Country	6-May	Rank	Country	27-Apr
1	USA	1,507,773	1	USA	1,263,092	1	USA	1,010,356
2	Spain	276,505	2	Spain	253,682	2	Spain	229,422
3	Russia	272,043	3	Italy	214,457	3	Italy	199,414
4	UK	240,161	4	UK	201,101	4	France	165,842
5	Brazil	233,142	5	France	174,191	5	Germany	158,758
6	Italy	224,760	6	Germany	168,162	6	UK	157,149
7	France	179,365	7	Russia	165,929	7	Turkey	112,261
8	Germany	176,244	8	Turkey	131,744	8	Iran	91,472
9	Turkey	148,067	9	Brazil	126,611	9	Russia	87,147
10	Iran	118,392	10	Iran	101,650	10	China	82,830
11	India	90,648	11	China	82,883	11	Brazil	66,501
12	Peru	88,541	12	Canada	63,496	12	Canada	48,500
13	China	82,941	13	Peru	54,817	13	Belgium	46,687
14	Canada	75,864	14	India	52,987	14	Netherlands	38,245
15	Belgium	54,989	15	Belgium	50,781	15	India	29,451
16	Saudi Arabia	52,016	16	Netherlands	41,319	16	Switzerland	29,164
17	Mexico	45,032	17	Saudi Arabia	31,938	17	Peru	28,669
18	Netherlands	43,870	18	Switzerland	30,060	18	Portugal	24,070
19	Chile	41,428	19	Ecuador	29,420	19	Ecuador	23,240
20	Pakistan	38,799	20	Portugal	26,182	20	Ireland	19,648
21	Ecuador	32,763	21	Mexico	26,025	21	Sweden	18,926
23	Switzerland	30,572	22	Sweden	23,918	22	Saudi Arabia	18,811
24	Sweden	29,677	23	Pakistan	23,214	23	Israel	15,555
25	Portugal	28,810	24	Chile	23,048	24	Austria	15,274
27	Singapore	27,356	25	Ireland	22,248	25	Mexico	14,677
28	Ireland	24,048	26	Singapore	20,198	26	Singapore	14,423
35	Israel	16,608	29	Israel	16,310	27	Pakistan	13,915
36	Japan	16,237	31	Austria	15,684	28	Chile	13,813
37	Austria	16,201	32	Japan	15,253	29	Japan	13,614
44	S. Korea	11,037	38	S. Korea	10,806	35	South Korea	10,738
	Others	493,121		Others	356,176		Others	263,943
	World	4,717,010			3,817,382		World	3,062,515

30 countries' share

89.5%

90.7%

91.4%

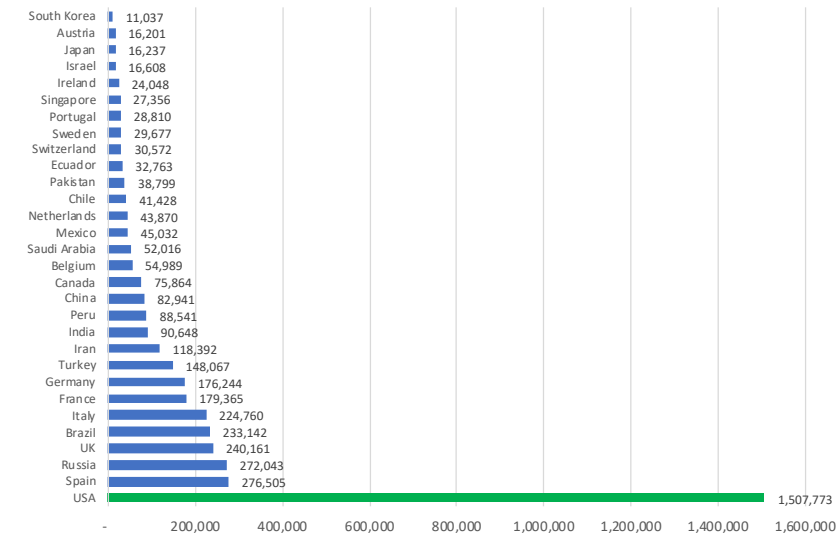
Country-by-Country Cases & Cases Per Capita

"Strategic Guidance in an Era of Unprecedented Change"

Brazil and Russia are moving up in the ranks of most cases; Austria, Israel, Japan and South Korea are dropping; several Asian, Eastern European and South American countries are moving ahead of them, albeit with relatively low case growth rates.

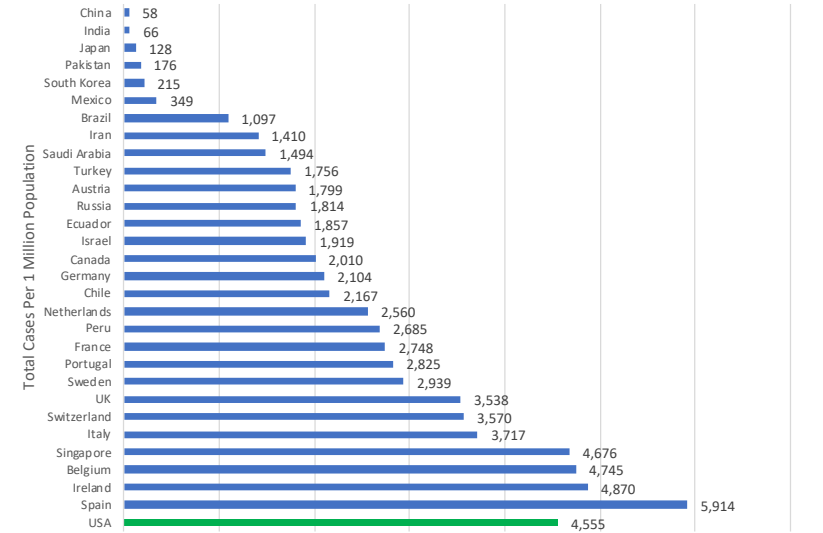
Cases per capita remain the highest in European countries, Singapore and the US.

Total Cases By Country
May 16



© 2020 Health Industry Advisor LLC analysis, using data from World Health Organization

Cases Per Capita By Country
May 16



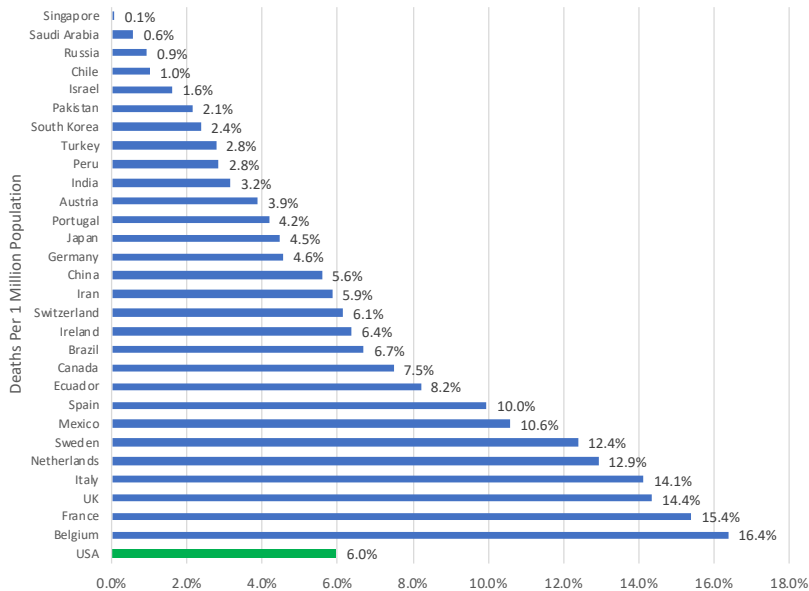
© 2020 Health Industry Advisor LLC analysis, using data from World Health Organization

Deaths Per Cases & Per Capita

"Strategic Guidance in an Era of Unprecedented Change"

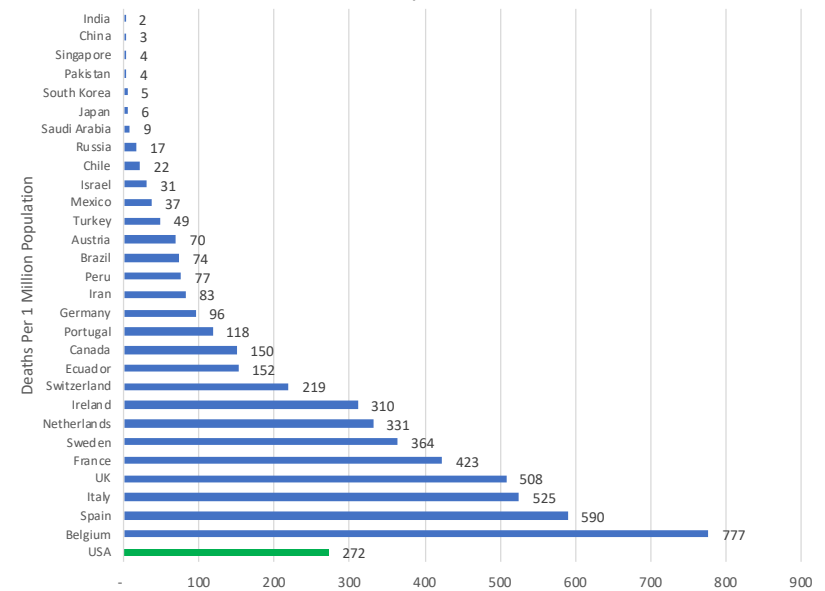
Death rates per case and per capita are the highest in Belgium, France, Italy and the UK. Rates in the US are in the middle of this group of countries

Death Rate By Country
May 16



© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

Deaths Per Capita By Country
May 16



© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

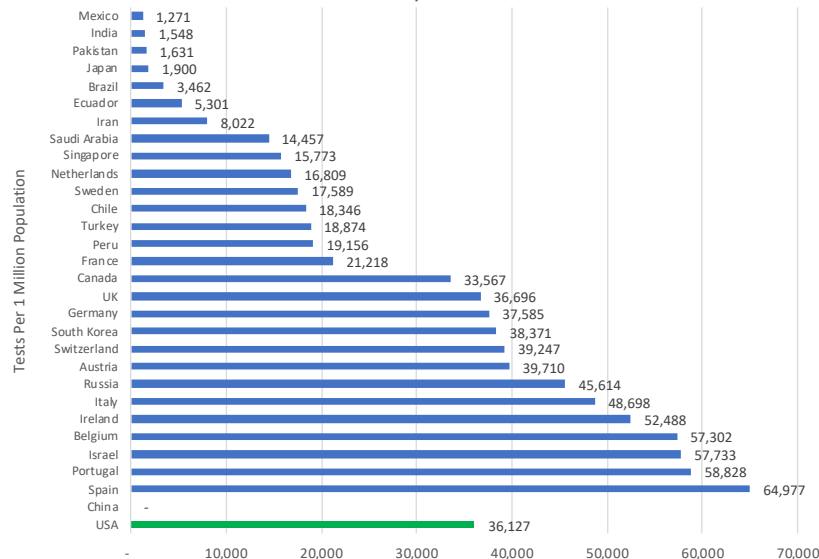
Country-by-Country Tests Per Capita & Case Growth Rate

"Strategic Guidance in an Era of Unprecedented Change"

Testing per capita varies widely among these countries. The US, while ramping up testing over the past several weeks, still lags that of many European countries.

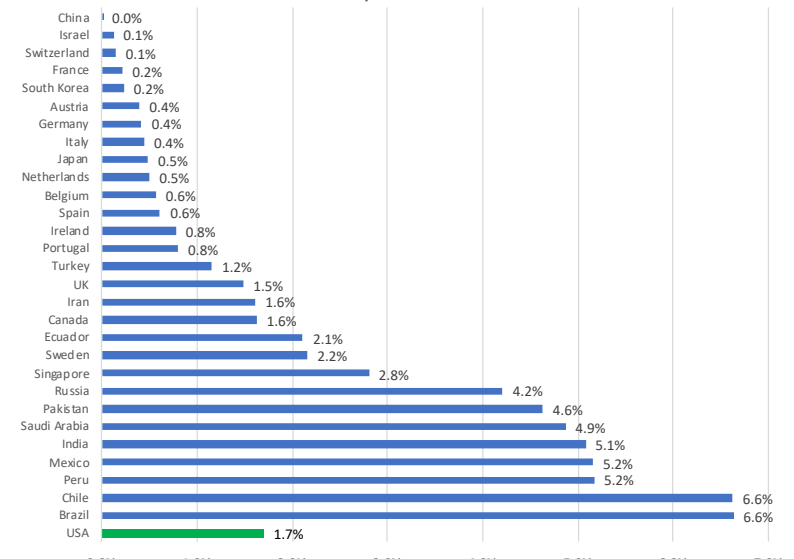
Case growth among the hardest-hit countries has fallen sharply over the past month

Tests Per Capita By Country
May 16



© 2020 Health Industry Advisor LLC analysis, using data from [World Health Organization](#)

Daily Case Growth Rate By Country
May 12 - 16



© 2020 Health Industry Advisor LLC analysis, using data from [World Health Organization](#)

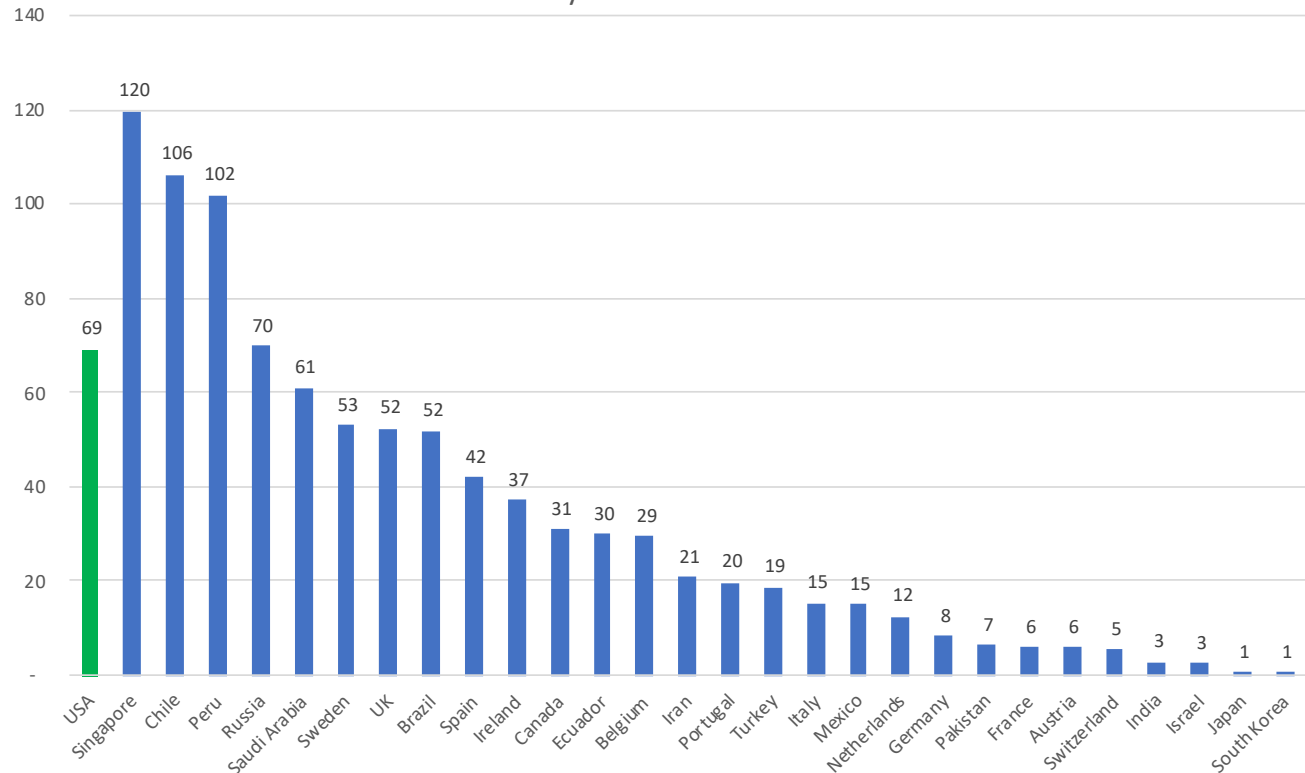
Country-by-Country New Daily Infection Rate

"Strategic Guidance in an Era of Unprecedented Change"

New daily infection rates are declining in most of the hardest-hit countries. Singapore is high but, declining.

Even in countries with newly-emerging virus-spread - Brazil, India, Mexico and Saudi Arabia - infection rates appear relatively low. Chile and Peru are the exceptions.

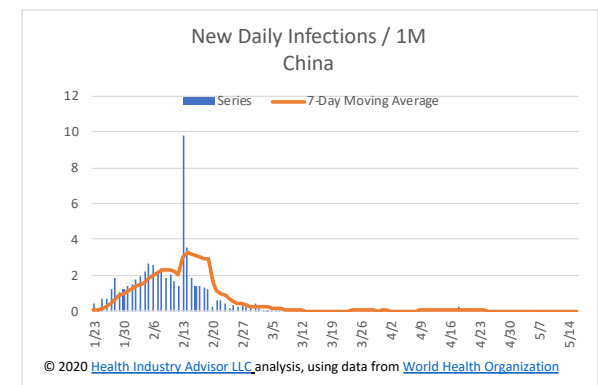
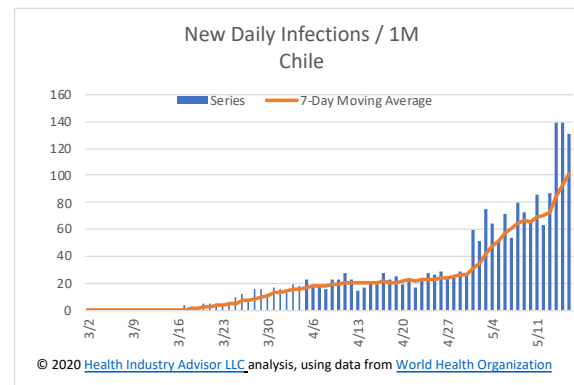
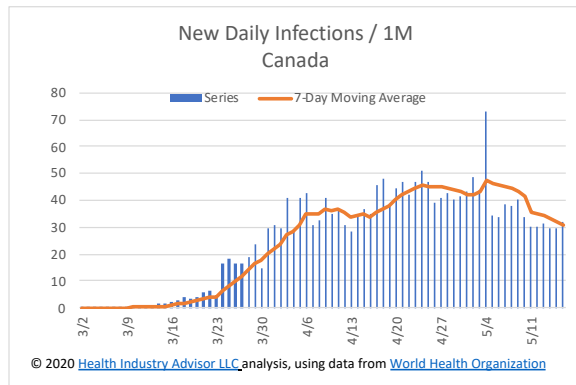
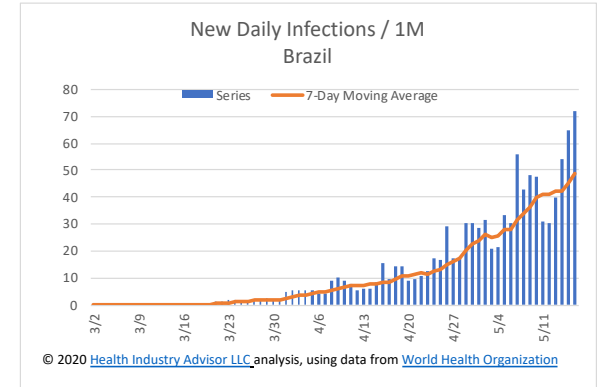
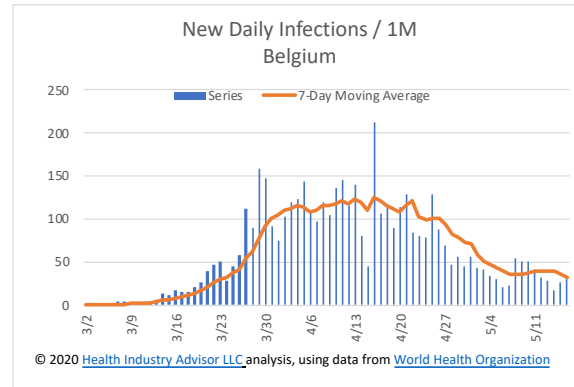
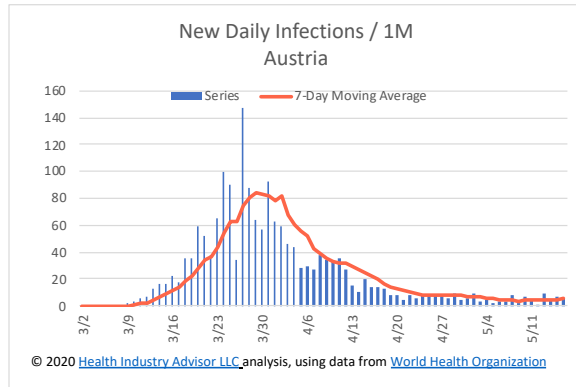
New Daily Infection Rates Per 1 Million Population By Country
May 10 - 16



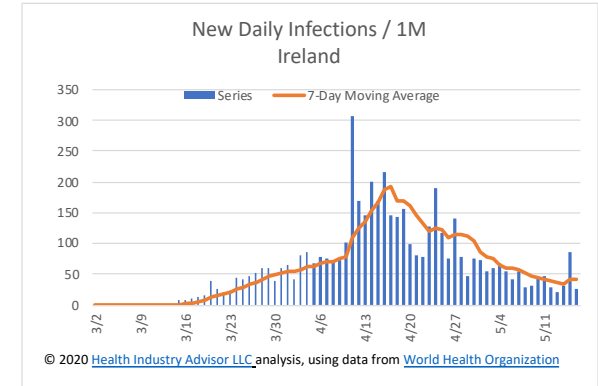
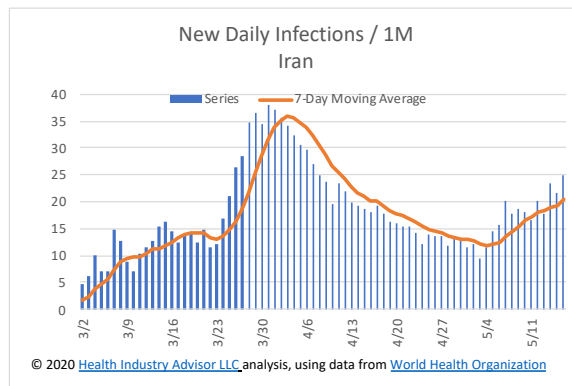
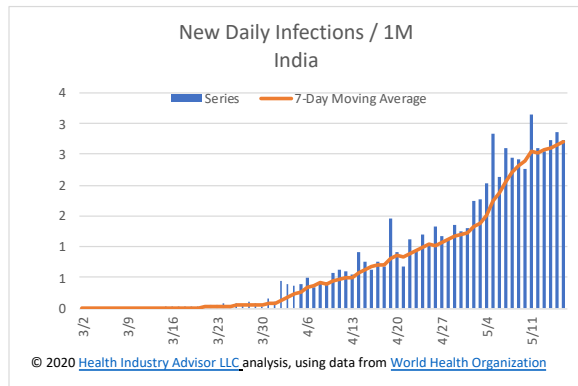
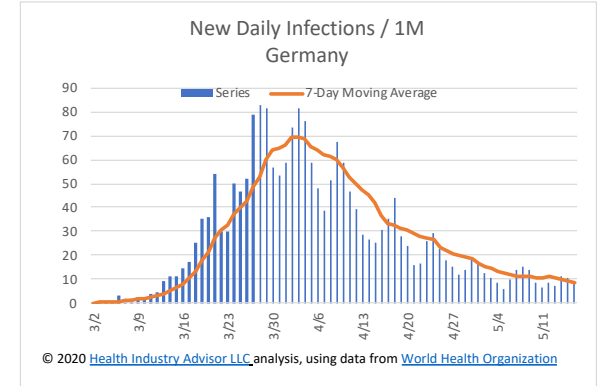
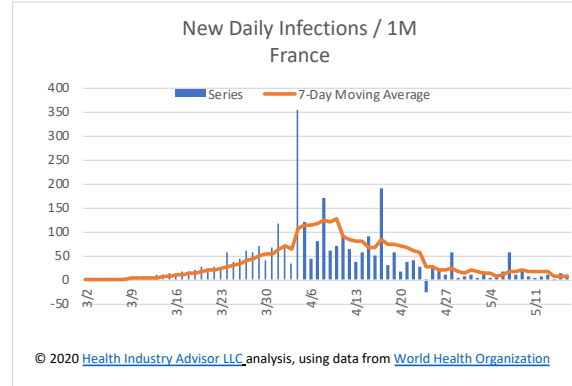
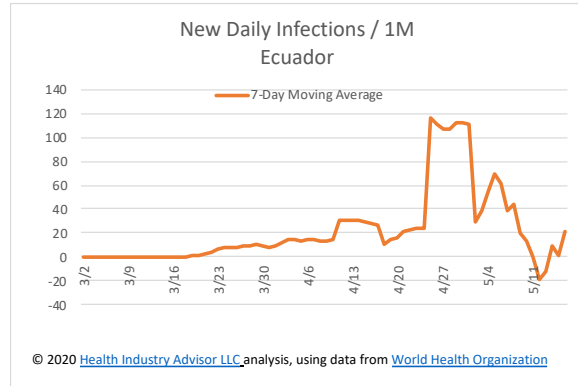
© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

New Daily Infection Rate Time Series

"Strategic Guidance in an Era of Unprecedented Change"

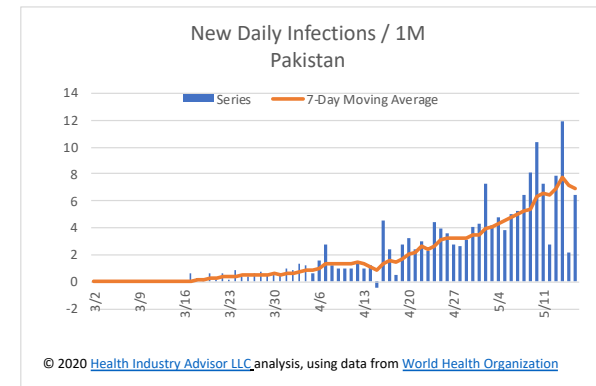
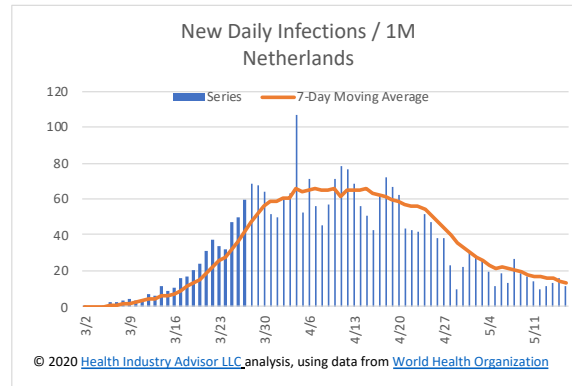
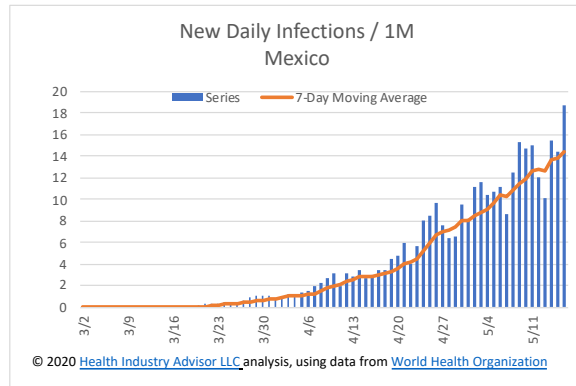
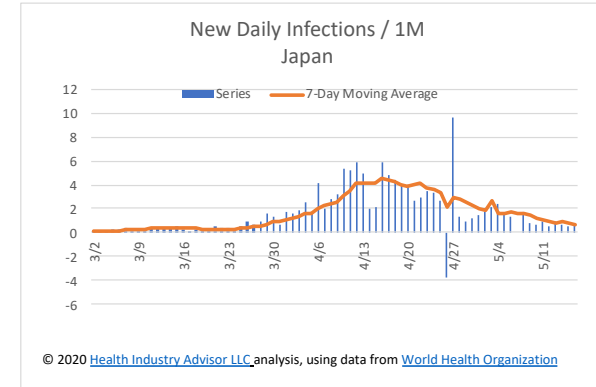
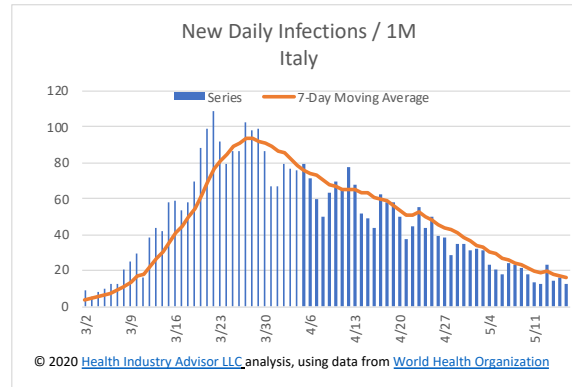
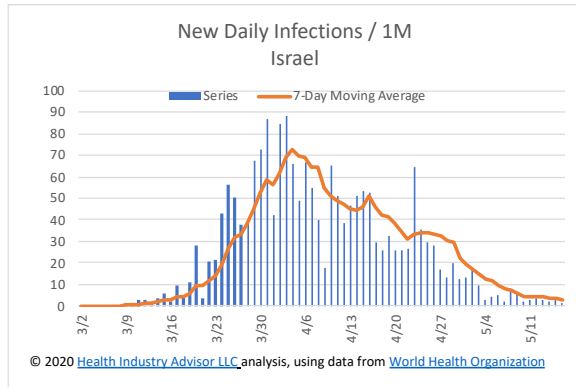


"Strategic Guidance in an Era of Unprecedented Change"

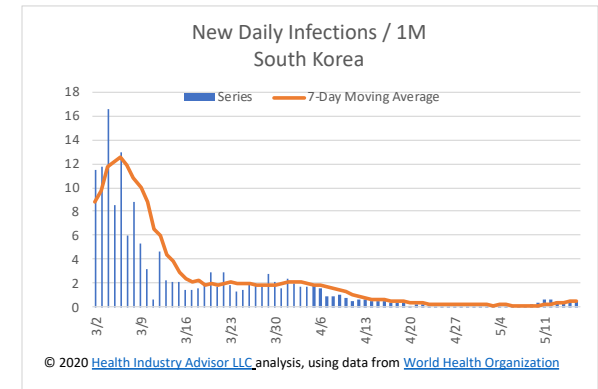
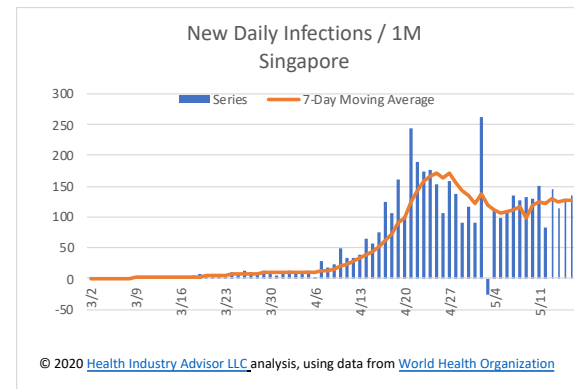
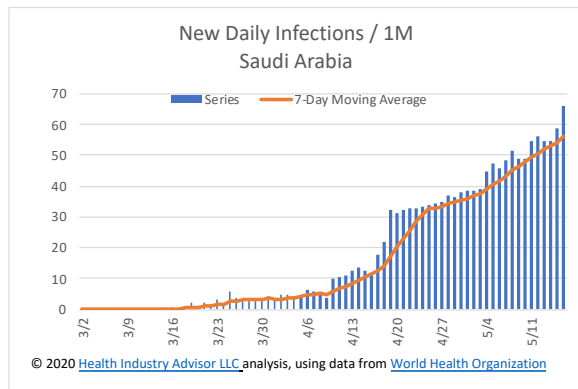
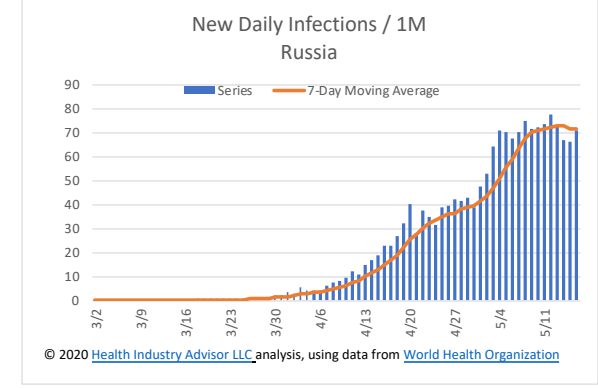
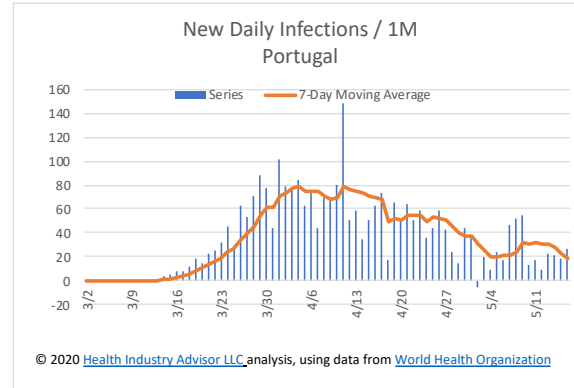
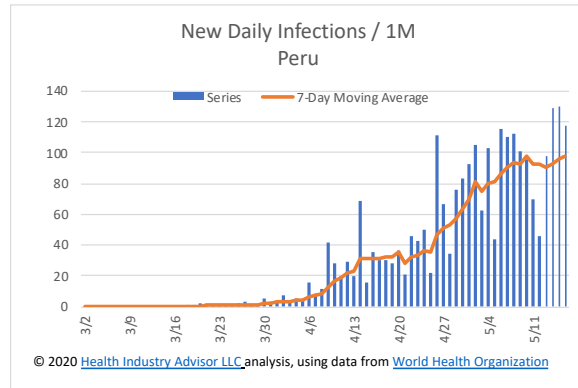


New Daily Infection Rate Time Series

"Strategic Guidance in an Era of Unprecedented Change"



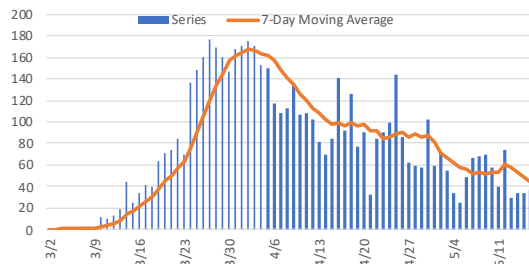
"Strategic Guidance in an Era of Unprecedented Change"



New Daily Infection Rate Time Series

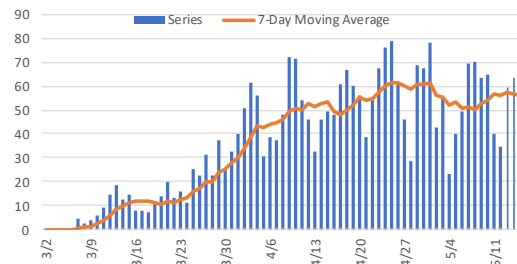
"Strategic Guidance in an Era of Unprecedented Change"

New Daily Infections / 1M
Spain



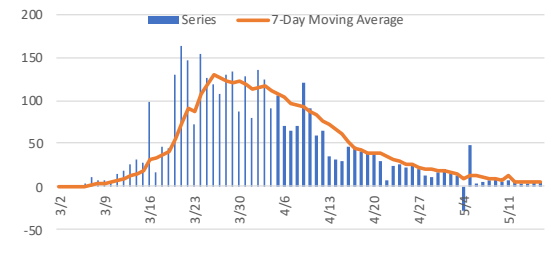
© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

New Daily Infections / 1M
Sweden



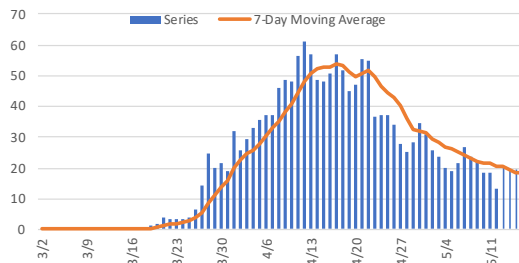
© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

New Daily Infections / 1M
Switzerland



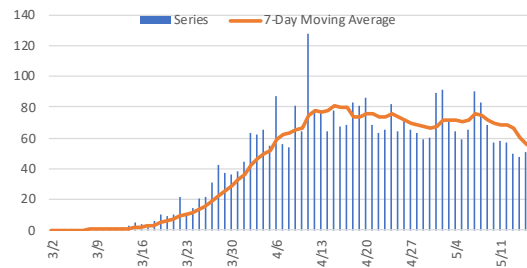
© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

New Daily Infections / 1M
Turkey



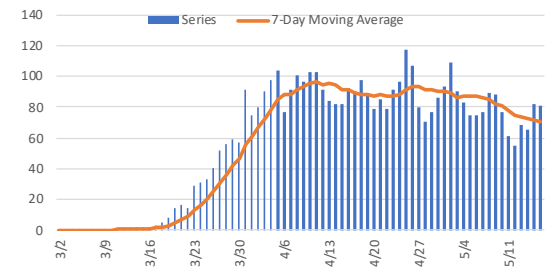
© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

New Daily Infections / 1M
United Kingdom



© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

New Daily Infections / 1M
United States



© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

UNITED STATES & STATE-BY-STATE INFORMATION

State-by-State Comparative Statistics

“Strategic Guidance in an Era of Unprecedented Change”

As of May 16

State	Total Cases	Rank	Cases per 1M Population	Rank2	Deaths	Rank3	Death Rate	Rank4	Deaths per 1 Million Population	Rank5	5-day Moving Average Case Growth Rate	Rank6	Tests per 1M Population Past 7 days	Rank7	New Daily Cases Per 1M Population (5-Day M.A.)	Rank8
Alabama	11,674	(26)	2,380.9	(28)	485	(25)	4.2%	(30)	98.9	(25)	2.8%	(15)	816	(30)	58.4	(22)
Alaska	392	(51)	535.9	(49)	10	(50)	2.6%	(42)	13.7	(49)	0.6%	(48)	1,334	(13)	2.7	(49)
Arizona	13,631	(23)	1,872.7	(35)	679	(20)	5.0%	(18)	93.3	(27)	3.7%	(3)	350	(49)	52.4	(29)
Arkansas	4,578	(39)	1,517.0	(41)	98	(40)	2.1%	(46)	32.5	(46)	2.5%	(19)	763	(35)	39.3	(36)
California	78,685	(5)	1,991.4	(34)	3,208	(8)	4.1%	(31)	81.2	(30)	2.6%	(17)	964	(25)	43.4	(33)
Colorado	21,633	(17)	3,756.6	(17)	1,192	(16)	5.5%	(11)	207.0	(14)	1.7%	(34)	622	(43)	56.0	(24)
Connecticut	36,703	(12)	10,294.5	(5)	3,339	(7)	9.1%	(2)	936.5	(3)	1.7%	(35)	1,650	(6)	149.0	(7)
Delaware	7,547	(33)	7,750.3	(7)	286	(34)	3.8%	(34)	293.7	(12)	2.8%	(14)	1,535	(8)	186.3	(3)
District Of Columbia	7,042	(35)	9,978.1	(6)	375	(28)	5.3%	(14)	531.4	(6)	2.0%	(30)	1,488	(9)	190.3	(2)
Florida	44,811	(9)	2,086.4	(33)	1,965	(10)	4.4%	(26)	91.5	(28)	1.8%	(33)	681	(40)	32.0	(38)
Georgia	37,212	(11)	3,504.8	(19)	1,598	(14)	4.3%	(28)	150.5	(16)	1.8%	(32)	1,154	(18)	62.3	(21)
Hawaii	639	(49)	451.3	(50)	17	(48)	2.7%	(41)	12.0	(51)	0.2%	(50)	466	(48)	0.8	(51)
Idaho	2,419	(43)	1,349.8	(43)	73	(42)	3.0%	(39)	40.7	(43)	1.4%	(42)	309	(50)	15.1	(46)
Illinois	92,457	(3)	7,296.3	(9)	4,129	(6)	4.5%	(22)	325.8	(10)	3.2%	(7)	1,638	(7)	184.6	(4)
Indiana	27,280	(16)	4,052.2	(16)	1,741	(12)	6.4%	(8)	258.6	(13)	2.1%	(28)	757	(36)	75.3	(17)
Iowa	14,328	(22)	4,541.3	(14)	346	(30)	2.4%	(44)	109.7	(24)	3.0%	(10)	1,124	(19)	120.3	(10)
Kansas	7,916	(31)	2,717.2	(22)	194	(36)	2.5%	(43)	66.6	(35)	2.1%	(27)	572	(46)	53.6	(27)
Kentucky	7,688	(32)	1,720.8	(38)	334	(31)	4.3%	(27)	74.8	(32)	2.9%	(12)	1,320	(14)	39.9	(35)
Louisiana	34,117	(13)	7,338.9	(8)	2,479	(9)	7.3%	(4)	533.3	(5)	1.4%	(41)	1,462	(11)	83.0	(16)
Maine	1,648	(45)	1,226.0	(46)	70	(43)	4.2%	(29)	52.1	(39)	2.4%	(20)	26	(51)	25.5	(42)
Maryland	37,968	(10)	6,280.2	(10)	1,957	(11)	5.2%	(17)	323.7	(11)	2.6%	(16)	807	(33)	152.0	(6)
Massachusetts	84,933	(4)	12,221.4	(3)	5,705	(3)	6.7%	(7)	820.9	(4)	1.6%	(38)	1,471	(10)	168.4	(5)
Michigan	50,504	(7)	5,057.0	(13)	4,880	(4)	9.7%	(1)	488.6	(7)	1.2%	(45)	1,208	(17)	53.6	(26)
Minnesota	14,969	(21)	2,654.3	(23)	709	(19)	4.7%	(20)	125.7	(20)	4.9%	(1)	938	(26)	105.9	(13)
Mississippi	11,123	(27)	3,737.4	(18)	510	(23)	4.6%	(21)	171.4	(15)	2.8%	(13)	1,296	(15)	83.8	(15)
Missouri	10,832	(28)	1,764.9	(36)	596	(22)	5.5%	(12)	97.1	(26)	1.3%	(43)	709	(38)	23.8	(43)
Montana	468	(50)	437.9	(51)	16	(49)	3.4%	(37)	15.0	(48)	0.4%	(49)	637	(41)	1.3	(50)
Nebraska	10,220	(29)	5,283.3	(11)	123	(39)	1.2%	(48)	63.6	(37)	3.6%	(4)	1,256	(16)	146.7	(8)
Nevada	6,662	(36)	2,162.9	(31)	349	(29)	5.2%	(16)	113.3	(23)	1.6%	(37)	814	(31)	29.4	(40)
New Hampshire	3,556	(42)	2,615.3	(24)	171	(37)	4.8%	(19)	125.8	(19)	2.4%	(22)	1,090	(20)	57.3	(23)
New Jersey	146,389	(2)	16,481.2	(2)	10,260	(2)	7.0%	(5)	1,155.1	(2)	0.7%	(46)	2,734	(2)	125.6	(9)
New Mexico	5,847	(37)	2,788.5	(21)	259	(35)	4.4%	(23)	123.5	(21)	2.9%	(11)	2,125	(3)	72.8	(19)
New York	358,099	(1)	18,407.9	(1)	28,134	(1)	7.9%	(3)	1,446.2	(1)	0.6%	(47)	1,652	(5)	107.9	(12)
North Carolina	18,130	(19)	1,728.6	(37)	676	(21)	3.7%	(35)	64.5	(36)	3.5%	(5)	711	(37)	49.7	(30)
North Dakota	1,848	(44)	2,425.0	(27)	42	(47)	2.3%	(45)	55.1	(38)	4.0%	(2)	1,791	(4)	72.0	(20)
Ohio	27,478	(15)	2,350.7	(29)	1,614	(13)	5.9%	(9)	138.1	(17)	2.1%	(26)	611	(44)	46.2	(31)
Oklahoma	5,237	(38)	1,323.5	(44)	288	(33)	5.5%	(13)	72.8	(34)	2.6%	(18)	994	(23)	27.0	(41)
Oregon	5,612	(41)	856.4	(47)	137	(38)	3.8%	(33)	32.5	(45)	1.9%	(31)	595	(45)	15.3	(45)
Pennsylvania	65,307	(6)	5,101.3	(12)	4,489	(5)	6.9%	(6)	350.6	(9)	1.5%	(39)	566	(47)	73.9	(18)
Rhode Island	12,434	(24)	11,737.3	(4)	489	(24)	3.9%	(32)	461.6	(8)	1.7%	(36)	2,787	(1)	194.9	(1)
South Carolina	8,661	(30)	1,682.2	(39)	380	(27)	4.4%	(25)	73.8	(33)	2.1%	(24)	795	(34)	31.4	(39)
South Dakota	3,959	(40)	4,475.2	(15)	44	(46)	1.1%	(49)	49.7	(40)	2.4%	(21)	844	(29)	91.4	(14)
Tennessee	17,288	(20)	2,530.0	(25)	295	(32)	1.7%	(47)	43.2	(42)	2.1%	(23)	1,410	(12)	52.7	(28)
Texas	47,672	(8)	1,644.1	(40)	1,340	(15)	2.8%	(40)	46.2	(41)	3.1%	(9)	932	(27)	44.5	(32)
Utah	7,068	(34)	2,204.6	(30)	78	(41)	1.1%	(50)	24.3	(47)	2.1%	(25)	1,046	(22)	43.0	(34)
Vermont	934	(47)	1,496.8	(42)	53	(45)	5.7%	(10)	84.9	(29)	0.2%	(51)	629	(42)	3.0	(48)
Virginia	29,683	(14)	3,477.6	(20)	1,002	(18)	3.4%	(38)	117.4	(22)	3.4%	(6)	810	(32)	108.6	(11)
Washington	19,211	(18)	2,522.8	(26)	1,015	(17)	5.3%	(15)	133.3	(18)	1.4%	(40)	703	(39)	33.5	(37)
West Virginia	1,457	(46)	815.3	(48)	64	(44)	4.4%	(24)	35.8	(44)	1.3%	(44)	991	(24)	8.8	(47)
Wisconsin	12,187	(25)	2,093.1	(32)	453	(26)	3.7%	(36)	77.8	(31)	3.2%	(8)	847	(28)	55.2	(25)
Wyoming	741	(48)	1,280.3	(45)	7	(51)	0.9%	(51)	12.1	(50)	2.1%	(29)	1,073	(21)	21.7	(44)
United States	1,507,773		4,555.2		90,113		6.0%		272.2		1.7%		1,021		69.3	

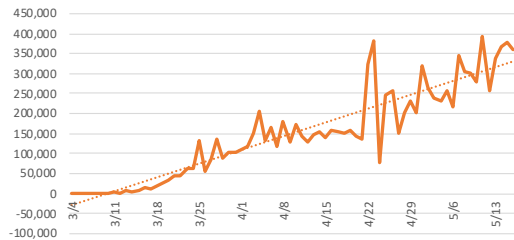
© 2020 [Health Industry Advisor LLC](#) analysis, using data from [Covid Tracking Project](#) and [World Health Organization](#)

United States Overall Statistics

"Strategic Guidance in an Era of Unprecedented Change"

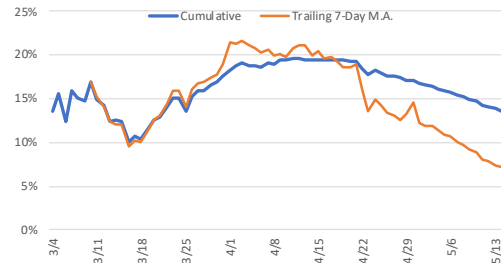
With significantly increased testing, the US is now meeting the WHO standard of <10% test-positives. This suggests that asymptomatic cases are being captured and that we have a better view of true infection rates.

New Daily Tests - US



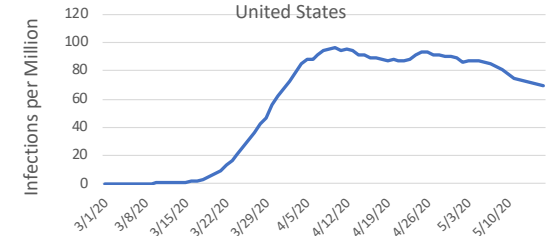
© 2020 [Health Industry Advisor LLC](#) analysis, using data from [Covid Tracking Project](#)

Test-Positive Rate



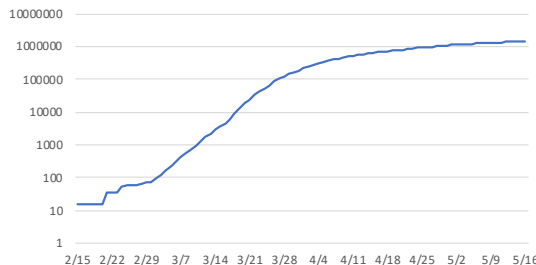
© 2020 [Health Industry Advisor LLC](#) analysis, using data from [Covid Tracking Project](#)

New Daily Infections Per 1M
Trailing 7-Day Moving Average
United States



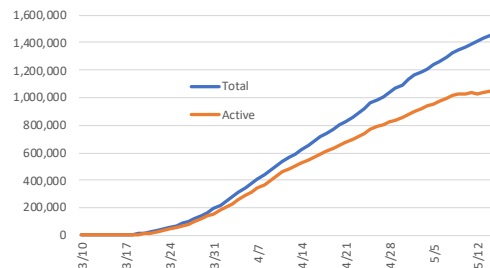
© [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

Total Cases Log Scale - US



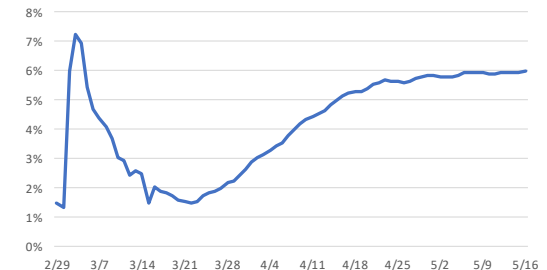
© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

Cases - US



© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

Deaths Per Case - US

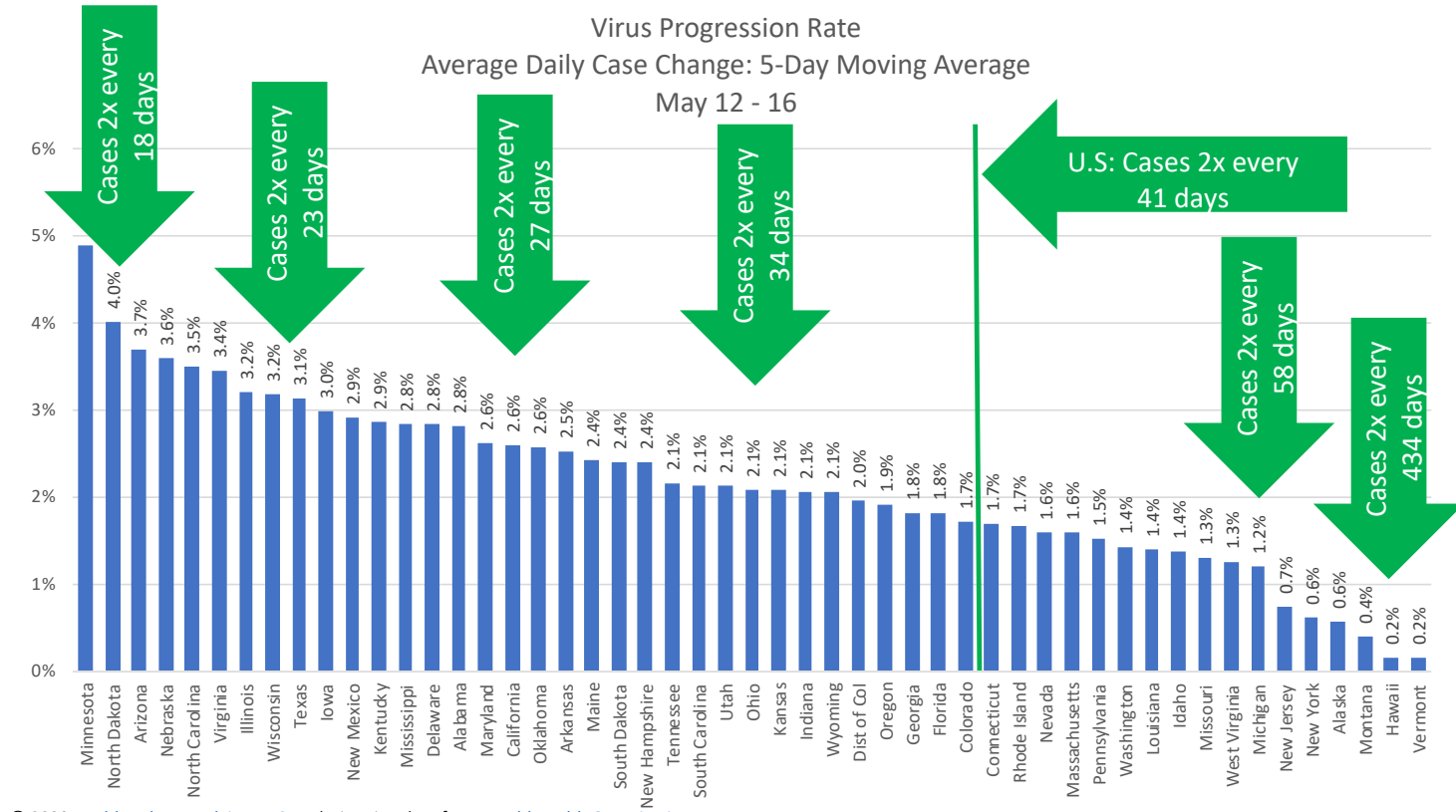


© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

State-by-State Average Daily Case Growth

"Strategic Guidance in an Era of Unprecedented Change"

Just 1 month ago, cases in every state were doubling every 1 – 3 weeks.
Now, they would take 2 weeks to more than 1 year to double

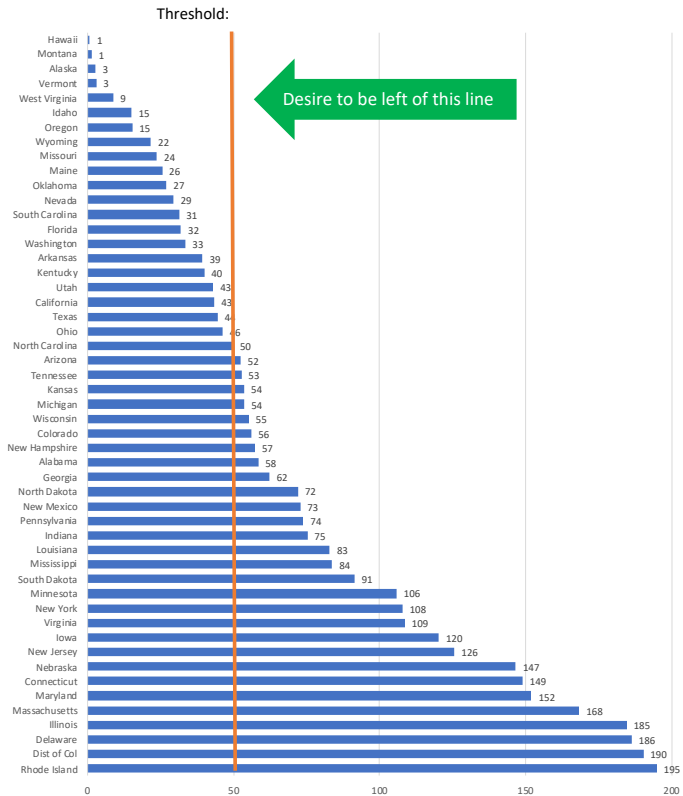


© 2020 Health Industry Advisor LLC analysis using data from World Health Organization

State-by-State New Daily Infections & Tests Per Capita

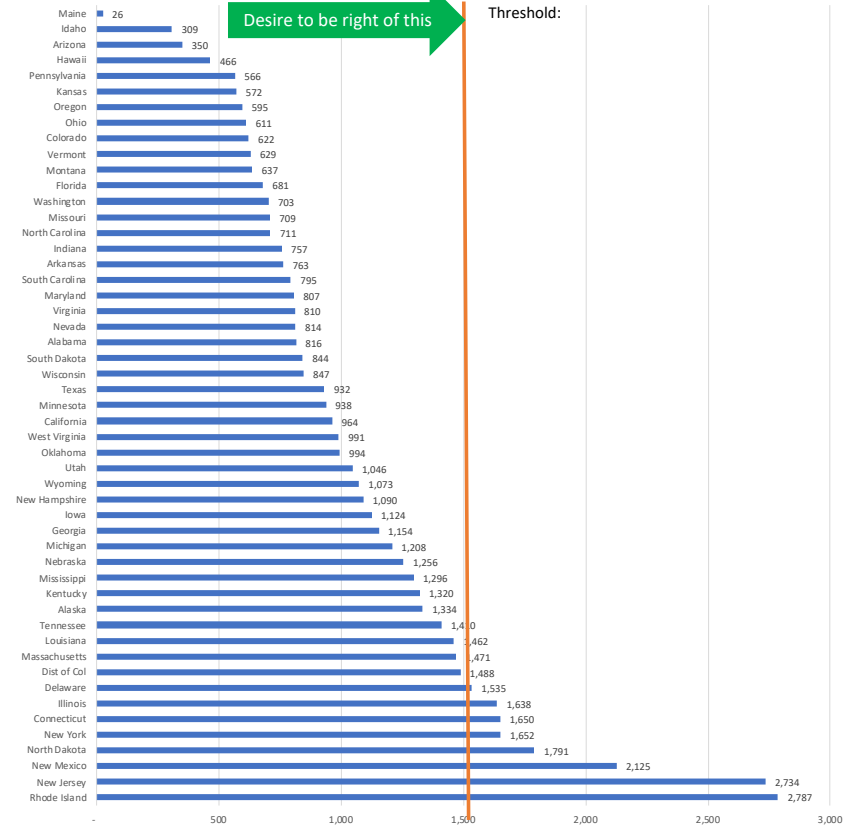
"Strategic Guidance in an Era of Unprecedented Change"

New Daily Infections Per 1 Million Population
By State
May 10 - 16



© 2020 Health Industry Advisor LLC analysis, using data from [World Health Organization](#)

Daily Tests Per 1 Million Population
By State
May 10 - 16

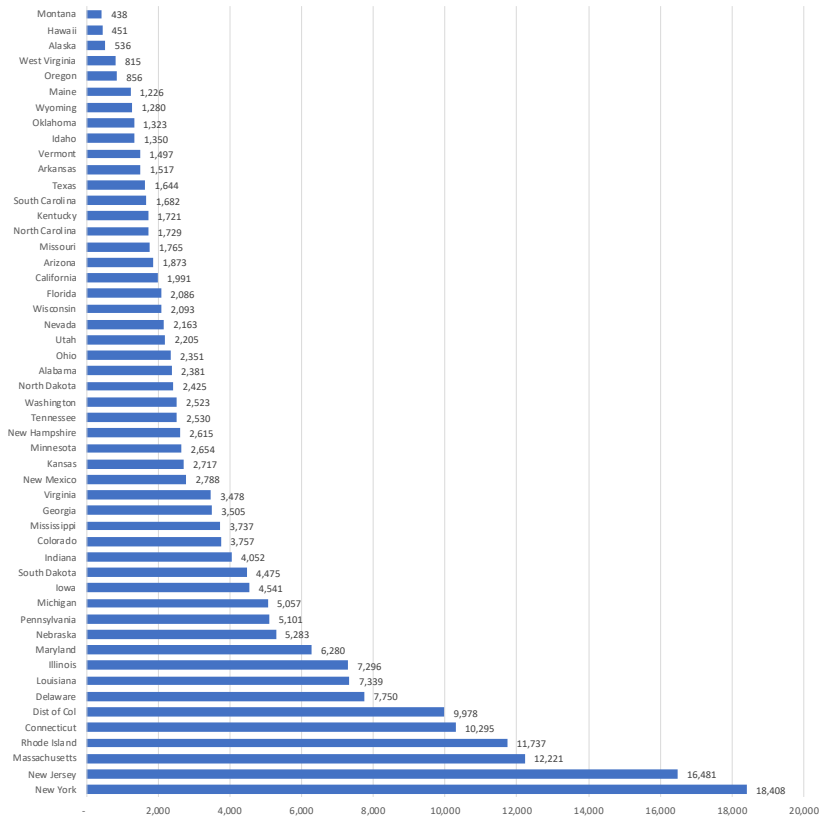


© 2020 Health Industry Advisor LLC analysis, using data from [World Health Organization](#)

State-by-State Cases & Deaths Per Capita

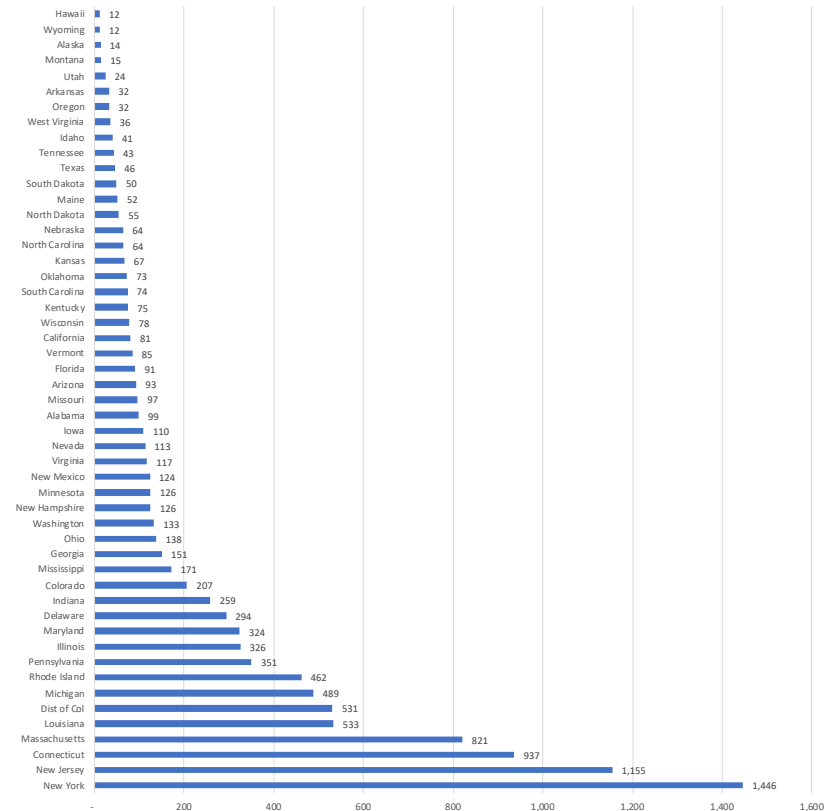
"Strategic Guidance in an Era of Unprecedented Change"

Total Cases Per 1 Million Population
By State
As of May 16



© 2020 Health Industry Advisor LLC analysis, using data from [World Health Organization](#)

Deaths Per 1 Million Population
By State
As of May 16

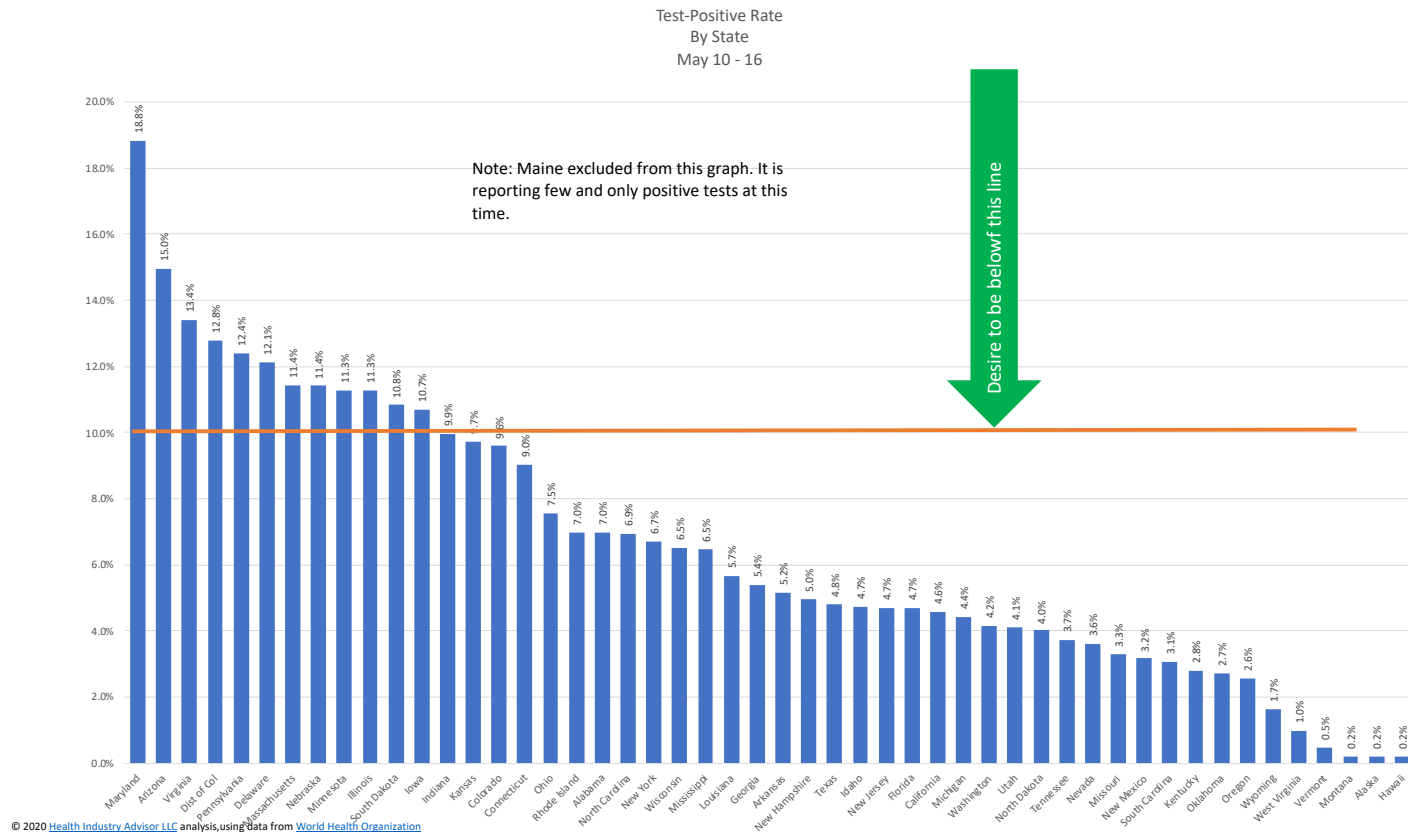


© 2020 Health Industry Advisor LLC analysis, using data from [World Health Organization](#)

Which States Are Performing Sufficient Tests?

"Strategic Guidance in an Era of Unprecedented Change"

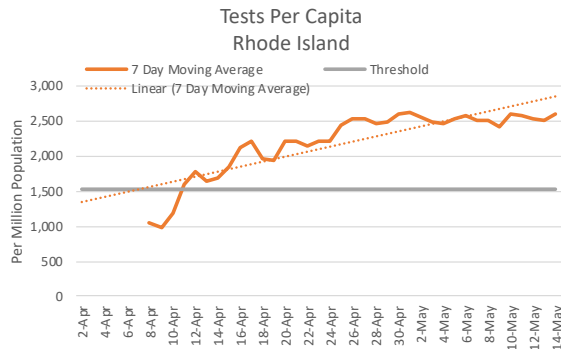
The [World Health Organization](#) suggested that the test-positive rate should be 10% or lower, for testing to be sufficient to assess the true prevalence of the virus. All except 11 states and the District of Columbia effectively met this guideline for the past week.



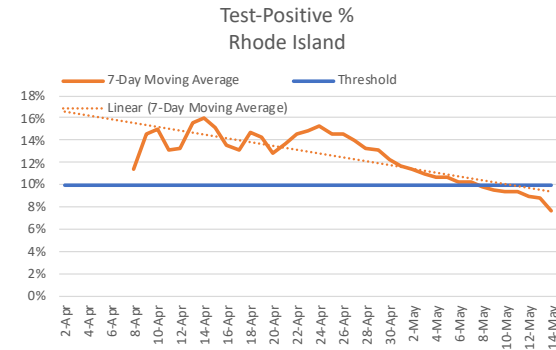
Which States Are Performing Sufficient Tests?

"Strategic Guidance in an Era of Unprecedented Change"

What sufficient testing looks like: high volume of tests, with low test-positive rates . . .

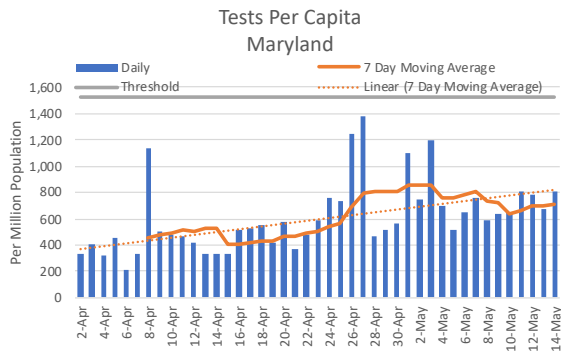


© 2020 [Health Industry Advisor LLC](#) analysis, using data from [Covid Tracking Project](#)

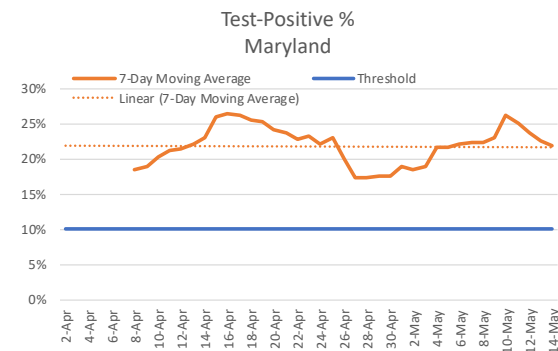


© 2020 [Health Industry Advisor LLC](#) analysis, using data from [Covid Tracking Project](#)

What insufficient testing looks like: low volume of tests, with high test-positive rates . . .



© 2020 [Health Industry Advisor LLC](#) analysis, using data from [Covid Tracking Project](#)

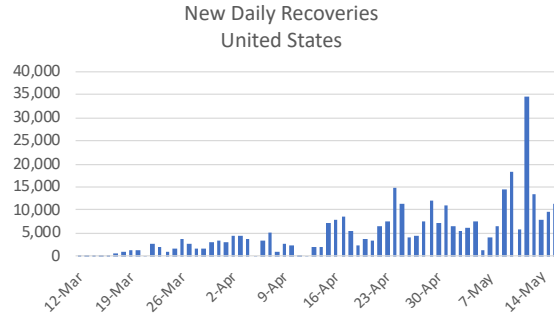


© 2020 [Health Industry Advisor LLC](#) analysis, using data from [Covid Tracking Project](#)

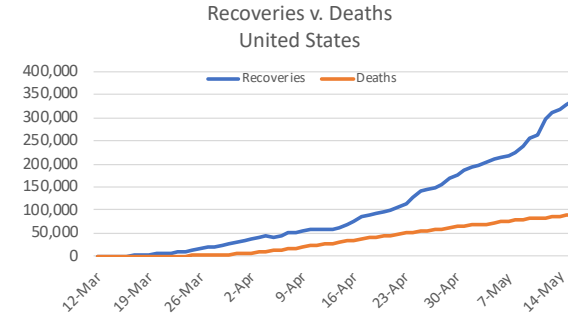
UNDER-REPORTED RECOVERIES? POSSIBLE LAG IN STATE REPORTING

United States Recoveries

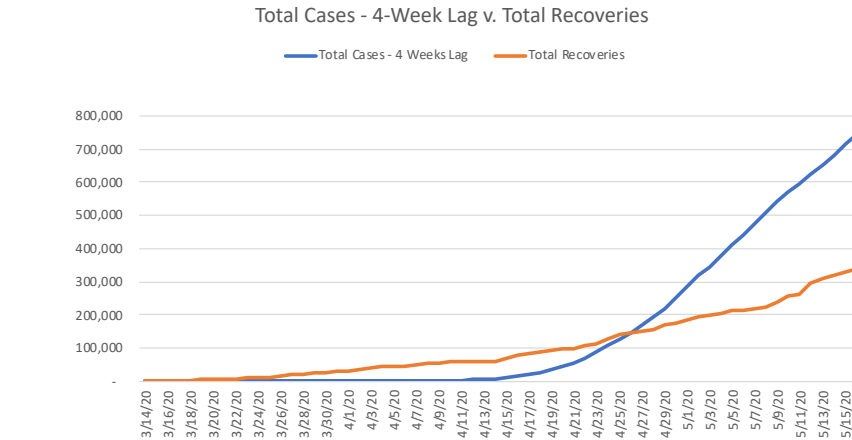
"Strategic Guidance in an Era of Unprecedented Change"



© Health Industry Advisor LLC analysis, using data from [World Health Organization](#)



© Health Industry Advisor LLC analysis, using data from [World Health Organization](#)



© 2020 Health Industry Advisor LLC analysis, using data from [World Health Organization](#)

"Strategic Guidance in an Era of Unprecedented Change"

Which states seem to be lagging in reporting?

At this point, we should be expecting far more recoveries in the U.S.

Comparing the reported recoveries to Total Cases 4 weeks ago*, this shortfall is ~250-325k

* - 4 weeks is the presumed time from infection-onset to recovery referenced by many states

State	Recoveries	Expected Recoveries		State	Recoveries	Expected Recoveries	
		Low	High			Low	High
Alabama	20	3,778	4,251	Montana	431	341	383
Alaska	343	251	283	Nebraska	22	1,030	1,158
Arizona	70	3,775	4,247	Nevada	5,039	2,901	3,263
Arkansas	3,472	1,391	1,565	New Hampshire	1,258	1,074	1,208
California	13,051	24,574	27,646	New Jersey	3,357	65,136	73,278
Colorado	1,491	7,546	8,490	New Mexico	1,739	1,438	1,618
Connecticut	6,264	14,040	15,795	New York	61,397	192,833	216,937
Delaware	3,367	2,030	2,284	North Carolina	9,115	5,093	5,729
District Of Columbia	998	2,133	2,399	North Dakota	1,111	422	475
Florida	7,638	20,394	22,943	Ohio	4,168	8,178	9,200
Georgia	340	14,273	16,057	Oklahoma	3,945	2,056	2,313
Hawaii	572	459	517	Oregon	1,406	1,475	1,660
Idaho	1,379	1,334	1,501	Pennsylvania	6,549	25,385	28,558
Illinois	2,168	23,328	26,244	Rhode Island	886	3,593	4,042
Indiana	1,869	8,513	9,577	South Carolina	6,043	3,397	3,821
Iowa	6,927	2,010	2,262	South Dakota	2,673	1,234	1,388
Kansas	2,477	1,432	1,611	Tennessee	9,529	5,410	6,086
Kentucky	2,768	2,166	2,436	Texas	26,870	14,943	16,811
Louisiana	22,608	18,864	21,222	Utah	3,718	2,345	2,638
Maine	1,012	678	762	Vermont	804	642	723
Maryland	2,806	9,846	11,077	Virginia	3,678	6,442	7,248
Massachusetts	27,812	29,098	32,735	Washington	4,770	9,442	10,622
Michigan	28,234	24,633	27,712	West Virginia	889	660	743
Minnesota	10,271	1,770	1,992	Wisconsin	6,193	3,359	3,779
Mississippi	6,268	3,179	3,577	Wyoming	498	338	380
Missouri	2,807	4,414	4,965				
				United States	339,232	591,034	664,913

Low = 80% of Total Cases 4 week ago
High = 90% of Total Cases 4 week ago

- States seemingly up-to-date with reporting recoveries
 - States only reporting ~ 1/2 expected recoveries
 - States well-behind in reporting recoveries

VIRUS PROGRESSION: ROADMAP TO RECOVERY

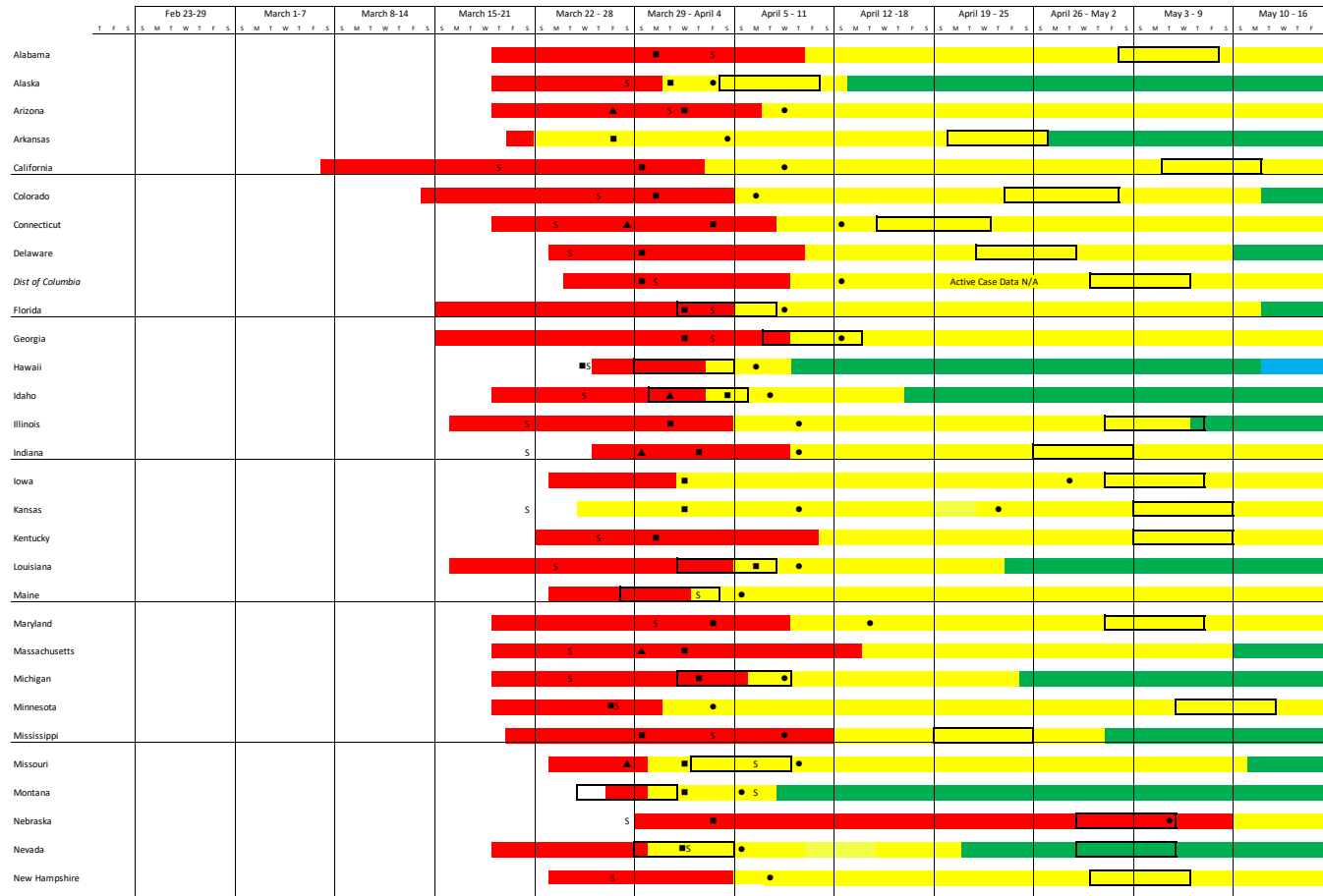
"Strategic Guidance in an Era of Unprecedented Change"

The graphic on the following two pages illustrates when the state first recorded 100 total cases (start of the "contagion" phase); when growth stopped following an exponential pattern (start of the "containment" phase); and, when peak total cases were recorded (start of the "recovery" phase). It uses symbols to indicate when average daily case growth rates fell (and were sustained) below certain benchmarks, as well as when deaths stopped growing exponentially.

A state is not shaded green until active cases appear to have peaked.

State-by-State Virus Progression – 1 of 2

“Strategic Guidance in an Era of Unprecedented Change”

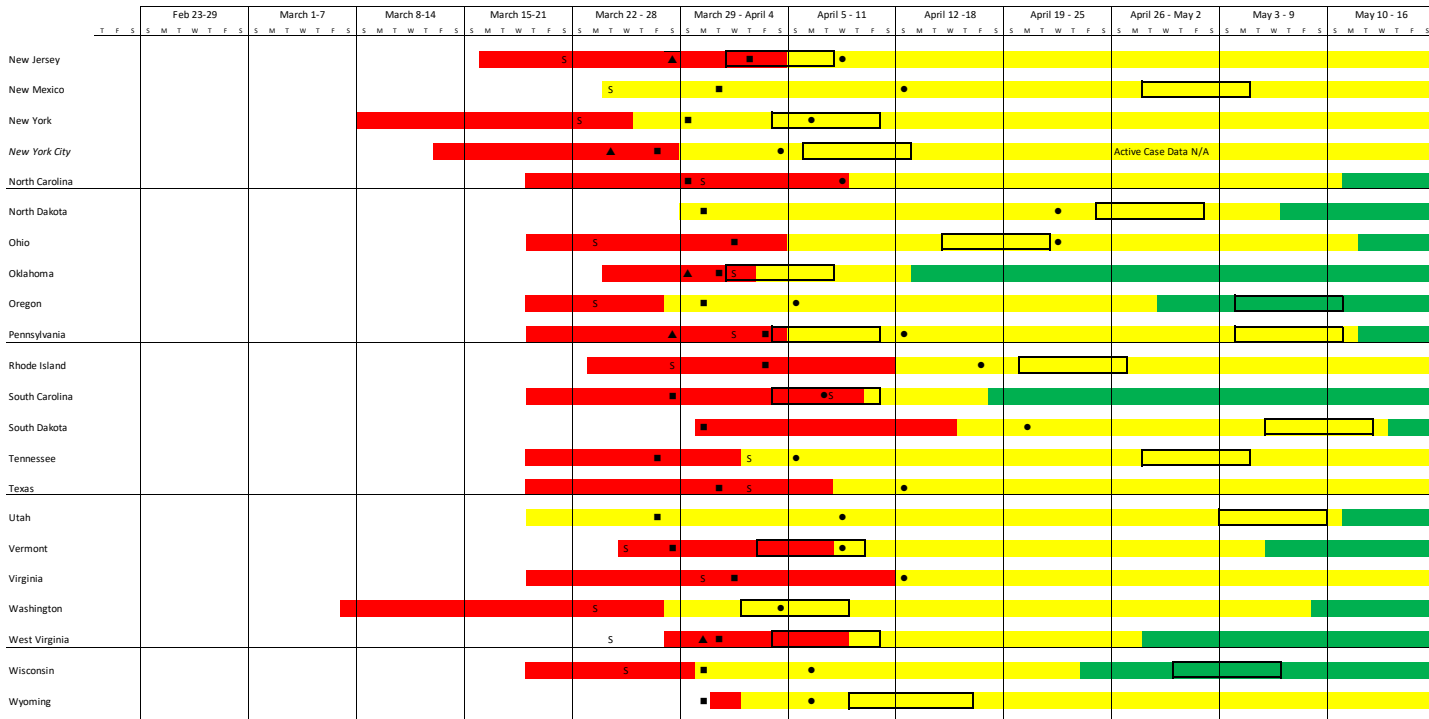


Legend on following page

© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

State-by-State Virus Progression – 2 of 2

“Strategic Guidance in an Era of Unprecedented Change”



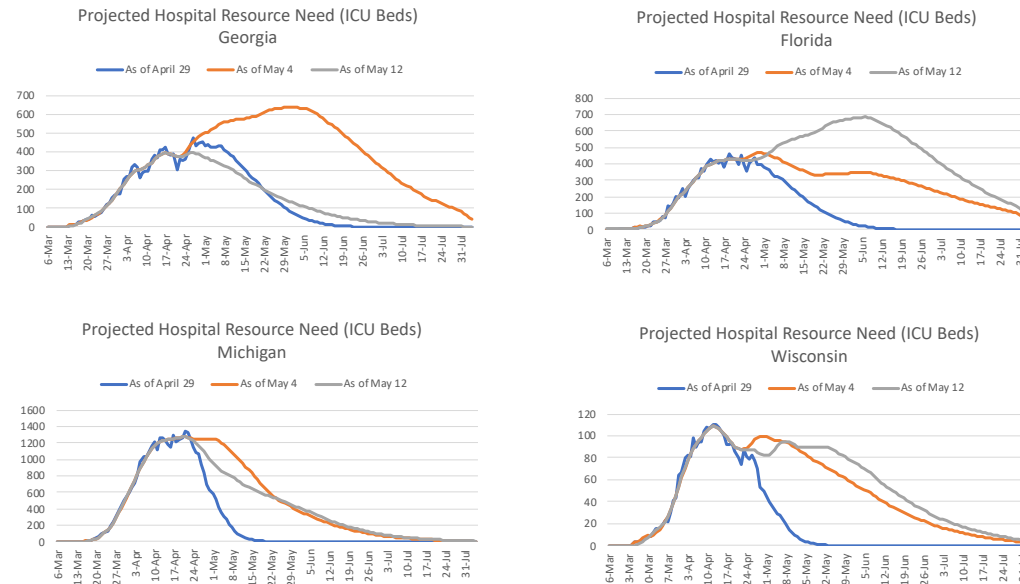
© 2020 [Health Industry Advisor LLC](#) analysis, using data from [World Health Organization](#)

MOITORING THE IMPACT OF RELAXING RESTRICTIONS

IHME's Hospital Resource Need Projections Are Sensitive to Relaxing Restrictions

"Strategic Guidance in an Era of Unprecedented Change"

The Institute for Health Metrics and Evaluation (IHME) regularly updates projections of hospital resource needs. Comparing their projections from April 29, May 2 and May 12 indicates how much relaxing restrictions factors into these projections. Consider how much the projections changed for Florida and Wisconsin:



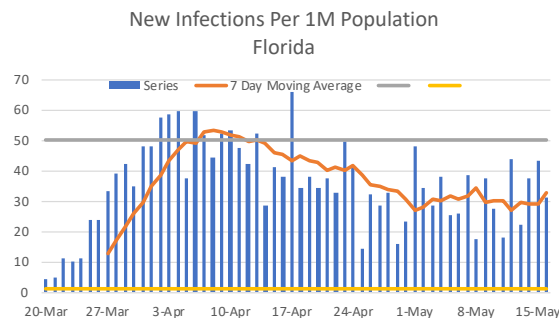
Note: ICU beds were selected as representative of the three metrics that IHME uses: total beds, ICU beds and ventilators. HIA does not vouch for the accuracy of these projections; in our limited experience, they seem to over-state actual needs.

State-By-State Impact of Relaxing Restrictions

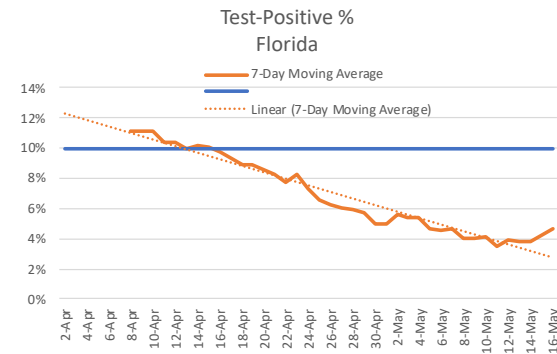
"Strategic Guidance in an Era of Unprecedented Change"

With several states re-opening, we are monitoring testing and infection rates to determine if, when and how much impact relaxation has on renewed spread of the virus. Here, we focus on Florida and Wisconsin (state Supreme Court last week invalidates governor's stay-home order; bars re-opened on Wednesday).

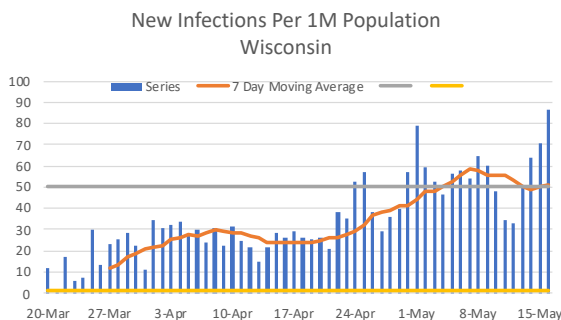
Florida's infections and test-positive rates increased slightly the past few days. However, these rates in both states are relatively low.



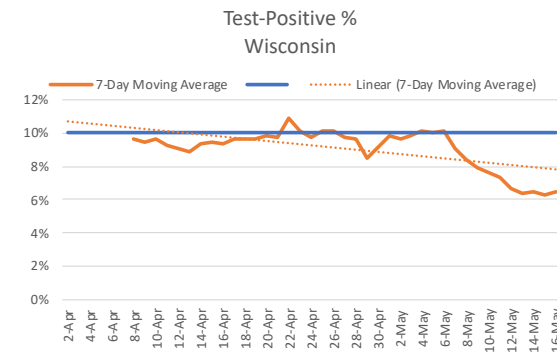
© Health Industry Advisor LLC analysis, using data from [World Health Organization](#)



© 2020 Health Industry Advisor LLC analysis, using data from [Covid Tracking Project](#)



© Health Industry Advisor LLC analysis, using data from [World Health Organization](#)



© 2020 Health Industry Advisor LLC analysis, using data from [Covid Tracking Project](#)

U.S. COUNTY-BY-COUNTY INFORMATION

- On the following pages, case and death information¹ is presented for the 100 most populous counties in the United States
 - New York case and death information are reported on a combined basis for Bronx, Kings, New York, Queens and Richmond counties
 - St. Louis City is reported as a distinct entity from St. Louis County
 - Dane County (Madison), Wisconsin and Washtenaw County (Ann Arbor), Michigan are included for professional-interest reasons
- Population information is the 2019 official estimate from the US Census Bureau²

1. Data from [The New York Times](#), based on reports from state and local health agencies. Accessed May 10-12, 2020

2. "Annual Estimates of the Resident Population for Counties in the United States: April 1, 2010 to July 1, 2019 (CO-EST2019-ANNRES)", Source: U.S. Census Bureau, Population Division, Release Date: March 2020. Accessed May 12, 2020

"Strategic Guidance in an Era of Unprecedented Change"

County	State	County seat	2019 Est. Population - Millions	Total Cases	Total Deaths	Cases Per 1M	Deaths Per 1M	Deaths Per Case	Peak New Daily Infections Last 7 Days	Peak New Daily Infections Trailing 7-Day M.A.	Date of Peak New Daily Infections
Maricopa, AZ	Arizona	Phoenix	4.49	6,821	302	1,521	67	4.4%	41.3	45.1	6-May
Pima, AZ	Arizona	Tucson	1.05	1,750	155	1,671	148	8.9%	31.4	39.7	19-Apr
Alameda, CA	California	Oakland	1.67	2,321	84	1,389	50	3.6%	29.0	31.0	11-Apr
Contra Costa, CA	California	Martinez	1.15	1,100	33	954	29	3.0%	10.7	28.5	6-Apr
Fresno, CA	California	Fresno	1.00	1,156	16	1,157	16	1.4%	45.0	45.0	15-May
Kern, CA	California	Bakersfield	0.90	1,438	25	1,597	28	1.7%	41.6	45.1	12-Apr
Los Angeles, CA	California	Los Angeles	10.04	36,259	1,755	3,612	175	4.8%	84.9	102.3	26-Apr
Orange, CA	California	Santa Ana	3.18	4,163	84	1,311	26	2.0%	39.6	39.6	15-May
Riverside, CA	California	Riverside	2.47	5,618	249	2,274	101	4.4%	46.3	67.7	18-Apr
Sacramento, CA	California	Sacramento	1.55	1,210	54	780	35	4.5%	4.7	27.6	7-Apr
San Bernardino, CA	California	San Bernardino	2.18	3,311	150	1,519	69	4.5%	44.7	54.6	11-May
San Diego, CA	California	San Diego	3.34	5,586	231	1,673	69	4.1%	36.8	44.7	11-May
San Francisco, CA	California	San Francisco	0.88	2,032	36	2,305	41	1.8%	28.5	60.6	13-Apr
San Joaquin, CA	California	Stockton	0.76	659	31	865	41	4.7%	11.6	28.1	18-Apr
San Mateo, CA	California	Redwood City	0.77	1,588	66	2,072	86	4.2%	35.4	52.2	7-Apr
Santa Clara, CA	California	San Jose	1.93	2,403	136	1,246	71	5.7%	8.4	41.6	5-Apr
Ventura, CA	California	Ventura	0.85	760	25	898	30	3.3%	18.2	19.8	3-May
Denver, CO	Colorado	Denver	0.73	4,452	248	6,122	341	5.6%	110.0	162.9	30-Apr
El Paso, CO	Colorado	Colorado Springs	0.72	1,251	83	1,737	115	6.6%	30.5	44.0	4-Apr
Fairfield, CT	Connecticut	Bridgeport	0.94	14,009	1,109	14,851	1,176	7.9%	171.1	515.3	22-Apr
Hartford, CT	Connecticut	Hartford	0.89	8,126	1,025	9,113	1,149	12.6%	195.8	262.4	26-Apr
New Haven, CT	Connecticut	New Haven	0.85	9,881	783	11,560	916	7.9%	166.1	357.2	17-Apr
Broward, FL	Florida	Fort Lauderdale	1.95	6,133	272	3,141	139	4.4%	32.6	80.6	13-Apr
Duval, FL	Florida	Jacksonville	0.96	1,252	32	1,307	33	2.6%	24.5	47.4	8-Apr
Hillsborough, FL	Florida	Tampa	1.47	1,568	47	1,065	32	3.0%	19.1	30.2	5-Apr
Lee, FL	Florida	Fort Myers	0.77	1,384	74	1,796	96	5.3%	30.8	49.7	10-Apr
Miami-Dade, FL	Florida	Miami	2.72	15,010	548	5,525	202	3.7%	70.8	160.1	8-Apr
Orange, FL	Florida	Orlando	1.39	1,614	35	1,158	25	2.2%	14.0	46.5	6-Apr
Palm Beach, FL	Florida	West Palm Beach	1.50	4,389	271	2,932	181	6.2%	74.1	74.1	10-May
Pinellas, FL	Florida	Clearwater	0.97	997	66	1,023	68	6.6%	24.8	35.6	5-Apr
Polk, FL	Florida	Bartow	0.72	716	40	988	55	5.6%	22.7	25.8	9-Apr
Cobb, GA	Georgia	Marietta	0.76	2,395	132	3,151	174	5.5%	60.7	78.9	19-Apr
DeKalb, GA	Georgia	Decatur	0.76	2,751	80	3,623	105	2.9%	57.6	109.1	19-Apr
Fulton, GA	Georgia	Atlanta	1.06	3,703	164	3,480	154	4.4%	51.8	86.1	15-Apr
Gwinnett, GA	Georgia	Lawrenceville	0.94	2,597	101	2,774	108	3.9%	42.0	78.1	4-May

"Strategic Guidance in an Era of Unprecedented Change"

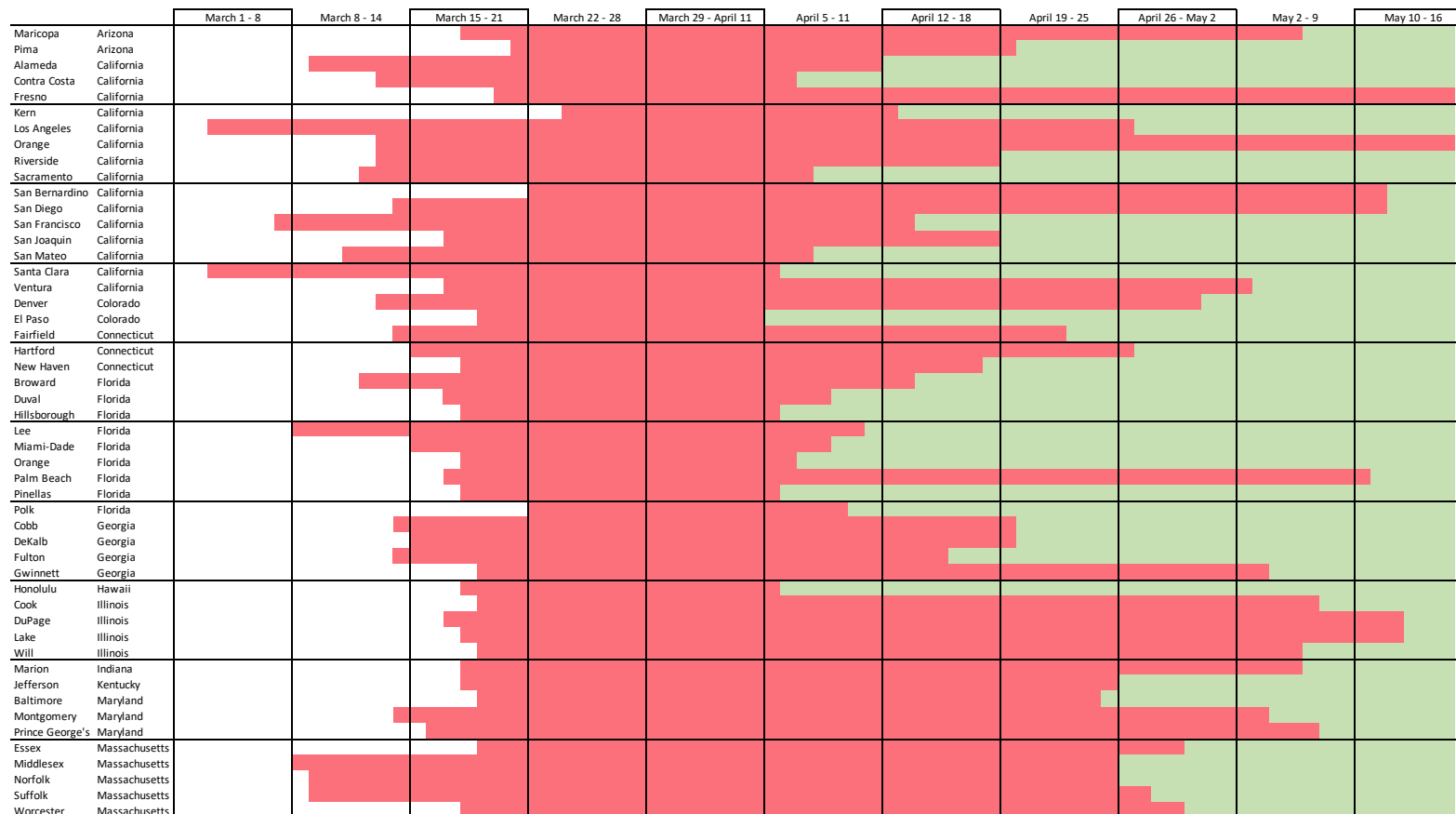
County	State	County seat	2019 Est. Population - Millions	Total Cases	Total Deaths	Cases Per 1M	Deaths Per 1M	Deaths Per Case	Peak New Daily Infections Last 7 Days	Peak New Daily Infections Trailing 7-Day M.A.	Date of Peak New Daily Infections
Gwinnett, GA	Georgia	Lawrenceville	0.94	2,597	101	2,774	108	3.9%	42.0	78.1	4-May
Honolulu HI	Hawaii	Honolulu	0.97	414	11	425	11	2.7%	0.9	23.7	5-Apr
Cook, IL	Illinois	Chicago	5.15	59,905	2,762	11,632	536	4.6%	268.2	328.1	7-May
DuPage, IL	Illinois	Wheaton	0.92	5,634	287	6,105	311	5.1%	195.0	195.0	12-May
Lake, IL	Illinois	Waukegan	0.70	6,157	207	8,839	297	3.4%	240.4	265.0	12-May
Will, IL	Illinois	Joliet	0.69	4,277	237	6,192	343	5.5%	148.1	199.2	6-May
Marion, IN	Indiana	Indianapolis	0.96	8,082	500	8,379	518	6.2%	139.2	213.9	6-May
Jefferson, KY	Kentucky	Louisville	0.77	1,864	126	2,431	164	6.8%	47.3	97.1	25-Apr
Baltimore, MD	Maryland	Towson	0.83	4,416	234	5,337	283	5.3%	110.2	156.1	24-Apr
Montgomery, MD	Maryland	Rockville	1.05	7,797	449	7,421	427	5.8%	197.1	236.0	4-May
Prince George's, MD	Maryland	Upper Marlboro	0.91	10,811	413	11,889	454	3.8%	297.6	389.1	7-May
Essex, MA	Massachusetts	Salem and Lawrence	0.79	12,131	751	15,374	952	6.2%	205.7	470.2	29-Apr
Middlesex, MA	Massachusetts	Lowell and Cambridge	1.61	18,683	1,347	11,592	836	7.2%	147.9	350.7	25-Apr
Norfolk, MA	Massachusetts	Dedham	0.71	7,331	710	10,372	1,005	9.7%	107.1	305.8	25-Apr
Suffolk, MA	Massachusetts	Boston	0.80	15,996	768	19,898	955	4.8%	186.9	634.2	27-Apr
Worcester, MA	Massachusetts	Worcester	0.83	8,786	538	10,578	648	6.1%	236.7	317.1	29-Apr
Macomb, MI	Michigan	Mount Clemens	0.87	6,274	729	7,179	834	11.6%	50.8	255.2	7-Apr
Oakland, MI	Michigan	Pontiac	1.26	7,994	896	6,357	712	11.2%	37.5	240.4	7-Apr
Washtenaw, MI	Michigan	Ann Arbor	0.37	1,236	87	3,362	237	7.0%	29.5	134.5	2-Apr
Wayne, MI	Michigan	Detroit	1.75	18,882	2,192	10,794	1,253	11.6%	86.4	433.6	7-Apr
Hennepin, MN	Minnesota	Minneapolis	1.27	4,674	449	3,692	355	9.6%	171.7	171.7	15-May
Jackson, MO	Missouri	Independence and Kansas City	0.70	425	16	605	23	3.8%	9.1	18.9	6-Apr
St Louis, MO	Missouri	Warren	0.99	4,025	318	4,048	320	7.9%	51.4	116.4	8-Apr
St. Louis, MO	Missouri	Clayton	0.30	1,602	95	5,290	314	5.9%	60.4	176.0	7-May
Clark, NV	Nevada	Las Vegas	2.27	5,235	291	2,310	128	5.6%	39.0	62.5	5-Apr
Bergen, NJ	New Jersey	Hackensack	0.93	17,195	1,443	18,446	1,548	8.4%	74.5	708.6	7-Apr
Essex, NJ	New Jersey	Newark	0.80	15,953	1,510	19,967	1,890	9.5%	124.6	628.1	10-Apr
Hudson, NJ	New Jersey	Jersey City	0.67	17,237	1,042	25,635	1,550	6.0%	152.3	766.8	9-Apr
Middlesex, NJ	New Jersey	New Brunswick	0.83	14,429	865	17,488	1,048	6.0%	140.6	508.2	10-Apr
Bernalillo, NM	New Mexico	Albuquerque	0.68	1,180	56	1,738	82	4.7%	31.6	52.6	4-May
Erie, NY	New York	Buffalo	0.92	4,782	417	5,205	454	8.7%	81.9	149.7	29-Apr
Monroe, NY	New York	Rochester	0.74	2,092	156	2,820	210	7.5%	68.6	68.6	6-Apr
Nassau, NY	New York	Mineola	1.36	38,864	2,499	28,641	1,842	6.4%	110.8	1005.7	9-Apr

"Strategic Guidance in an Era of Unprecedented Change"

County	State	County seat	2019 Est. Population - Millions	Total Cases	Total Deaths	Cases Per 1M	Deaths Per 1M	Deaths Per Case	Peak New Daily Infections Last 7 Days	Peak New Daily Infections Trailing 7-Day M.A.	Date of Peak New Daily Infections
Nassau, NY	New York	Mineola	1.36	38,864	2,499	28,641	1,842	6.4%	110.8	1005.7	9-Apr
New York, NY	New York	Includes: Bronx, Kings, New York and Richmond Counties	8.34	195,472	19,972	23,447	2,396	10.2%	142.5	650.8	15-Apr
Suffolk, NY	New York	Riverhead	1.48	37,719	1,757	25,544	1,190	4.7%	144.7	856.0	7-Apr
Westchester, NY	New York	White Plains	0.97	31,942	1,392	33,015	1,439	4.4%	153.3	981.3	14-May
Mecklenburg, NC	North Carolina	Charlotte	1.11	2,385	63	2,148	57	2.6%	50.9	51.5	11-May
Wake, NC	North Carolina	Raleigh	1.11	1,143	28	1,028	25	2.4%	20.2	28.9	2-May
Cuyahoga, OH	Ohio	Cleveland	1.24	3,156	162	2,555	131	5.1%	56.4	59.2	6-May
Franklin, OH	Ohio	Columbus	1.32	4,330	156	3,288	118	3.6%	77.6	111.3	8-May
Hamilton, OH	Ohio	Cincinnati	0.82	1,961	109	2,399	133	5.6%	51.9	68.0	6-May
Oklahoma, OK	Oklahoma	Oklahoma City	0.80	1,035	45	1,298	56	4.3%	23.3	31.5	10-Apr
Multnomah, OR	Oregon	Portland	0.81	957	55	1,177	68	5.7%	20.7	28.5	14-Apr
Allegheny, PA	Pennsylvania	Pittsburgh	1.22	1,582	141	1,301	116	8.9%	14.9	42.8	8-Apr
Montgomery, PA	Pennsylvania	Norristown	0.83	5,697	608	6,856	732	10.7%	113.5	184.1	11-Apr
Philadelphia, PA	Pennsylvania	Philadelphia	1.58	19,349	1,021	12,215	645	5.3%	165.2	308.2	28-Apr
Davidson, TN	Tennessee	Nashville	0.69	4,008	43	5,774	62	1.1%	112.8	157.0	7-May
Shelby, TN	Tennessee	Memphis	0.94	3,595	82	3,836	87	2.3%	73.5	91.3	17-Apr
Bexar, TX	Texas	San Antonio	2.00	2,120	62	1,058	31	2.9%	20.3	31.0	6-May
Collin, TX	Texas	McKinney	1.03	1,010	31	976	30	3.1%	16.7	27.5	9-Apr
Dallas, TX	Texas	Dallas	2.64	7,036	164	2,670	62	2.3%	90.4	95.0	11-May
Denton, TX	Texas	Denton	0.89	1,040	28	1,172	32	2.7%	22.2	28.7	12-Apr
El Paso, TX	Texas	El Paso	0.84	1,655	45	1,972	54	2.7%	64.5	71.0	15-May
Fort Bend, TX	Texas	Richmond	0.81	1,510	40	1,860	49	2.6%	26.9	49.3	7-May
Harris, TX	Texas	Houston	4.71	9,050	193	1,920	41	2.1%	44.1	69.0	11-Apr
Hidalgo, TX	Texas	Edinburg	0.87	425	10	489	12	2.4%	7.9	16.8	11-Apr
Tarrant, TX	Texas	Fort Worth	2.10	4,266	120	2,029	57	2.8%	77.4	85.8	13-May
Travis, TX	Texas	Austin	1.27	2,381	77	1,869	60	3.2%	34.8	48.4	17-Apr
Salt Lake, UT	Utah	Salt Lake City	1.16	3,717	55	3,203	47	1.5%	75.5	75.5	13-May
Fairfax, VA	Virginia	Fairfax	1.15	7,159	273	6,239	238	3.8%	226.7	237.3	13-May
King, WA	Washington	Seattle	2.25	7,679	523	3,409	232	6.8%	31.5	86.5	11-Apr
Pierce, WA	Washington	Tacoma	0.90	1,772	66	1,958	73	3.7%	20.8	65.4	7-Apr
Snohomish, WA	Washington	Everett	0.82	3,065	125	3,728	152	4.1%	25.7	116.6	1-Apr
Dane, WI	Wisconsin	Madison	0.55	517	25	946	46	4.8%	16.2	33.2	1-Apr
Milwaukee, WI	Wisconsin	Milwaukee	0.95	4,694	249	4,963	263	5.3%	146.8	146.8	15-May

Timeline of the Virus Spread

"Strategic Guidance in an Era of Unprecedented Change"

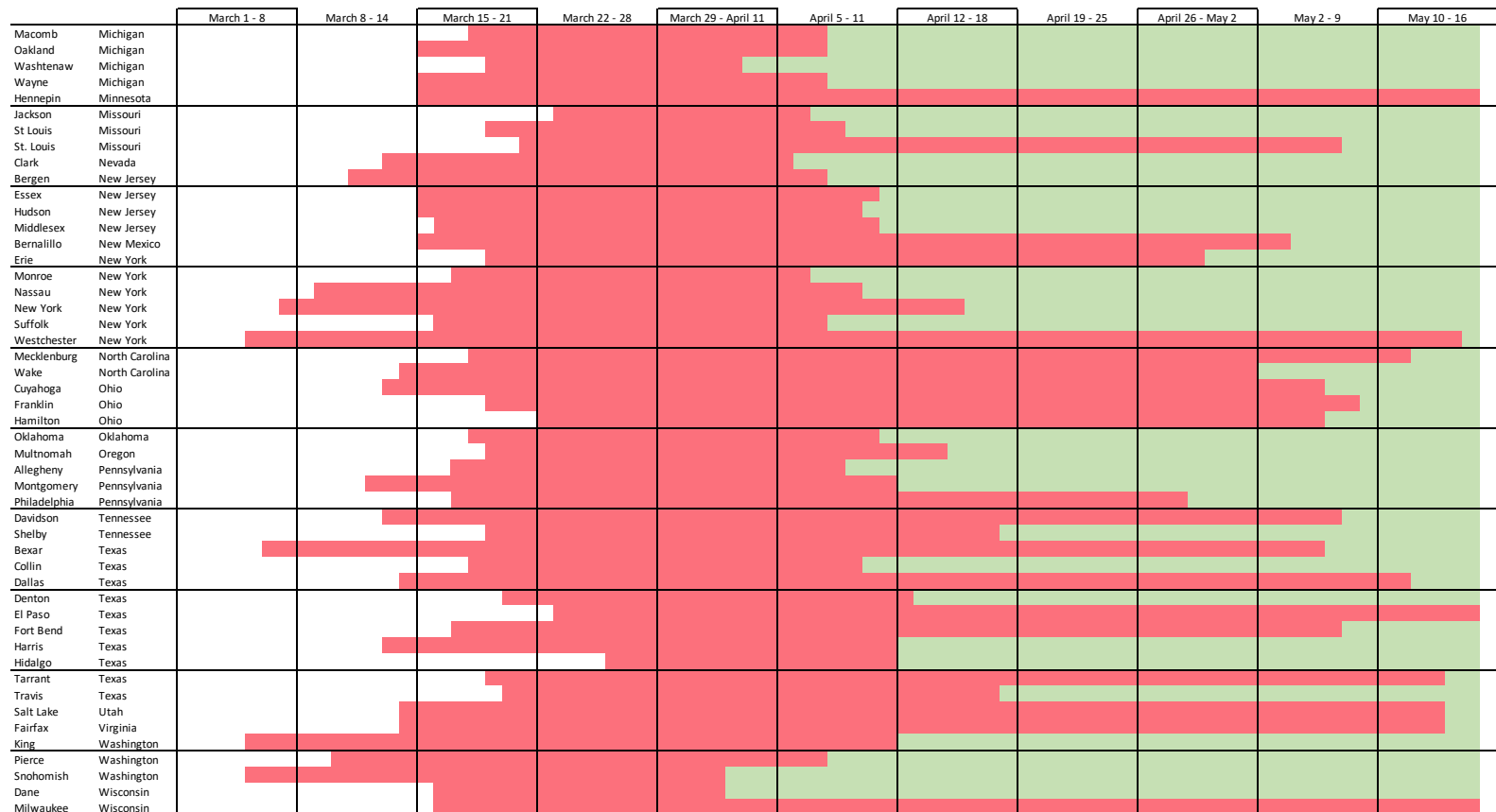


10th Case to Peak New Daily Infections (Trailing 7-Day Moving Average)

Declining New Daily Infections

Timeline of the Virus Spread

"Strategic Guidance in an Era of Unprecedented Change"



10th Case to Peak New Daily Infections (Trailing 7-Day Moving Average)



Declining New Daily Infections

WHAT FACTORS "EXPLAIN" COUNTY-BY-COUNTY DIFFERENCES IN INFECTION AND DEATH RATES?

Can We "Explain" Different Infection & Death Rates?

"Strategic Guidance in an Era of Unprecedented Change"

- We tested various models in attempt to "explain" county-by-county differences in the following (dependent variables):
 - Peak new daily infection rates
 - Cases per capita (as of May 15)
 - Deaths per capita (as of May 15)
 - Deaths per case (as of May 15)
- Additionally, we tested the impact of the issuance of stay home orders, as well as the timing of these orders
- The following (independent variables) were tested for their usefulness in "explaining" the differences in infections and deaths:
 - Population
 - Population density
 - % of population under 100% of federal poverty level
 - % of population 65 years old or older
 - % of commuters using shared transportation
 - African American % of the population
 - State Stay-Home order issued (Y or N)?
 - If yes, when was it executed, relative to the county's peak new daily infection rate

We found statistically significant models for:

Peak new daily infection rates ($r^2 = 0.706$)

Cases per capita ($r^2 = 0.706$)

Deaths per capita ($r^2 = 0.625$)

However, we could not find a model for Deaths per case

Sources:

- US Census Bureau, ["Annual Estimates of the Resident Population for Selected Age Groups by Sex: April 1, 2010 to July 1, 2018"](#)
- US Census Bureau, ["Small Area Income and Poverty Estimates"](#)
- US Department of Transportation, [Transportation and Health Tool](#)

Can We "Explain" Different Infection & Death Rates?

"Strategic Guidance in an Era of Unprecedented Change"

- **Population density** had a statistically significant impact ($p < 0.05$ that coefficient is zero) on:
 - Deaths per capita
- **% of commuters using shared transportation** (buses, trains, subways) has a significant impact on:
 - Peak daily infection rates
 - Cases per capita
 - Deaths per capita
- **% of the population 65 years old or older** had a significant impact on:
 - Deaths per capita
 - Deaths per case
 - And, although it couldn't be statistically established as having a non-zero impact, this variable also strengthened the predictive models for Cases per capita ($p = 0.30$) and Peak New Infection Rates ($p = 0.31$)
- **African American % of the population** had a significant impact on:
 - Peak daily infection rates
 - Cases per capita
 - And, although it couldn't be statistically established as having a non-zero impact ($p = 0.11$), this variable also strengthened the predictive model for Deaths per capita
- **Stay-Home Orders and the Timing of Stay-Home Orders, Relative to the County's 10th Case** could not be established to have a statistically significant impact on any of the models
 - However, these strengthened the models for Deaths per capita ($p = 0.23$ and 0.14 , respectively) and Deaths per case ($p = 0.054$ and 0.156)

Special note: with each of these analyses, they are subject to change as additional experience is gained with the virus and more data becomes available

Peak New Daily Infection Rates

"Strategic Guidance in an Era of Unprecedented Change"

Factors influencing peak new infection rates:

- % of commuters using shared transportation
- African American % of the population

P-value indicates the probability that the factor's impact on infection rates is zero. P-values <0.05 are considered statistically significant (i.e., factor's impact is non-zero).

R-square shows how much of the variability in infection rates is explained by these variables

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.840
R Square	0.706
Adjusted R Square	0.690
Standard Error	120.741
Observations	99

ANOVA					
	df	SS	MS	F	Significance F
Regression	5	3,251,865.77	650,373.15	44.61	2.9425E-23
Residual	93	1,355,799.23	14,578.49		
Total	98	4,607,664.99			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-131.34	76.32	-1.72	0.09	-282.90	20.22	-282.90	20.22
Population Density (2018)	0.00	0.00	-0.85	0.40	-0.01	0.00	-0.01	0.00
Commute Mode Share - Transit: Score	23.19	1.93	12.01	0.00	19.36	27.03	19.36	27.03
Poverty Rate per 100	4.94	3.14	1.57	0.12	-1.30	11.18	-1.30	11.18
% of Population 65 & Older	4.16	4.05	1.03	0.31	-3.87	12.20	-3.87	12.20
African American % of Population	2.15	1.03	2.09	0.04	0.10	4.19	0.10	4.19

Including:

- Population density,
- Poverty Rate and
- % of population 65 years old & older

strengthened the model, however, their respective impacts cannot be statistically determined to be non-zero ($p > .05$)

County-By-County Modeling Results

Cases Per 1 Million Population (as of May 15)

"Strategic Guidance in an Era of Unprecedented Change"

Factors influencing deaths per capita:

- % of commuters using shared transportation
- Poverty rate
- African American % of the population

P-value indicates the probability that the factor's impact on cases per capita is zero. P-values <0.05 are considered statistically significant (i.e., factor's impact is non-zero).

R-square shows how much of the variability in cases per capita is explained by these variables

Including % of population 65 years old & older strengthened the model, however, its impact cannot be statistically determined to be non-zero ($p > .05$)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.85
R Square	0.73
Adjusted R Square	0.71
Standard Error	3,572.07
Observations	99

ANOVA

	df	SS	MS	F	Significance F
Regression	4	3,165,746,694.36	791,436,673.59	62.03	0.00
Residual	94	1,199,411,317.36	12,759,694.87		
Total	98	4,365,158,011.72			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	(4,146.92)	2,240.45	(1.85)	0.07	(8,595.38)	301.55	(8,595.38)	301.55
Commute Mode Share - Transit: Score	698.67	47.17	14.81	0.00	605.01	792.33	605.01	792.33
Poverty Rate per 100	161.16	88.76	1.82	0.07	(15.08)	337.39	(15.08)	337.39
% of Population 65 & Older	124.28	119.60	1.04	0.30	(113.18)	361.75	(113.18)	361.75
Black % of Population	66.69	30.09	2.22	0.03	6.95	126.44	6.95	126.44

County-By-County Modeling Results

Deaths Per 1 Million Population (as of May 15)

"Strategic Guidance in an Era of Unprecedented Change"

Factors influencing deaths per capita:

- Population density
- % of commuters using shared transportation
- % of the population 65 years old & up

P-value indicates the probability that the factor's impact on deaths per capita is zero. P-values <0.05 are considered statistically significant (i.e., factor's impact is non-zero).

R-square shows how much of the variability in deaths per capita is explained by these variables

Including:

- Poverty rate
- African American % of population

added to the value of the model. However, their respective impacts cannot be statistically determined to be non-zero ($p > .05$)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.80
R Square	0.64
Adjusted R Square	0.63
Standard Error	291.69
Observations	99

ANOVA					
	df	SS	MS	F	Significance F
Regression	5	14,331,499.94	2,866,299.99	33.69	0.00
Residual	93	7,912,477.60	85,080.40		
Total	98	22,243,977.54			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	(467.33)	184.38	(2.53)	0.01	(833.47)	(101.19)	(833.47)	(101.19)
Population Density (2018)	0.02	0.01	1.94	0.06	(0.00)	0.03	(0.00)	0.03
Commute Mode Share - Transit: Score	40.76	4.66	8.74	0.00	31.50	50.03	31.50	50.03
Poverty Rate per 100	9.67	7.59	1.28	0.21	(5.39)	24.74	(5.39)	24.74
% of Population 65 & Older	20.61	9.78	2.11	0.04	1.20	40.03	1.20	40.03
Black % of Population	4.00	2.49	1.61	0.11	(0.94)	8.94	(0.94)	8.94