

Covid19 - Death Counts and Rates by State Through August 2020

An Update Using Two Key Epidemiological Models

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Introduction

The following presents a summary of the state by state projections for Covid19 deaths by state for two key epidemiological models as well as Seattle Analytics own projections of where deaths might occur over the summer of 2020. The two epidemiological models are:

1. The Covid19 Simulator developed by Mass General Hospital in conjunction with Harvard Medical School, Georgia Tech, and Boston University. It can be found here: <https://www.covid19sim.org/> - update is through May 24, 2020. From here on, this will be referred to as the Mass General model.
2. The IHME model from University of Washington. It can be found here: <https://covid19.healthdata.org/united-states-of-america>, update is through May 26, 2020.

In this discussion the two models are compared in terms of scenarios on a state level. For the IHME model, scenario is a bit of a misnomer – the model is really trying to get at possible variance of estimates rather than generate scenarios. Additionally, the projections from Mass General are through August 31 while the projections from IHME are through August 4.

Simply having the summary of the Mass General model for multiple scenarios at the state level represents a useful piece of information. The online simulator is not set up to produce accessible tables and output data, so it was a tedious task to pull this together. The IHME data, too, is summarized here in a clear manner for comparing across states and for comparison to the Mass General model. (If you just want to see this summary, skip to Exhibit 4 on page 8.)

Seattle Analytics also developed a methodology to allocate the overall United States projections using various predictors of Covid19 cases and data through April. The original analysis was not updated for state allocation. However, the projections are calibrated to the overall numbers from the Mass General model this time to assure that the projected levels are aligned with epidemiological possibilities. Additionally, the Seattle Analytics projections present something of an alternative timeline that, in our opinion, appears to be a bit more consistent with how the disease is currently spreading from area to area and might evolve over the course of the summer rather than a more sudden outbreak late in the summer. This is to provide a different path and set of information for comparison that might assist in diagnosing whether a situation appears to be deteriorating more than might be expected in a particular state. Finally, a high case scenario is developed using social distancing metrics incorporated into the IHME model. This makes the Seattle Analytics projections, while still more “econometric/statistical” in nature, more fully integrated with the epidemiological models. Therefore, these are not unique projections, but do represent another view as to (1) in what states the deaths may occur (2) the possible timeline of deaths throughout the summer and (3) the potential impact of relaxation of restrictions.

The discussion proceeds in this order:

1. Where are we now and what has been learned over the past month?
2. What is the range and pattern of scenarios from the epidemiological models, including what is the most likely case currently projected?
3. What might be the pattern of US deaths throughout the summer for four different scenarios?
4. State by State death comparisons of the various models - This provides multiple scenarios and ranges by state and should give some useful benchmarks as to whether there is an emerging crisis in a specific area.
5. Conclusion and current trends.

Where are we now and what has been learned over the past month?

At the end of April, Seattle Analytics posted projections of Best and Worst Case scenarios plus a weighted average of the two based on judgmental weighting of the impact of lifting restrictions in various states. The worst case scenario was a bit better than the Mass General model, which at the time showed 832,000 deaths in a worst case through August. The Seattle Analytics worst case was 744,000 with 110,000 through August in the best case (vs. the Mass General model best case of 115,000 at the time), with the weighted average at 235,000 deaths. A problem with assessing these currently is that the various scenarios did not diverge that much through the first month. However, enough has happened to know that the best case scenario no longer seems at all feasible and that tracking toward the weighted average case or worst case appears more likely. That said, the latest epidemiological models appear to project deaths higher than the best case from late April, but not near the 235,000 range, yet, for anything in the expected range. The current projections will be discussed fully in the next section.

Certain states are above the trend for the prior worst case scenario as of May 27, while some states have substantially outperformed projections. The worse off states are shown in Exhibit 1A and the better off states in Exhibit 1B. States in the upper table would be in the category of needing to consider either applying or reinstating restrictions.

Exhibit 1a
States over 30% above worst case Covid19 projections
Period: May1 - May 27, 2020

State	Pct Above
New Hampshire	62%
New Mexico	43%
Mississippi	42%
Rhode Island	41%
North Dakota	40%
Iowa	37%
South Dakota	35%
Minnesota	30%

Exhibit 1b
States over 30% below worst case Covid19 projections
Period: May1 - May 27, 2020

State	Pct Below
Tennessee	-32%
Idaho	-34%
Vermont	-36%
Oregon	-38%
California	-43%
Texas	-51%
Montana	-56%
Alaska	-63%
Hawaii	-65%

What is the range and pattern of scenarios from the epidemiological models, including what is the most likely case currently projected?

Exhibit 2 summarizes a range of scenarios from the Mass General model (update as of May 24) and the IHME model (update as of May 26).

Note that the Mass General worst case scenario through August 31, 2020, with minimal restrictions on movement over the entire period, has dropped substantially from prior scenarios, with a projection of 459,000 deaths down from 832,000 deaths. The Mass General model considers behavioral changes regarding mask usage and social distancing that have occurred over the last couple of months.

Exhibit 2

US Scenarios*	Mass General			IHME Exp	IHME High
	31-Aug	4-Aug	31-Jul	4-Aug	4-Aug
Best	116000	115000	115000		
Current (May 24)	135000	126000	125000	131967	173926
20 pct/50 pct	135000	126000	125000		
50 percent	146000	131000	129000		
Minimal	459000	159000	149000		

*These are the level of restrictions, such as 50 percent reduction in mobility

A second item to note in Exhibit 2 is that projections for expected outcomes through August now seem to be around 135,000 deaths. A check on the May 29 update to the IHME numbers shows the figure to now be around 135,000 through early August.

What is most disturbing about the Mass General results, however, is that even in the worst case scenario, the number of deaths through August 4 is 159,000, with an additional

300,000 deaths occurring in August. This gets at the nature of an epidemic – that once a massive outbreak occurs it hits quickly and hard and grows exponentially. (Exponential growth is often a difficult concept to grasp and to get across effectively and often leads people to discount possibilities that are not that unlikely.)

Scenario Descriptions:

Best – Lockdown through August

Current – Restrictions in place by state as of May 24

20 pct/50 pct – A 20 percent increase in mobility for 8 weeks from prior restrictions followed by a 50 percent increase in mobility after that.

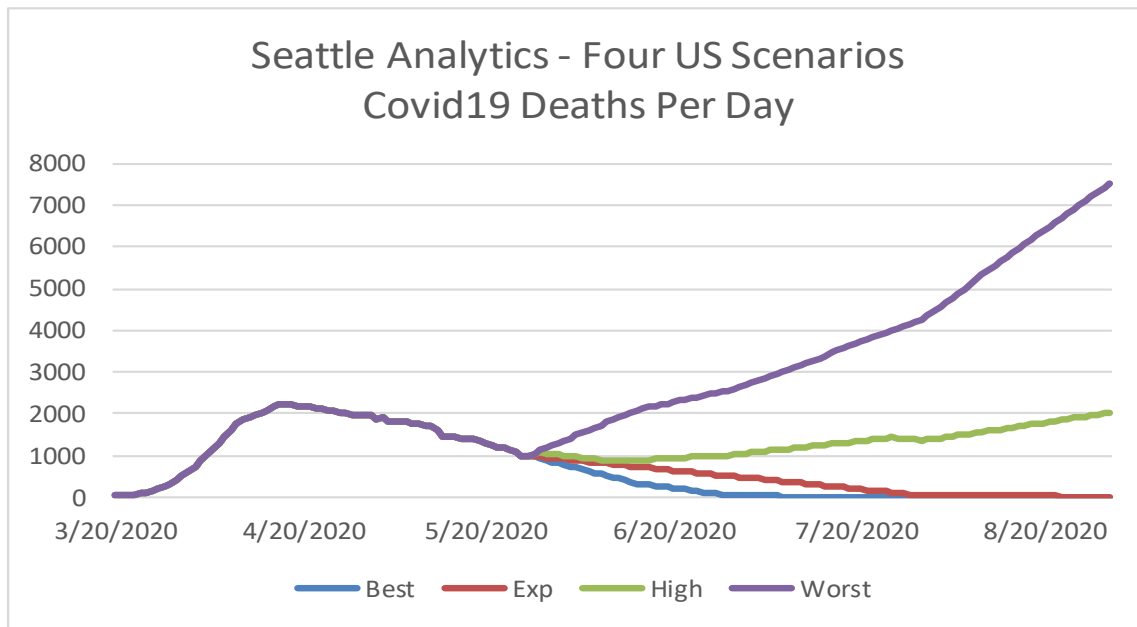
50 percent – A 50 percent increase in mobility through August

Minimal – Minimal restrictions in place, but with current social distancing behavior considered

What might be the pattern of US deaths throughout the summer for four different scenarios?

Whether or not such a massive upswing would occur in August is open to question – it obviously could, but the nature of the current outbreak – having spread beyond the New York metro area – is more in various pockets of activity around the country. Therefore, Seattle Analytics has developed some alternative paths for reaching these numbers at the national level. These are shown in Exhibit 3. Tracking against these might give some indication of where the longer term trend is headed.

Exhibit 3 - Covid19 Deaths - US - Forecast begins May 28, 2020



In these projections there is an alternative 'High' case scenario that is based on a state-specific weighted average of the mobility reduction projected by the IHME model. The calculation examines the Mobility Reduction in that model calculated as of April 10 and determines the US average based on state employment weighting. This leads to a 53 percent reduction in mobility across the US at that point. Each state is projected to plateau at a certain level in either May or June. That level is compared to the 53 percent and the distance is used as a linear impact weighting factor such that only a small reduction in mobility leads to a greater likelihood of the worst case scenario. A large reduction in mobility leads to a High case closer to either the best or expected case scenario (for the High case, states are not allowed to go below the expected case scenario.)

In the High case scenario, there are around 225,000 deaths through August 31. While a massive outbreak that leads to death in August certainly is feasible, this High case seems like something that is both extremely disturbing and very feasible in the context of 'rolling outbreaks' across the country. What is also disconcerting about this scenario is it will not be obvious for another three weeks whether it is likely – that is, whether or not the expected value will shift up to a range that is close to double current expectations.

Finally, it would certainly be sad to see Americans accept that losing 1000 to 2000 people per day is simply endemic to the current situation and not take the necessary actions to reduce the death toll in the country (meaning better adherence to social distancing and face mask wearing and the re-institution of restrictions as needed – along with other measures that could mitigate the death toll.) Our greatest fear is that the "High" scenario path is seen as "the cost of doing business" or some other such nonsense that discounts a loss of life that is unprecedented in the last 100 years.

State by State death comparisons of the various models

This section presents more detailed tables by state to allow for some range of estimates as to what might be expected and to help assess, going forward, when things may be going awry. Although the Seattle Analytics national level numbers are benchmarked to the Mass General model, the state allocations vary. The IHME state by state numbers are also provided. If a given model seems to be well out of line with other estimates, it might be some indication that model is less reliable for that area. Alternatively, it might be worth looking into further as perhaps there are specific circumstances that should serve as a warning sign.

The following tables are presented along with a discussion of each on the given and/or accompanying page.

Exhibit 4 – State by State Covid19 Death Count Scenarios for Mass General and IHME Models

Exhibit 5 – Seattle Analytics Scenarios Benchmarked to Mass General Model-Deaths through August 31, 2020

Exhibit 6 – Expected Scenarios by State through August 31, 2020

Exhibit 7 – “High” Case Outcomes by State through August 4, 2020

Exhibit 8 – Worst Case Scenarios by State through August 31, 2020

Exhibit 9 – Mass General – Expected and Worst Case Deaths Per Capita Maps (Cumulative Through August 31, 2020)

Exhibit 10 – Seattle Analytics – Expected and Worst Case Deaths Per Capita Maps (Cumulative Through August 31, 2020)

Exhibit 4**State by State Covid19 Death Count Scenarios for Mass General and IHME Models**

State	Mass General			IHME	
	Best	Exp	Worst	Exp	High
Alabama	718	1220	5680	882	1309
Alaska	11	11	11	3	3
Arizona	1440	2050	9720	4335	16462
Arkansas	181	312	2070	140	263
California	4800	7150	42200	7558	10313
Colorado	1590	1870	6350	2238	3870
Connecticut	4390	4860	10600	4548	5208
Delaware	402	504	2040	521	926
District of Columbia	506	596	1790	540	630
Florida	2570	3220	18800	3899	5978
Georgia	2160	2740	12800	2544	3386
Hawaii	18	18	18	17	17
Idaho	92	126	397	88	114
Illinois	6510	8180	32300	7628	11155
Indiana	2430	2720	9130	2567	3111
Iowa	569	728	4160	1146	2021
Kansas	282	349	1840	235	271
Kentucky	456	565	2490	480	685
Louisiana	2970	3420	9920	3119	3418
Maine	102	166	626	87	96
Maryland	3120	4370	14800	3510	5333
Massachusetts	7480	8440	19500	8232	10016
Michigan	5800	6190	14300	5801	6208
Minnesota	1580	2010	12000	1611	2713
Mississippi	1040	1390	5520	836	1172
Missouri	781	880	3980	1022	1344
Montana	17	17	17	11	11
Nebraska	289	430	3260	331	670
Nevada	433	494	1950	581	741
New Hampshire	222	270	1110	377	651
New Jersey	12400	12800	25900	13654	14647
New Mexico	367	488	2340	577	1036
New York	31800	32500	68500	30823	31401
North Carolina	1080	2020	10300	1397	2039
North Dakota	84	143	710	120	302
Ohio	2710	3340	14600	3160	4302
Oklahoma	357	425	1620	359	441
Oregon	174	183	666	197	245
Pennsylvania	5980	6590	21000	7679	10165
Rhode Island	680	799	2720	881	1487
South Carolina	505	685	2890	502	575
South Dakota	91	150	881	94	228
Tennessee	499	824	4840	509	710
Texas	2160	3660	26700	2985	7089
Utah	172	404	2180	146	288
Vermont	56	56	56	50	50
Virginia	1600	2210	12700	1956	2742
Washington	1170	1380	4630	1176	1274
West Virginia	83	100	312	109	172
Wisconsin	670	1000	5130	697	891
Wyoming	17	26	122	9	30
United States	115614	135079	458176	131967	178212

Mass General through August 31; IHME through August 4

Exhibit 4 shows the state by state outcomes for two key epidemiological models for Covid19 deaths over the coming months. Certain items of note:

- The high case for Arizona from the IHME model seems extremely high.
- The expected cases are reasonably well aligned.
- A worst case scenario – somewhat obviously, requires a major toll in the most populous states. This is one reason why this could, fortunately, be unlikely: states like California and New York are likely to react quickly to future outbreaks. However, a higher case could occur that would still be devastating but more widespread.

Exhibit 5

Seattle Analytics Scenarios Benchmarked to Mass General Model - Deaths through August 31, 2020

State	Cumulative Deaths					Remaining Deaths				Remaining Deaths Per Day			
	Best	Exp	Worst	High	Mob Fact	Best	Exp	Worst	High	Best	Exp	Worst	High
Alabama	694	811	5448	4182	0.73	111	228	4865	3599	1	2	51	37
Alaska	10	11	225	49	0.18	2	3	217	41	0	0	2	0
Arizona	970	1134	8784	5366	0.56	139	303	7953	4535	1	3	83	47
Arkansas	129	151	2140	1413	0.64	9	31	2020	1293	0	0	21	13
California	4259	4977	36620	7694	0.11	298	1016	32659	3733	3	11	340	39
Colorado	1687	1971	7527	2973	0.22	294	578	6134	1580	3	6	64	16
Connecticut	4841	5656	11018	5849	0.16	1038	1853	7215	2046	11	19	75	21
Delaware	440	514	1722	649	0.16	96	170	1378	305	1	2	14	3
District of Columbia	588	687	1680	755	0.00	143	242	1235	310	1	3	13	3
Florida	2446	2858	23252	7820	0.26	128	540	20934	5502	1	6	218	57
Georgia	2193	2562	12632	7669	0.52	289	658	10728	5765	3	7	112	60
Hawaii	20	24	425	33	0.03	3	7	408	16	0	0	4	0
Idaho	100	117	1059	621	0.54	18	35	977	539	0	0	10	6
Illinois	5789	6763	23839	9421	0.20	671	1645	18721	4303	7	17	195	45
Indiana	2472	2889	10441	5440	0.37	442	859	8411	3410	5	9	88	36
Iowa	586	684	4483	2556	0.51	90	188	3987	2060	1	2	42	21
Kansas	245	286	2121	1122	0.47	38	79	1914	915	0	1	20	10
Kentucky	509	594	4002	2142	0.47	89	174	3582	1722	1	2	37	18
Louisiana	3375	3944	9079	7126	0.66	653	1222	6357	4404	7	13	66	46
Maine	102	119	966	391	0.33	21	38	885	310	0	0	9	3
Maryland	2958	3456	11707	5384	0.28	566	1064	9315	2992	6	11	97	31
Massachusetts	8024	9375	20841	10313	0.00	1477	2828	14294	3766	15	29	149	39
Michigan	6527	7626	18799	8388	0.05	1193	2292	13465	3054	12	24	140	32
Minnesota	1170	1367	7935	4075	0.43	228	425	6993	3133	2	4	73	33
Mississippi	814	951	4694	3513	0.70	144	281	4024	2843	1	3	42	30
Missouri	835	975	6685	3347	0.43	130	270	5980	2642	1	3	62	28
Montana	21	25	384	246	0.62	4	8	367	229	0	0	4	2
Nebraska	196	229	1895	990	0.47	28	61	1727	822	0	1	18	9
Nevada	491	574	3015	903	0.16	89	172	2613	501	1	2	27	5
New Hampshire	276	323	2162	907	0.33	53	100	1939	684	1	1	20	7
New Jersey	14004	16361	26081	17998	0.00	2665	5022	14742	6659	28	52	154	69
New Mexico	402	470	2955	1256	0.33	73	141	2626	927	1	1	27	10
New York	30914	36118	68753	39730	0.00	1575	6779	39414	10391	16	71	411	108
North Carolina	998	1166	9201	4520	0.43	171	339	8374	3693	2	4	87	38
North Dakota	73	85	931	572	0.58	14	26	872	513	0	0	9	5
Ohio	2455	2869	15430	7040	0.35	411	825	13386	4996	4	9	139	52
Oklahoma	391	457	3036	2080	0.64	69	135	2714	1758	1	1	28	18
Oregon	172	201	2359	820	0.30	24	53	2211	672	0	1	23	7
Pennsylvania	6083	7107	25188	11744	0.30	793	1817	19898	6454	8	19	207	67
Rhode Island	849	992	2682	1288	0.24	194	337	2027	633	2	4	21	7
South Carolina	558	651	4823	3119	0.60	92	185	4357	2653	1	2	45	28
South Dakota	59	69	1023	619	0.58	5	15	969	565	0	0	10	6
Tennessee	380	444	4592	2910	0.60	27	91	4239	2557	0	1	44	27
Texas	1767	2064	18797	8433	0.39	169	466	17199	6835	2	5	179	71
Utah	96	112	2191	916	0.39	-9	7	2086	811	0	0	22	8
Vermont	69	81	408	170	0.30	15	27	354	116	0	0	4	1
Virginia	1500	1753	10336	3110	0.18	219	472	9055	1829	2	5	94	19
Washington	1312	1533	7221	3288	0.33	206	427	6115	2182	2	4	64	23
West Virginia	91	106	1207	613	0.47	17	32	1133	539	0	0	12	6
Wisconsin	654	765	5028	3032	0.54	115	226	4489	2493	1	2	47	26
Wyoming	17	20	356	234	0.64	3	6	342	220	0	0	4	2
United States	115614	135079	458176	224831	0.32	15335	34800	357897	124552	160	363	3728	1297

Mob Fact is a mobility factor derived from the IHME model using the distance from the weighted average US rate as of 4/10/20 to the state 'plateau' rate for May-August. For 4 states where mobility reduction is lower than the prior US weighted average as of 4/10, a 10 percent increase over the expected case is used for the high case.

Exhibit 5 provides the Seattle Analytics 'allocation' across states of the Mass General scenarios using an econometric assessment of where cases might be most likely to occur. It is provided as another view/alternative benchmark to the other models to help assess the reasonableness by state. Probably most interesting is the mobility factor weighted 'High' scenario, which implies an extremely high but continuous toll over the course of the summer averaging 1297 deaths per day. This, unfortunately, does not seem at all unfeasible.

Exhibit 6
Expected Scenarios By State Through August 31

State	Deaths				Remaining Deaths				Remaining Deaths Per Day			
	MassGen	IHME*	SeaAna	Median	MassGen	IHME*	SeaAna	Median	MassGen	IHME*	SeaAna	Median
Alabama	1220	903	811	903	637	320	228	320	7	3	2	3
Alaska	11	3	11	11	3	0	3	3	0	0	0	0
Arizona	2050	4437	1134	2050	1219	3606	303	1219	13	38	3	13
Arkansas	312	143	151	151	192	23	31	31	2	0	0	0
California	7150	7736	4977	7150	3189	3775	1016	3189	33	39	11	33
Colorado	1870	2290	1971	1971	477	897	578	578	5	9	6	6
Connecticut	4860	4655	5656	4860	1057	852	1853	1057	11	9	19	11
Delaware	504	533	514	514	160	189	170	170	2	2	2	2
District of Columbia	596	553	687	596	151	108	242	151	2	1	3	2
Florida	3220	3991	2858	3220	902	1673	540	902	9	17	6	9
Georgia	2740	2604	2562	2604	836	700	658	700	9	7	7	7
Hawaii	18	17	24	18	1	0	7	1	0	0	0	0
Idaho	126	90	117	117	44	8	35	35	0	0	0	0
Illinois	8180	7807	6763	7807	3062	2689	1645	2689	32	28	17	28
Indiana	2720	2628	2889	2720	690	598	859	690	7	6	9	7
Iowa	728	1173	684	728	232	677	188	232	2	7	2	2
Kansas	349	241	286	286	142	34	79	79	1	0	1	1
Kentucky	565	491	594	565	145	71	174	145	2	1	2	2
Louisiana	3420	3193	3944	3420	698	471	1222	698	7	5	13	7
Maine	166	89	119	119	85	8	38	38	1	0	0	0
Maryland	4370	3593	3456	3593	1978	1201	1064	1201	21	13	11	13
Massachusetts	8440	8426	9375	8440	1893	1879	2828	1893	20	20	29	20
Michigan	6190	5938	7626	6190	856	604	2292	856	9	6	24	9
Minnesota	2010	1649	1367	1649	1068	707	425	707	11	7	4	7
Mississippi	1390	856	951	951	720	186	281	281	8	2	3	3
Missouri	880	1046	975	975	175	341	270	270	2	4	3	3
Montana	17	11	25	17	0	0	8	0	0	0	0	0
Nebraska	430	339	229	339	262	171	61	171	3	2	1	2
Nevada	494	594	574	574	92	192	172	172	1	2	2	2
New Hampshire	270	386	323	323	47	163	100	100	0	2	1	1
New Jersey	12800	13976	16361	13976	1461	2637	5022	2637	15	27	52	27
New Mexico	488	591	470	488	159	262	141	159	2	3	1	2
New York	32500	31550	36118	32500	3161	2211	6779	3161	33	23	71	33
North Carolina	2020	1430	1166	1430	1193	603	339	603	12	6	4	6
North Dakota	143	123	85	123	84	64	26	64	1	1	0	1
Ohio	3340	3234	2869	3234	1296	1190	825	1190	14	12	9	12
Oklahoma	425	367	457	425	103	45	135	103	1	0	1	1
Oregon	183	202	201	201	35	54	53	53	0	1	1	1
Pennsylvania	6590	7861	7107	7107	1300	2571	1817	1817	14	27	19	19
Rhode Island	799	902	992	902	144	247	337	247	2	3	4	3
South Carolina	685	513	651	651	219	47	185	185	2	0	2	2
South Dakota	150	97	69	97	96	43	15	43	1	0	0	0
Tennessee	824	521	444	521	471	168	91	168	5	2	1	2
Texas	3660	3056	2064	3056	2062	1458	466	1458	21	15	5	15
Utah	404	149	112	149	299	44	7	44	3	0	0	0
Vermont	56	51	81	56	2	0	27	2	0	0	0	0
Virginia	2210	2002	1753	2002	929	721	472	721	10	8	5	8
Washington	1380	1204	1533	1380	274	98	427	274	3	1	4	3
West Virginia	100	111	106	106	26	37	32	32	0	0	0	0
Wisconsin	1000	714	765	765	461	175	226	226	5	2	2	2
Wyoming	26	10	20	20	12	0	6	6	0	0	0	0
United States**	135079	135097	135079	132049	34800	34818	34800	31770	363	363	363	331

*IHME Model is through August 4, but calibrated up to align with Mass General; Mass General is as of May 24 update and IHME is as of May 26 update.

**US shows the sum for the medians, IHME varies slightly using calibration to Mass General for August.

Exhibit 6 shows the expected scenario by state for the two models and three allocation approaches. While there is a good deal of consistency, the Seattle Analytics approach tends to push up those areas that have already had serious issues. If these prove accurate, it means less

leeway in other states in order to achieve the expected scenario. Note that the current expected scenarios imply a drop to averaging around 363 deaths per day across the country. It will be important to continue to monitor and evaluate the situation moves in this direction. Current numbers (see the last section – Conclusion and Current Trends) are cause for concern.

Exhibit 7
"High" Case Outcomes by State thru August 4

State	Deaths		Rem Dths		Rem Dths Per Day	
	IHME	SeaAna	IHME	SeaAna	IHME	SeaAna
Alabama	1309	2220	726	1637	8	17
Alaska	3	53	0	45	0	0
Arizona	16462	2503	15631	1672	163	17
Arkansas	263	799	143	679	1	7
California	10313	7308	6352	3347	66	35
Colorado	3870	2170	2477	777	26	8
Connecticut	5208	4978	1405	1175	15	12
Delaware	926	458	582	114	6	1
District of Columbia	630	658	185	213	2	2
Florida	5978	5568	3660	3250	38	34
Georgia	3386	4955	1482	3051	15	32
Hawaii	17	36	0	19	0	0
Idaho	114	432	32	350	0	4
Illinois	11155	7160	6037	2042	63	21
Indiana	3111	3576	1081	1546	11	16
Iowa	2021	1144	1525	648	16	7
Kansas	271	748	64	541	1	6
Kentucky	685	1296	265	876	3	9
Louisiana	3418	5394	696	2672	7	28
Maine	96	250	15	169	0	2
Maryland	5333	3596	2941	1204	31	13
Massachusetts	10016	9367	3469	2820	36	29
Michigan	6208	8230	874	2896	9	30
Minnesota	2713	2001	1771	1059	18	11
Mississippi	1172	1561	502	891	5	9
Missouri	1344	1851	639	1146	7	12
Montana	11	234	0	217	0	2
Nebraska	670	505	502	337	5	4
Nevada	741	657	339	255	4	3
New Hampshire	651	401	428	178	4	2
New Jersey	14647	17474	3308	6135	34	64
New Mexico	1036	610	707	281	7	3
New York	31401	38399	2062	9060	21	94
North Carolina	2039	2886	1212	2059	13	21
North Dakota	302	209	243	150	3	2
Ohio	4302	4319	2258	2275	24	24
Oklahoma	441	1342	119	1020	1	11
Oregon	245	617	97	469	1	5
Pennsylvania	10165	8251	4875	2961	51	31
Rhode Island	1487	859	832	204	9	2
South Carolina	575	1726	109	1260	1	13
South Dakota	228	225	174	171	2	2
Tennessee	710	2019	357	1666	4	17
Texas	7089	8186	5491	6588	57	69
Utah	288	530	183	425	2	4
Vermont	50	139	0	85	0	1
Virginia	2742	2065	1461	784	15	8
Washington	1274	2411	168	1305	2	14
West Virginia	172	376	98	302	1	3
Wisconsin	891	1920	352	1381	4	14
Wyoming	30	132	16	118	0	1
United States	178212	174804	77933	74525	812	776

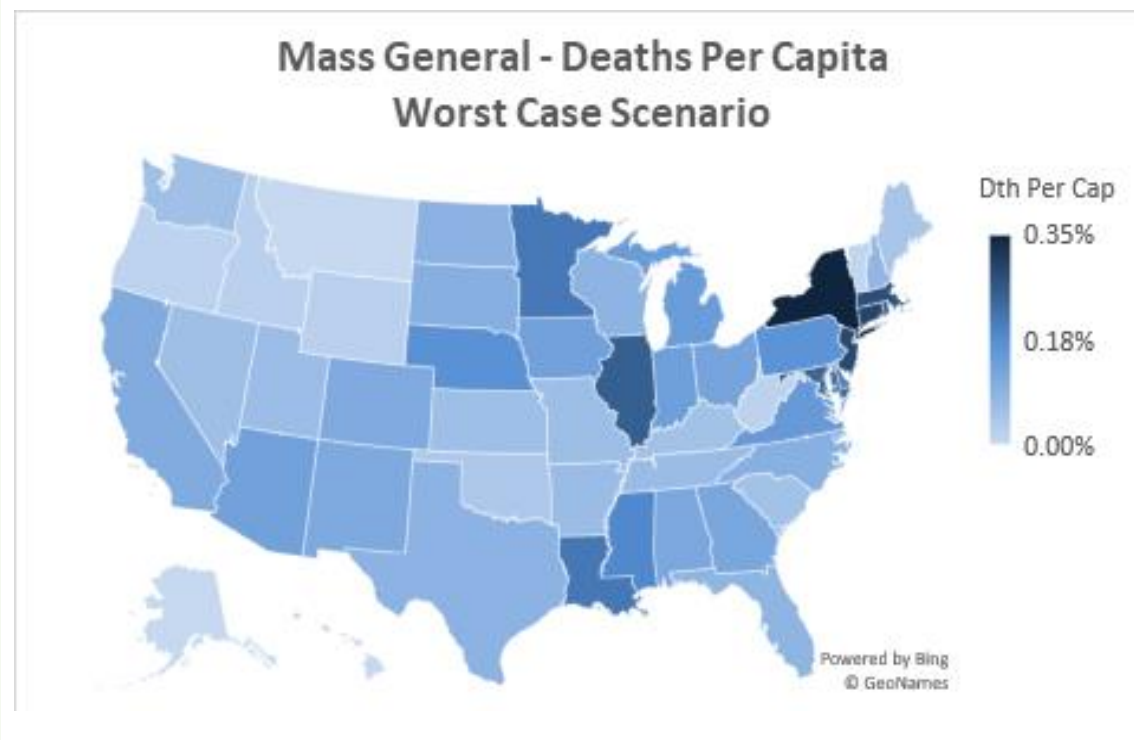
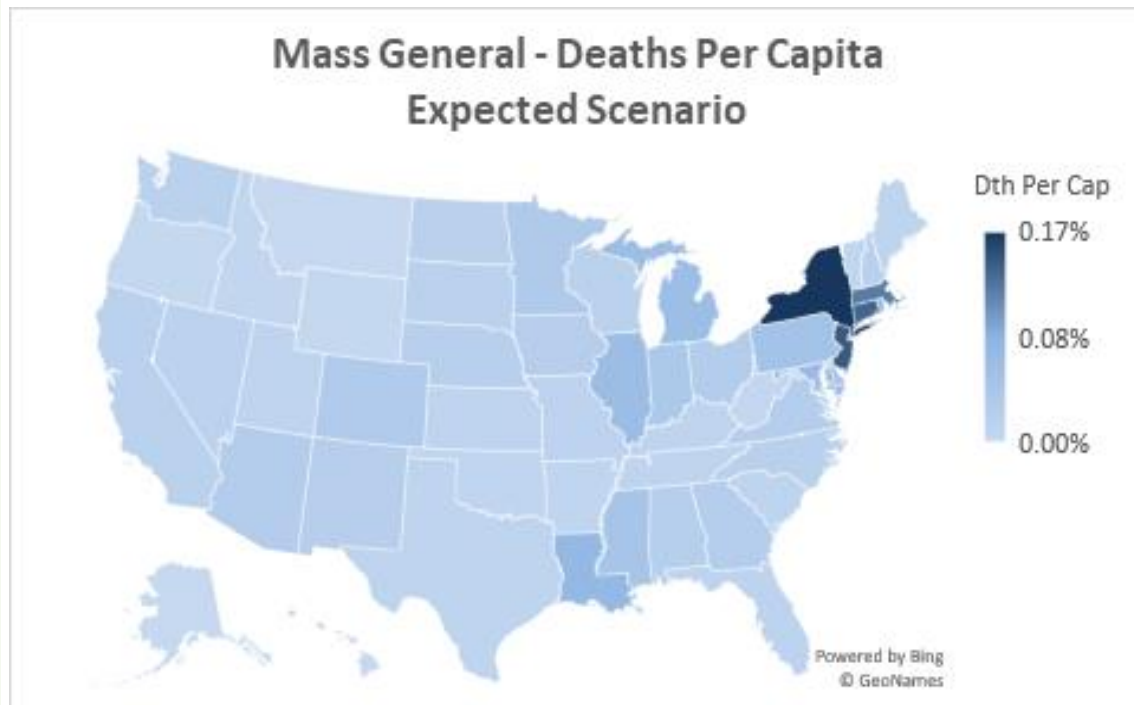
This is a case that we, unfortunately, consider all too likely and disturbing. The one very strange outlying point here is in Arizona for the IHME forecasts with projections above even the worst case for the Mass General simulation or the Seattle Analytics allocation. A daily death toll around 800 across the US seems plausible and something Americans have grown all too numb toward. The Seattle Analytics projections are derived from a linear weighting of the distance from prior US-wide prior practices to specific statewide practices in terms of mobility reduction. It would be useful if both states and individuals recognized that more than gradual re-openings could lead to a doubling of the deaths already incurred before the end of the summer. Our hope is that states will respond appropriately and that individuals will continue to take social distancing and masking seriously. (Getting an intelligent and cohesive response from the Federal Government seems like a lost cause at this point.)

Exhibit 8**Worst Case Scenario By State Through August 31**

State	Deaths		Rem Dths		Rem Dths Per Day	
	Mass Gen	SeaAna	Mass Gen	SeaAna	Mass Gen	SeaAna
Alabama	5680	5448	5097	4865	53	51
Alaska	11	225	3	217	0	2
Arizona	9720	8784	8889	7953	93	83
Arkansas	2070	2140	1950	2020	20	21
California	42200	36620	38239	32659	398	340
Colorado	6350	7527	4957	6134	52	64
Connecticut	10600	11018	6797	7215	71	75
Delaware	2040	1722	1696	1378	18	14
District of Columbia	1790	1680	1345	1235	14	13
Florida	18800	23252	16482	20934	172	218
Georgia	12800	12632	10896	10728	114	112
Hawaii	18	425	1	408	0	4
Idaho	397	1059	315	977	3	10
Illinois	32300	23839	27182	18721	283	195
Indiana	9130	10441	7100	8411	74	88
Iowa	4160	4483	3664	3987	38	42
Kansas	1840	2121	1633	1914	17	20
Kentucky	2490	4002	2070	3582	22	37
Louisiana	9920	9079	7198	6357	75	66
Maine	626	966	545	885	6	9
Maryland	14800	11707	12408	9315	129	97
Massachusetts	19500	20841	12953	14294	135	149
Michigan	14300	18799	8966	13465	93	140
Minnesota	12000	7935	11058	6993	115	73
Mississippi	5520	4694	4850	4024	51	42
Missouri	3980	6685	3275	5980	34	62
Montana	17	384	0	367	0	4
Nebraska	3260	1895	3092	1727	32	18
Nevada	1950	3015	1548	2613	16	27
New Hampshire	1110	2162	887	1939	9	20
New Jersey	25900	26081	14561	14742	152	154
New Mexico	2340	2955	2011	2626	21	27
New York	68500	68753	39161	39414	408	411
North Carolina	10300	9201	9473	8374	99	87
North Dakota	710	931	651	872	7	9
Ohio	14600	15430	12556	13386	131	139
Oklahoma	1620	3036	1298	2714	14	28
Oregon	666	2359	518	2211	5	23
Pennsylvania	21000	25188	15710	19898	164	207
Rhode Island	2720	2682	2065	2027	22	21
South Carolina	2890	4823	2424	4357	25	45
South Dakota	881	1023	827	969	9	10
Tennessee	4840	4592	4487	4239	47	44
Texas	26700	18797	25102	17199	261	179
Utah	2180	2191	2075	2086	22	22
Vermont	56	408	2	354	0	4
Virginia	12700	10336	11419	9055	119	94
Washington	4630	7221	3524	6115	37	64
West Virginia	312	1207	238	1133	2	12
Wisconsin	5130	5028	4591	4489	48	47
Wyoming	122	356	108	342	1	4
United States	458176	458176	357897	357897	3728	3728

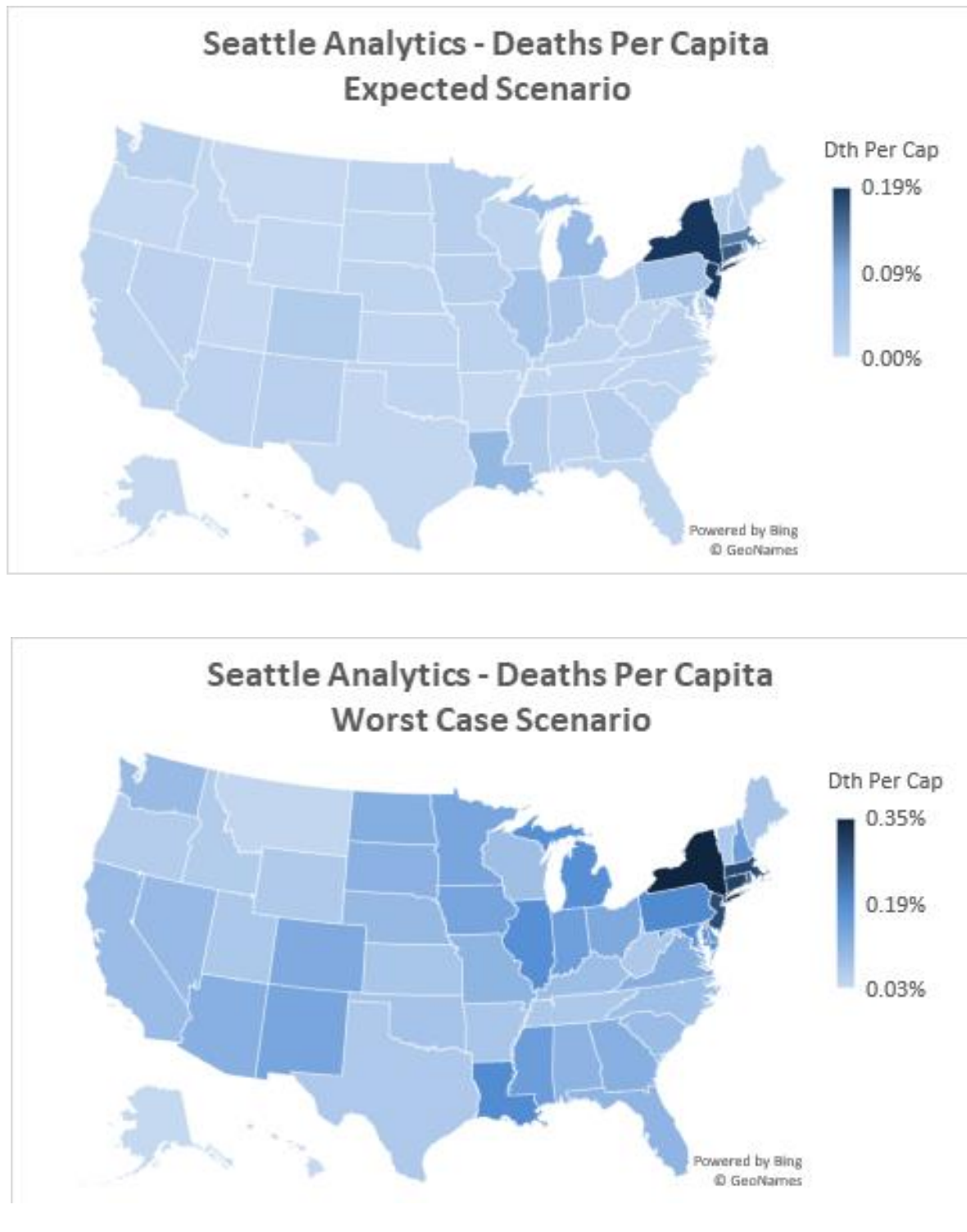
These are the worst case scenarios from the Mass General and Seattle Analytics state projections. For relatively small low risk states, the Mass General numbers appear extremely low (Alaska, Hawaii, Montana, Vermont, West Virginia, Wyoming). Except for those states, death counts headed toward the numbers noted would be an unmitigated disaster.

Exhibit 9



Cumulative Rate through August 31, 2020

Exhibit 10



Cumulative Rate through August 31, 2020

Conclusion and Current Trends

The killing of George Floyd and the ensuing protests, while many times carried out with social distancing in mind, are clearly of a nature as to not be compliant with best practices during the epidemic. While this is completely understandable (and may even seem like a silly statement), it is worth noting specifically in the context of the current estimates. Nothing that has occurred in that regard would lead one to expect a better outcome on Covid19 deaths – only deterioration from current expectations.

Perhaps more troubling even than the current upheaval, which is likely to gradually abate unless President Trump uses this to incite further protests (on June 1 he has chosen to make incendiary comments), is that recent death counts tend to align more with a high case or even worst case scenario. As mentioned earlier, it is hard to know exactly where things may head right now, but early indicators are not that encouraging. Here are the deaths projected for the last four days of May for each of the Seattle Analytics scenarios along with the actuals.

Covid19 Deaths - US - May 28 to May 31

Best	Expected	High	Worst	Actual
3639	3860	4197	4617	3959

Source: New York Times/Github

Actuals fall above the Expected scenario and are part of the way to the high scenario. The site <https://ourworldindata.org/> shows even worse numbers. This includes a fairly low May 31 number. Without steady progress, it is feared that the "High" case scenarios noted might be a viable reality for the summer months and deaths in the United States could climb to double their current level. This would be a disturbing outcome made more troublesome by what appears to be an increasing numbness to the loss of life from a fairly large proportion of the general populace.