

## Pandemic Evolution Simulation

Bill Joy 9/15/2020 revised 9/22/2020 and 10/31/2020

This is a simple simulation of the evolution of the US pandemic if we assume the population is divided into two groups—those complying with non-pharmaceutical interventions (PPE, hand washing, social distancing, etc.) (Cs) and those who don't (Ns). The N's may include young people, those front-line people for whom adequate personal protective gear is not available and those who for whatever personal reason do not comply with guidelines.

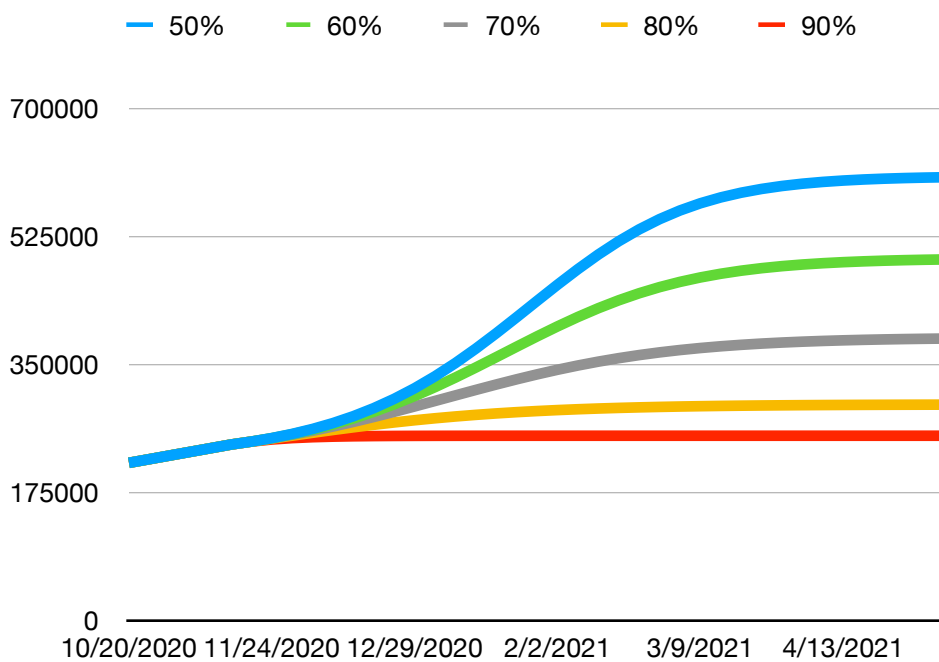
The main inputs to the simulation are the  $R_0$  for the C- and N-populations, and the percentage of people in the C (vs N) population. We assume that the cycle time, from generation to generation, is 5 days, and simplistically that this is also the average amount of time someone is infectious.

Beyond the simple  $R_0$  for each of the two subpopulations, there are adjustable parameters for how often each population infects the other, and to initialize the simulation, the number of cases which have occurred so far (including both detected and undetected, which cases are assumed to yield immunity), the relative percentage of such cases between the C and N population, and the case fatality rate.

The number of deaths which result in the simulation for the United States is shown in the table below for varying % of compliance. That additional compliance saves lives should not be surprising, but that 10% more compliance saves about 100000 lives (to late May) is dramatic. Perhaps more surprising is that the epidemic slows down in a similar time frame with 50-70% compliance (80-90% compliance in the US seems unlikely) showing it flattening sometime in February, when the noncompliant  $R_t$  drops meaningfully below 1, until when there are substantial deaths in the N population. At that time the C subpopulation is still quite vulnerable, so will still need to exercise caution.

What is striking is how high the death rate is estimated to go (peak just over 4000 per day in the “base” 60% compliance case). My other takeaway is that if the epidemic proceeds along this simulated path then a vaccine will arrive too late, spring-summer, to stem substantial deaths in the N population.

This simple model suggests that the single most important thing to do would be to increase compliance, but this regrettably seems quite blocked due to behavior, lack of PPE for all, fatigue with restrictions, politics and other factors.



### Cumulative deaths with different % compliant (“C”)

By date	50%	60%	70%	80%	90%
10/20/2020	215000	215000	215000	215000	215000
10/25/2020	220000	220000	220000	220000	220000
10/30/2020	225000	225000	225000	225000	225000
11/4/2020	230000	230000	230000	230000	230000
11/9/2020	235000	235000	235000	235000	235000
11/14/2020	240000	240000	240000	240000	240000
11/19/2020	244050	244050	244050	244050	244050
11/24/2020	248838	248719	248517	248113	246896
11/29/2020	254540	254123	253441	252141	248796
12/4/2020	261320	260359	258835	256088	250023
12/9/2020	269346	267512	264695	259908	250798
12/14/2020	278782	275652	271001	263560	251281
12/19/2020	289788	284828	277712	267010	251578
12/24/2020	302496	295058	284770	270230	251760
12/29/2020	317002	306322	292097	273204	251871
1/3/2021	333334	318550	299599	275921	251939
1/8/2021	351436	331617	307172	278379	251980
1/13/2021	371141	345338	314701	280583	252005
1/18/2021	392157	359476	322074	282543	252020
1/23/2021	414072	373751	329181	284273	252029
1/28/2021	436367	387862	335928	285789	252035
2/2/2021	458460	401507	342238	287111	252038
2/7/2021	479760	414414	348053	288257	252040
2/12/2021	499728	426357	353339	289246	252041
2/17/2021	517938	437179	358084	290097	252042
2/22/2021	534109	446791	362291	290825	252043
2/27/2021	548114	455172	365983	291447	252043
3/4/2021	559974	462359	369190	291976	252043
3/9/2021	569816	468432	371954	292427	252043
3/14/2021	577845	473498	374318	292809	252043
3/19/2021	584298	477678	376326	293132	252043
3/24/2021	589422	481095	378022	293406	252043
3/29/2021	593451	483866	379449	293637	252043
4/3/2021	596593	486100	380643	293832	252043
4/8/2021	599029	487890	381640	293997	252043
4/13/2021	600908	489319	382469	294135	252043
4/18/2021	602351	490456	383158	294252	252043
4/23/2021	603456	491358	383728	294350	252043
4/28/2021	604300	492072	384199	294433	252043
5/3/2021	604944	492637	384589	294503	252043
5/8/2021	605435	493082	384910	294561	252043

<b>US Population</b>	330000000	
<b>Current Total Cases</b>	22000000	Cumulative cases to date (estimate)
<b>Current Active Cases</b>	675000	Is greater than confirmed cases because many never tested; We assume these are infectious for one period (5 days)
<b>Compliant (C) %</b>	50%	Percentage of population being careful—mask wearing, distancing, etc.
<b>R0 Compliant</b>	0.4	Assumed R0 for Compliers, mostly infect other complainers (but see C->N fraction below)
<b>Compliant Population</b>	165000000	<b>derived, don't change</b>
<b>Non-compliant (N) % (1-C)</b>	50%	<b>derived, don't change</b> E.g. the young, essential workers with insufficient PPE, others who don't mask, distance, etc.
<b>R0 Non-compliant</b>	1.4	Assumed R0 for Non-compliers
<b>Non-compliant Population</b>	165000000	<b>derived, don't change</b>
<b>Cycle time (days)</b>	5	Time in which new cases emerge, and average time for which infected assumed infectious
<b>Assume % of Total Cases so far C</b>	25%	Backcasting higher than steady-state—we assume a lot of C people were infected e.g. before masking
<b>Assume % of Active Cases C</b>	10%	Adjusted so simulation is roughly continuous going forward
<b>Assume N transmission fraction to C</b>	5%	Noncompliers don't affect many compliers because they are being careful
<b>Assume C transmission fraction to N</b>	15%	Compliers affect more noncompliers because they are not being careful
<b>CFR</b>	0.6%	Extrapolated to match current death rate of ~750/day to above numbers

Date	New Cases	C immune	C immune	C new cases	C new cases	N immune	N immune	N new cases	N immune	Deaths (later)	Deaths (later)	Rt
	/ day	Total	as % of C	/ cycle	as % of C	Total	as % of N	/cycle	As % of N	/ day	As of	Population
10/20/202	135000	5500000	3.33%	67500	0.041%	16500000	10.000%	607500	10.000%	810	11/19/2020	1.18
10/25/202	159606	5567500	3.37%	67208	0.041%	17107500	10.368%	730823	10.368%	958	11/24/2020	1.19
10/30/202	190047	5634708	3.41%	75407	0.046%	17838323	10.811%	874830	10.811%	1140	11/29/2020	1.19
11/4/2020	226010	5710115	3.46%	88280	0.054%	18713153	11.341%	1041770	11.341%	1356	12/4/2020	1.18
11/9/2020	267520	5798395	3.51%	104490	0.063%	19754922	11.973%	1233110	11.973%	1605	12/9/2020	1.18
11/14/202	314562	5902885	3.58%	123612	0.075%	20988032	12.720%	1449199	12.720%	1887	12/14/2020	1.17
11/19/202	366846	6026496	3.65%	145490	0.088%	22437231	13.598%	1688737	13.598%	2201	12/19/2020	1.15
11/24/202	423621	6171987	3.74%	169965	0.103%	24125968	14.622%	1948142	14.622%	2542	12/24/2020	1.14
11/29/202	483518	6341951	3.84%	196712	0.119%	26074110	15.802%	2220881	15.802%	2901	12/29/2020	1.13
12/4/2020	544417	6538663	3.96%	225147	0.136%	28294991	17.148%	2496939	17.148%	3267	1/3/2021	1.11
12/9/2020	603396	6763810	4.10%	254349	0.154%	30791930	18.662%	2762633	18.662%	3620	1/8/2021	1.09
12/14/202	656810	7018159	4.25%	283026	0.172%	33554563	20.336%	3001025	20.336%	3941	1/13/2021	1.07
12/19/202	700547	7301185	4.42%	309532	0.188%	36555587	22.155%	3193203	22.155%	4203	1/18/2021	1.04
12/24/202	730495	7610716	4.61%	331967	0.201%	39748791	24.090%	3320508	24.090%	4383	1/23/2021	1.02
12/29/202	743177	7942684	4.81%	348376	0.211%	43069298	26.103%	3367507	26.103%	4459	1/28/2021	0.99
1/3/2021	736434	8291060	5.02%	357021	0.216%	46436805	28.144%	3325151	28.144%	4419	2/2/2021	0.96
1/8/2021	709981	8648081	5.24%	356697	0.216%	49761956	30.159%	3193210	30.159%	4260	2/7/2021	0.94
1/13/2021	665619	9004778	5.46%	347010	0.210%	52955166	32.094%	2981083	32.094%	3994	2/12/2021	0.91
1/18/2021	607004	9351788	5.67%	328516	0.199%	55936250	33.901%	2706502	33.901%	3642	2/17/2021	0.89
1/23/2021	539009	9680304	5.87%	302676	0.183%	58642752	35.541%	2392368	35.541%	3234	2/22/2021	0.87
1/28/2021	466860	9982980	6.05%	271608	0.165%	61035120	36.991%	2062693	36.991%	2801	2/27/2021	0.85
2/2/2021	395314	10254588	6.21%	237723	0.144%	63097813	38.241%	1738846	38.241%	2372	3/4/2021	0.83
2/7/2021	328084	10492311	6.36%	203334	0.123%	64836659	39.295%	1437085	39.295%	1969	3/9/2021	0.82
2/12/2021	267607	10695644	6.48%	170361	0.103%	66273744	40.166%	1167676	40.166%	1606	3/14/2021	0.80
2/17/2021	215102	10866005	6.59%	140166	0.085%	67441421	40.874%	935345	40.874%	1291	3/19/2021	0.79

Date	New Cases	C immune	C immune	C new cases	C new cases	N immune	N immune	N new cases	N immune	Deaths (later)	Deaths (later)	Rt
	/ day	Total	as % of C	/ cycle	as % of C	Total	as % of N	/cycle	As % of N	/ day	As of	Population
2/22/2021	170809	11006171	6.67%	113537	0.069%	68376766	41.440%	740510	41.440%	1025	3/24/2021	0.79
2/27/2021	134299	11119708	6.74%	90763	0.055%	69117276	41.889%	580730	41.889%	806	3/29/2021	0.78
3/4/2021	104753	11210471	6.79%	71770	0.043%	69698006	42.241%	451995	42.241%	629	4/3/2021	0.78
3/9/2021	81191	11282241	6.84%	56248	0.034%	70150000	42.515%	349706	42.515%	487	4/8/2021	0.77
3/14/2021	62615	11338489	6.87%	43766	0.027%	70499706	42.727%	269307	42.727%	376	4/13/2021	0.77
3/19/2021	48101	11382255	6.90%	33860	0.021%	70769013	42.890%	206643	42.890%	289	4/18/2021	0.77
3/24/2021	36839	11416114	6.92%	26077	0.016%	70975657	43.016%	158118	43.016%	221	4/23/2021	0.76
3/29/2021	28148	11442191	6.93%	20011	0.012%	71133775	43.111%	120728	43.111%	169	4/28/2021	0.76
4/3/2021	21469	11462203	6.95%	15314	0.009%	71254503	43.185%	92028	43.185%	129	5/3/2021	0.76
4/8/2021	16351	11477517	6.96%	11695	0.007%	71346531	43.240%	70063	43.240%	98	5/8/2021	0.76
4/13/2021	12441	11489212	6.96%	8916	0.005%	71416593	43.283%	53289	43.283%	75	5/13/2021	0.76
4/18/2021	9458	11498127	6.97%	6788	0.004%	71469882	43.315%	40501	43.315%	57	5/18/2021	0.76
4/23/2021	7186	11504916	6.97%	5164	0.003%	71510384	43.340%	30765	43.340%	43	5/23/2021	0.76
4/28/2021	5457	11510079	6.98%	3925	0.002%	71541149	43.358%	23360	43.358%	33	5/28/2021	0.76
5/3/2021	4143	11514004	6.98%	2982	0.002%	71564508	43.372%	17731	43.372%	25	6/2/2021	0.76
5/8/2021	3144	11516986	6.98%	2264	0.001%	71582239	43.383%	13455	43.383%	19	6/7/2021	0.76
5/13/2021	2385	11519250	6.98%	1719	0.001%	71595695	43.391%	10209	43.391%	14	6/12/2021	0.76
5/18/2021	1810	11520968	6.98%	1304	0.001%	71605904	43.398%	7745	43.398%	11	6/17/2021	0.76
5/23/2021	1373	11522272	6.98%	989	0.001%	71613648	43.402%	5875	43.402%	8	6/22/2021	0.76
5/28/2021	1041	11523262	6.98%	751	0.000%	71619523	43.406%	4456	43.406%	6	6/27/2021	0.76
6/2/2021	790	11524013	6.98%	569	0.000%	71623978	43.408%	3379	43.408%	5	7/2/2021	0.76
6/7/2021	599	11524582	6.98%	432	0.000%	71627358	43.411%	2563	43.411%	4	7/7/2021	0.76
6/12/2021	454	11525014	6.98%	328	0.000%	71629920	43.412%	1944	43.412%	3	7/12/2021	0.76
6/17/2021	344	11525341	6.99%	248	0.000%	71631864	43.413%	1474	43.413%	2	7/17/2021	0.76
6/22/2021	261	11525590	6.99%	188	0.000%	71633338	43.414%	1118	43.414%	2	7/22/2021	0.76
6/27/2021	198	11525778	6.99%	143	0.000%	71634456	43.415%	848	43.415%	1	7/27/2021	0.76
7/2/2021	150	11525921	6.99%	108	0.000%	71635303	43.415%	643	43.415%	1	8/1/2021	0.76
7/7/2021	114	11526029	6.99%	82	0.000%	71635946	43.416%	487	43.416%	1	8/6/2021	0.76
7/12/2021	86	11526112	6.99%	62	0.000%	71636433	43.416%	370	43.416%	1	8/11/2021	0.76
7/17/2021	65	11526174	6.99%	47	0.000%	71636803	43.416%	280	43.416%	0	8/16/2021	

<b>US Population</b>	330000000	
<b>Current Total Cases</b>	22000000	Cumulative cases to date (estimate)
<b>Current Active Cases</b>	675000	Is greater than confirmed cases because many never tested; We assume these are infectious for one period (5 days)
<b>Compliant (C) %</b>	60%	Percentage of population being careful—mask wearing, distancing, etc.
<b>R0 Compliant</b>	0.4	Assumed R0 for Compliers, mostly infect other complainers (but see C->N fraction below)
<b>Compliant Population</b>	198000000	<b>derived, don't change</b>
<b>Non-compliant (N) % (1-C)</b>	40%	<b>derived, don't change</b> E.g. the young, essential workers with insufficient PPE, others who don't mask, distance, etc.
<b>R0 Non-compliant</b>	1.4	Assumed R0 for Non-compliers
<b>Non-compliant Population</b>	132000000	<b>derived, don't change</b>
<b>Cycle time (days)</b>	5	Time in which new cases emerge, and average time for which infected assumed infectious
<b>Assume % of Total Cases so far C</b>	25%	Backcasting higher than steady-state—we assume a lot of C people were infected e.g. before masking
<b>Assume % of Active Cases C</b>	10%	Adjusted so simulation is roughly continuous going forward
<b>Assume N transmission fraction to C</b>	5%	Noncompliers don't affect many compliers because they are being careful
<b>Assume C transmission fraction to N</b>	15%	Compliers affect more noncompliers because they are not being careful
<b>CFR</b>	0.6%	Extrapolated to match current death rate of ~750/day to above numbers

Date	New Cases	C immune	C immune	C new cases	C new cases	N immune	N immune	N new cases	N immune	Deaths (later)	Deaths (later)	Rt
	/ day	Total	as % of C	/ cycle	as % of C	Total	as % of N	/cycle	As % of N	/ day	As of	Population
11/2/20	135000	5500000	2.78%	67500	0.034%	16500000	12.500%	607500	12.500%	810	12/2/20	1.15
11/7/20	155623	5567500	2.81%	67594	0.034%	17107500	12.960%	710522	12.960%	934	12/7/20	1.16
11/12/20	180133	5635094	2.85%	74615	0.038%	17818022	13.499%	826051	13.499%	1081	12/12/20	1.15
11/17/20	207879	5709709	2.88%	85175	0.043%	18644073	14.124%	954219	14.124%	1247	12/17/20	1.15
11/22/20	238441	5794884	2.93%	97957	0.049%	19598292	14.847%	1094247	14.847%	1431	12/22/20	1.14
11/27/20	271333	5892840	2.98%	112391	0.057%	20692539	15.676%	1244275	15.676%	1628	12/27/20	1.13
12/2/20	305855	6005231	3.03%	128126	0.065%	21936814	16.619%	1401149	16.619%	1835	1/1/21	1.11
12/7/20	341009	6133357	3.10%	144802	0.073%	23337963	17.680%	1560243	17.680%	2046	1/6/21	1.10
12/12/20	375469	6278159	3.17%	161960	0.082%	24898206	18.862%	1715387	18.862%	2253	1/11/21	1.09
12/17/20	407603	6440119	3.25%	179000	0.090%	26613593	20.162%	1859013	20.162%	2446	1/16/21	1.07
12/22/20	435547	6619118	3.34%	195169	0.099%	28472606	21.570%	1982564	21.570%	2613	1/21/21	1.05
12/27/20	457366	6814288	3.44%	209598	0.106%	30455170	23.072%	2077230	23.072%	2744	1/26/21	1.03
1/1/21	471266	7023886	3.55%	221356	0.112%	32532401	24.646%	2134974	24.646%	2828	1/31/21	1.01
1/6/21	475850	7245242	3.66%	229548	0.116%	34667375	26.263%	2149704	26.263%	2855	2/5/21	0.99
1/11/21	470360	7474790	3.78%	233432	0.118%	36817078	27.892%	2118370	27.892%	2822	2/10/21	0.97
1/16/21	454847	7708222	3.89%	232536	0.117%	38935448	29.497%	2041701	29.497%	2729	2/15/21	0.95
1/21/21	430216	7940758	4.01%	226748	0.115%	40977149	31.043%	1924331	31.043%	2581	2/20/21	0.93
1/26/21	398119	8167506	4.13%	216363	0.109%	42901480	32.501%	1774232	32.501%	2389	2/25/21	0.91
1/31/21	360720	8383869	4.23%	202048	0.102%	44675712	33.845%	1601553	33.845%	2164	3/2/21	0.89
2/5/21	320384	8585917	4.34%	184759	0.093%	46277265	35.059%	1417160	35.059%	1922	3/7/21	0.87
2/10/21	279366	8770676	4.43%	165598	0.084%	47694425	36.132%	1231230	36.132%	1676	3/12/21	0.86
2/15/21	239576	8936274	4.51%	145674	0.074%	48925656	37.065%	1052205	37.065%	1437	3/17/21	0.84
2/20/21	202441	9081948	4.59%	125970	0.064%	49977861	37.862%	886236	37.862%	1215	3/22/21	0.83
2/25/21	168876	9207918	4.65%	107268	0.054%	50864096	38.533%	737113	38.533%	1013	3/27/21	0.83

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	/ day	Total	as % of C	/ cycle	as % of C	Total	as % of N	/cycle	As % of N	/ day	As of	Population
3/2/21	139332	9315185	4.70%	90110	0.046%	51601209	39.092%	606550	39.092%	836	4/1/21	0.82
3/7/21	113891	9405295	4.75%	74809	0.038%	52207759	39.551%	494646	39.551%	683	4/6/21	0.81
3/12/21	92375	9480105	4.79%	61483	0.031%	52702405	39.926%	400393	39.926%	554	4/11/21	0.81
3/17/21	74445	9541587	4.82%	50101	0.025%	53102798	40.229%	322123	40.229%	447	4/16/21	0.80
3/22/21	59681	9591689	4.84%	40537	0.020%	53424921	40.473%	257868	40.473%	358	4/21/21	0.80
3/27/21	47642	9632225	4.86%	32606	0.016%	53682789	40.669%	205603	40.669%	286	4/26/21	0.80
4/1/21	37901	9664831	4.88%	26100	0.013%	53888392	40.825%	163403	40.825%	227	5/1/21	0.79
4/6/21	30068	9690931	4.89%	20810	0.011%	54051795	40.948%	129530	40.948%	180	5/6/21	0.79
4/11/21	23802	9711741	4.90%	16540	0.008%	54181326	41.046%	102469	41.046%	143	5/11/21	0.79
4/16/21	18808	9728281	4.91%	13112	0.007%	54283795	41.124%	80929	41.124%	113	5/16/21	0.79
4/21/21	14842	9741393	4.92%	10374	0.005%	54364724	41.185%	63835	41.185%	89	5/21/21	0.79
4/26/21	11699	9751767	4.93%	8194	0.004%	54428558	41.234%	50300	41.234%	70	5/26/21	0.79
5/1/21	9213	9759961	4.93%	6464	0.003%	54478858	41.272%	39603	41.272%	55	5/31/21	0.79
5/6/21	7251	9766425	4.93%	5094	0.003%	54518461	41.302%	31161	41.302%	44	6/5/21	0.79
5/11/21	5703	9771519	4.94%	4011	0.002%	54549622	41.325%	24506	41.325%	34	6/10/21	0.79
5/16/21	4484	9775529	4.94%	3156	0.002%	54574128	41.344%	19265	41.344%	27	6/15/21	0.79
5/21/21	3524	9778685	4.94%	2482	0.001%	54593393	41.359%	15140	41.359%	21	6/20/21	0.79
5/26/21	2769	9781167	4.94%	1951	0.001%	54608533	41.370%	11896	41.370%	17	6/25/21	0.79
5/31/21	2176	9783118	4.94%	1534	0.001%	54620429	41.379%	9345	41.379%	13	6/30/21	0.79
6/5/21	1709	9784652	4.94%	1205	0.001%	54629774	41.386%	7340	41.386%	10	7/5/21	0.79
6/10/21	1342	9785857	4.94%	947	0.000%	54637113	41.392%	5764	41.392%	8	7/10/21	0.79
6/15/21	1054	9786803	4.94%	743	0.000%	54642877	41.396%	4526	41.396%	6	7/15/21	0.79
6/20/21	828	9787547	4.94%	584	0.000%	54647403	41.400%	3554	41.400%	5	7/20/21	0.79
6/25/21	650	9788131	4.94%	458	0.000%	54650958	41.402%	2791	41.402%	4	7/25/21	0.79
6/30/21	510	9788589	4.94%	360	0.000%	54653748	41.404%	2191	41.404%	3	7/30/21	0.79
7/5/21	401	9788949	4.94%	283	0.000%	54655939	41.406%	1720	41.406%	2	8/4/21	0.79
7/10/21	314	9789232	4.94%	222	0.000%	54657659	41.407%	1350	41.407%	2	8/9/21	0.79
7/15/21	247	9789454	4.94%	174	0.000%	54659009	41.408%	1060	41.408%	1	8/14/21	0.79
7/20/21	194	9789628	4.94%	137	0.000%	54660070	41.409%	832	41.409%	1	8/19/21	0.79
7/25/21	152	9789765	4.94%	107	0.000%	54660902	41.410%	653	41.410%	1	8/24/21	

<b>US Population</b>	330000000	
<b>Current Total Cases</b>	22000000	Cumulative cases to date (estimate)
<b>Current Active Cases</b>	675000	Is greater than confirmed cases because many never tested; We assume these are infectious for one period (5 days)
<b>Compliant (C) %</b>	<b>70%</b>	Percentage of population being careful—mask wearing, distancing, etc.
<b>R0 Compliant</b>	0.4	Assumed R0 for Compliers, mostly infect other complainers (but see C->N fraction below)
<b>Compliant Population</b>	231000000	<b>derived, don't change</b>
<b>Non-compliant (N) % (1-C)</b>	30%	<b>derived, don't change</b> E.g. the young, essential workers with insufficient PPE, others who don't mask, distance, etc.
<b>R0 Non-compliant</b>	1.4	Assumed R0 for Non-compliers
<b>Non-compliant Population</b>	99000000	<b>derived, don't change</b>
<b>Cycle time (days)</b>	5	Time in which new cases emerge, and average time for which infected assumed infectious
<b>Assume % of Total Cases so far C</b>	25%	Backcasting higher than steady-state—we assume a lot of C people were infected e.g. before masking
<b>Assume % of Active Cases C</b>	10%	Adjusted so simulation is roughly continuous going forward
<b>Assume N transmission fraction to C</b>	5%	Noncompliers don't affect many complainers because they are being careful
<b>Assume C transmission fraction to N</b>	15%	Compliers affect more noncompliers because they are not being careful
<b>CFR</b>	0.6%	Extrapolated to match current death rate of ~750/day to above numbers

Date	New Cases	C immune	C immune	C new cases	C new cases	N immune	N immune	N new cases	N immune	Deaths (later)	Deaths (later)	Rt
	/ day	Total	as % of C	/ cycle	as % of C	Total	as % of N	/cycle	As % of N	/ day	As of	Population
11/2/20	135000	5500000	2.38%	67500	0.029%	16500000	16.667%	607500	16.667%	810	12/2/20	1.10
11/7/20	148911	5567500	2.41%	67870	0.029%	17107500	17.280%	676688	17.280%	893	12/7/20	1.10
11/12/20	164112	5635370	2.44%	72720	0.031%	17784188	17.964%	747841	17.964%	985	12/12/20	1.10
11/17/20	179797	5708090	2.47%	79450	0.034%	18532029	18.719%	819535	18.719%	1079	12/17/20	1.09
11/22/20	195353	5787540	2.51%	86945	0.038%	19351563	19.547%	889820	19.547%	1172	12/22/20	1.08
11/27/20	210192	5874484	2.54%	94633	0.041%	20241383	20.446%	956326	20.446%	1261	12/27/20	1.06
12/2/20	223702	5969118	2.58%	102131	0.044%	21197709	21.412%	1016377	21.412%	1342	1/1/21	1.05
12/7/20	235252	6071249	2.63%	109105	0.047%	22214086	22.438%	1067156	22.438%	1412	1/6/21	1.04
12/12/20	244231	6180354	2.68%	115233	0.050%	23281243	23.516%	1105922	23.516%	1465	1/11/21	1.02
12/17/20	250094	6295586	2.73%	120203	0.052%	24387165	24.633%	1130267	24.633%	1501	1/16/21	1.01
12/22/20	252424	6415789	2.78%	123733	0.054%	25517432	25.775%	1138386	25.775%	1515	1/21/21	0.99
12/27/20	250981	6539523	2.83%	125593	0.054%	26655818	26.925%	1129314	26.925%	1506	1/26/21	0.98
1/1/21	245742	6665115	2.89%	125629	0.054%	27785133	28.066%	1103083	28.066%	1474	1/31/21	0.96
1/6/21	236912	6790744	2.94%	123790	0.054%	28888216	29.180%	1060770	29.180%	1421	2/5/21	0.95
1/11/21	224907	6914534	2.99%	120131	0.052%	29948985	30.252%	1004405	30.252%	1349	2/10/21	0.94
1/16/21	210317	7034665	3.05%	114818	0.050%	30953390	31.266%	936769	31.266%	1262	2/15/21	0.92
1/21/21	193840	7149483	3.10%	108105	0.047%	31890159	32.212%	861093	32.212%	1163	2/20/21	0.91
1/26/21	176211	7257588	3.14%	100315	0.043%	32751252	33.082%	780738	33.082%	1057	2/25/21	0.90
1/31/21	158138	7357903	3.19%	91800	0.040%	33531990	33.871%	698891	33.871%	949	3/2/21	0.89
2/5/21	140249	7449703	3.22%	82914	0.036%	34230882	34.577%	618331	34.577%	841	3/7/21	0.88
2/10/21	123053	7532617	3.26%	73983	0.032%	34849213	35.201%	541284	35.201%	738	3/12/21	0.87
2/15/21	106930	7606601	3.29%	65283	0.028%	35390497	35.748%	469367	35.748%	642	3/17/21	0.86
2/20/21	92129	7671883	3.32%	57027	0.025%	35859864	36.222%	403616	36.222%	553	3/22/21	0.86
2/25/21	78783	7728910	3.35%	49368	0.021%	36263480	36.630%	344548	36.630%	473	3/27/21	0.85

Date	New Cases	C immune	C immune	C new cases	C new cases	N immune	N immune	N new cases	N immune	Deaths (later)	Deaths (later)	Rt
	/ day	Total	as % of C	/ cycle	as % of C	Total	as % of N	/cycle	As % of N	/ day	As of	Population
3/2/21	66934	7778278	3.37%	42398	0.018%	36608027	36.978%	292270	36.978%	402	4/1/21	0.84
3/7/21	56548	7820676	3.39%	36158	0.016%	36900297	37.273%	246583	37.273%	339	4/6/21	0.84
3/12/21	47545	7856834	3.40%	30650	0.013%	37146880	37.522%	207077	37.522%	285	4/11/21	0.84
3/17/21	39813	7887484	3.41%	25845	0.011%	37353957	37.731%	173221	37.731%	239	4/16/21	0.83
3/22/21	33224	7913330	3.43%	21697	0.009%	37527178	37.906%	144423	37.906%	199	4/21/21	0.83
3/27/21	27645	7935026	3.44%	18145	0.008%	37671601	38.052%	120079	38.052%	166	4/26/21	0.83
4/1/21	22947	7953171	3.44%	15125	0.007%	37791680	38.173%	99609	38.173%	138	5/1/21	0.83
4/6/21	19009	7968296	3.45%	12574	0.005%	37891288	38.274%	82469	38.274%	114	5/6/21	0.83
4/11/21	15720	7980871	3.45%	10430	0.005%	37973757	38.357%	68169	38.357%	94	5/11/21	0.83
4/16/21	12982	7991301	3.46%	8635	0.004%	38041926	38.426%	56274	38.426%	78	5/16/21	0.82
4/21/21	10708	7999935	3.46%	7137	0.003%	38098200	38.483%	46403	38.483%	64	5/21/21	0.82
4/26/21	8824	8007073	3.47%	5892	0.003%	38144603	38.530%	38230	38.530%	53	5/26/21	0.82
5/1/21	7266	8012964	3.47%	4858	0.002%	38182832	38.569%	31472	38.569%	44	5/31/21	0.82
5/6/21	5979	8017823	3.47%	4003	0.002%	38214304	38.600%	25893	38.600%	36	6/5/21	0.82
5/11/21	4917	8021825	3.47%	3295	0.001%	38240197	38.626%	21292	38.626%	30	6/10/21	0.82
5/16/21	4042	8025120	3.47%	2711	0.001%	38261489	38.648%	17501	38.648%	24	6/15/21	0.82
5/21/21	3322	8027831	3.48%	2229	0.001%	38278991	38.666%	14381	38.666%	20	6/20/21	0.82
5/26/21	2729	8030060	3.48%	1832	0.001%	38293371	38.680%	11813	38.680%	16	6/25/21	0.82
5/31/21	2241	8031893	3.48%	1506	0.001%	38305184	38.692%	9701	38.692%	13	6/30/21	0.82
6/5/21	1841	8033398	3.48%	1237	0.001%	38314885	38.702%	7966	38.702%	11	7/5/21	0.82
6/10/21	1511	8034635	3.48%	1016	0.000%	38322851	38.710%	6540	38.710%	9	7/10/21	0.82
6/15/21	1240	8035651	3.48%	834	0.000%	38329391	38.717%	5368	38.717%	7	7/15/21	0.82
6/20/21	1018	8036485	3.48%	685	0.000%	38334760	38.722%	4406	38.722%	6	7/20/21	0.82
6/25/21	836	8037170	3.48%	562	0.000%	38339166	38.726%	3616	38.726%	5	7/25/21	0.82
6/30/21	686	8037732	3.48%	461	0.000%	38342782	38.730%	2968	38.730%	4	7/30/21	0.82
7/5/21	563	8038193	3.48%	379	0.000%	38345750	38.733%	2435	38.733%	3	8/4/21	0.82
7/10/21	462	8038572	3.48%	311	0.000%	38348185	38.736%	1998	38.736%	3	8/9/21	0.82
7/15/21	379	8038882	3.48%	255	0.000%	38350183	38.738%	1640	38.738%	2	8/14/21	0.82
7/20/21	311	8039137	3.48%	209	0.000%	38351823	38.739%	1345	38.739%	2	8/19/21	0.82
7/25/21	255	8039347	3.48%	172	0.000%	38353168	38.741%	1104	38.741%	2	8/24/21	



<b>US Population</b>	330000000	
<b>Current Total Cases</b>	22000000	Cumulative cases to date (estimate)
<b>Current Active Cases</b>	675000	Is greater than confirmed cases because many never tested; We assume these are infectious for one period (5 days)
<b>Compliant (C) %</b>	80%	Percentage of population being careful—mask wearing, distancing, etc.
<b>R0 Compliant</b>	0.4	Assumed R0 for Compliant, mostly infect other complaints (but see C->N fraction below)
<b>Compliant Population</b>	264000000	<b>derived, don't change</b>
<b>Non-compliant (N) % (1-C)</b>	20%	<b>derived, don't change</b> E.g. the young, essential workers with insufficient PPE, others who don't mask, distance, etc.
<b>R0 Non-compliant</b>	1.4	Assumed R0 for Non-complaints
<b>Non-compliant Population</b>	66000000	<b>derived, don't change</b>
<b>Cycle time (days)</b>	5	Time in which new cases emerge, and average time for which infected assumed infectious
<b>Assume % of Total Cases so far C</b>	25%	Backcasting higher than steady-state—we assume a lot of C people were infected e.g. before masking
<b>Assume % of Active Cases C</b>	10%	Adjusted so simulation is roughly continuous going forward
<b>Assume N transmission fraction to C</b>	5%	Noncomplaints don't affect many compliant because they are being careful
<b>Assume C transmission fraction to N</b>	15%	Complaints affect more noncomplaints because they are not being careful
<b>CFR</b>	0.6%	Extrapolated to match current death rate of ~750/day to above numbers

Date	New Cases	C immune	C immune	C new cases	C new cases	N immune	N immune	N new cases	N immune	Deaths (later)	Deaths (later)	Rt
	/ day	Total	as % of C	/ cycle	as % of C	Total	as % of N	/cycle	As % of N	/ day	As of	Population
11/2/20	135000	5500000	2.08%	67500	0.026%	16500000	25.000%	607500	25.000%	810	12/2/20	1.00
11/7/20	135419	5567500	2.11%	68077	0.026%	17107500	25.920%	609019	25.920%	813	12/7/20	0.99
11/12/20	134291	5635577	2.13%	68389	0.026%	17716519	26.843%	603066	26.843%	806	12/12/20	0.98
11/17/20	131572	5703965	2.16%	68085	0.026%	18319585	27.757%	589777	27.757%	789	12/17/20	0.97
11/22/20	127333	5772050	2.19%	67038	0.025%	18909362	28.651%	569628	28.651%	764	12/22/20	0.96
11/27/20	121730	5839088	2.21%	65231	0.025%	19478990	29.514%	543417	29.514%	730	12/27/20	0.94
12/2/20	114982	5904319	2.24%	62713	0.024%	20022406	30.337%	512195	30.337%	690	1/1/21	0.93
12/7/20	107351	5967032	2.26%	59576	0.023%	20534602	31.113%	477179	31.113%	644	1/6/21	0.92
12/12/20	99118	6026608	2.28%	55939	0.021%	21011781	31.836%	439653	31.836%	595	1/11/21	0.91
12/17/20	90561	6082548	2.30%	51938	0.020%	21451433	32.502%	400868	32.502%	543	1/16/21	0.90
12/22/20	81936	6134486	2.32%	47711	0.018%	21852302	33.110%	361971	33.110%	492	1/21/21	0.90
12/27/20	73466	6182197	2.34%	43390	0.016%	22214273	33.658%	323940	33.658%	441	1/26/21	0.89
1/1/21	65330	6225587	2.36%	39094	0.015%	22538214	34.149%	287555	34.149%	392	1/31/21	0.88
1/6/21	57663	6264681	2.37%	34923	0.013%	22825769	34.584%	253392	34.584%	346	2/5/21	0.88
1/11/21	50556	6299604	2.39%	30954	0.012%	23079161	34.968%	221828	34.968%	303	2/10/21	0.87
1/16/21	44063	6330559	2.40%	27244	0.010%	23300989	35.305%	193071	35.305%	264	2/15/21	0.87
1/21/21	38203	6357802	2.41%	23827	0.009%	23494060	35.597%	167186	35.597%	229	2/20/21	0.86
1/26/21	32970	6381629	2.42%	20722	0.008%	23661246	35.850%	144125	35.850%	198	2/25/21	0.86
1/31/21	28339	6402352	2.43%	17934	0.007%	23805371	36.069%	123764	36.069%	170	3/2/21	0.86
2/5/21	24275	6420285	2.43%	15453	0.006%	23929135	36.256%	105922	36.256%	146	3/7/21	0.85
2/10/21	20731	6435738	2.44%	13265	0.005%	24035057	36.417%	90391	36.417%	124	3/12/21	0.85
2/15/21	17659	6449003	2.44%	11350	0.004%	24125448	36.554%	76946	36.554%	106	3/17/21	0.85
2/20/21	15009	6460353	2.45%	9684	0.004%	24202394	36.670%	65362	36.670%	90	3/22/21	0.85

Date	New Cases	C immune	C immune	C new cases	C new cases	N immune	N immune	N new cases	N immune	Deaths (later)	Deaths (later)	Rt
	/ day	Total	as % of C	/ cycle	as % of C	Total	as % of N	/cycle	As % of N	/ day	As of	Population
2/25/21	12733	6470037	2.45%	8242	0.003%	24267756	36.769%	55421	36.769%	76	3/27/21	0.85
3/2/21	10784	6478279	2.45%	7000	0.003%	24323177	36.853%	46920	36.853%	65	4/1/21	0.85
3/7/21	9121	6485279	2.46%	5935	0.002%	24370098	36.924%	39671	36.924%	55	4/6/21	0.84
3/12/21	7706	6491215	2.46%	5025	0.002%	24409769	36.984%	33505	36.984%	46	4/11/21	0.84
3/17/21	6504	6496239	2.46%	4248	0.002%	24443274	37.035%	28271	37.035%	39	4/16/21	0.84
3/22/21	5485	6500487	2.46%	3588	0.001%	24471545	37.078%	23835	37.078%	33	4/21/21	0.84
3/27/21	4622	6504075	2.46%	3027	0.001%	24495380	37.114%	20082	37.114%	28	4/26/21	0.84
4/1/21	3893	6507102	2.46%	2552	0.001%	24515462	37.145%	16911	37.145%	23	5/1/21	0.84
4/6/21	3277	6509654	2.47%	2150	0.001%	24532373	37.170%	14233	37.170%	20	5/6/21	0.84
4/11/21	2757	6511804	2.47%	1811	0.001%	24546606	37.192%	11975	37.192%	17	5/11/21	0.84
4/16/21	2319	6513615	2.47%	1524	0.001%	24558581	37.210%	10071	37.210%	14	5/16/21	0.84
4/21/21	1950	6515139	2.47%	1282	0.000%	24568652	37.225%	8468	37.225%	12	5/21/21	0.84
4/26/21	1639	6516421	2.47%	1078	0.000%	24577120	37.238%	7118	37.238%	10	5/26/21	0.84
5/1/21	1378	6517499	2.47%	907	0.000%	24584238	37.249%	5983	37.249%	8	5/31/21	0.84
5/6/21	1158	6518406	2.47%	762	0.000%	24590221	37.258%	5027	37.258%	7	6/5/21	0.84
5/11/21	973	6519168	2.47%	641	0.000%	24595248	37.266%	4224	37.266%	6	6/10/21	0.84
5/16/21	817	6519809	2.47%	538	0.000%	24599472	37.272%	3548	37.272%	5	6/15/21	0.84
5/21/21	687	6520347	2.47%	452	0.000%	24603020	37.277%	2980	37.277%	4	6/20/21	0.84
5/26/21	577	6520799	2.47%	380	0.000%	24606000	37.282%	2503	37.282%	3	6/25/21	0.84
5/31/21	484	6521179	2.47%	319	0.000%	24608504	37.286%	2102	37.286%	3	6/30/21	0.84
6/5/21	407	6521498	2.47%	268	0.000%	24610606	37.289%	1766	37.289%	2	7/5/21	0.84
6/10/21	342	6521766	2.47%	225	0.000%	24612372	37.291%	1483	37.291%	2	7/10/21	0.84
6/15/21	287	6521991	2.47%	189	0.000%	24613855	37.294%	1245	37.294%	2	7/15/21	0.84
6/20/21	241	6522180	2.47%	159	0.000%	24615100	37.296%	1046	37.296%	1	7/20/21	0.84
6/25/21	202	6522339	2.47%	133	0.000%	24616145	37.297%	878	37.297%	1	7/25/21	0.84
6/30/21	170	6522473	2.47%	112	0.000%	24617023	37.299%	737	37.299%	1	7/30/21	0.84
7/5/21	143	6522584	2.47%	94	0.000%	24617760	37.300%	619	37.300%	1	8/4/21	0.84
7/10/21	120	6522678	2.47%	79	0.000%	24618379	37.301%	520	37.301%	1	8/9/21	0.84
7/15/21	101	6522757	2.47%	66	0.000%	24618899	37.301%	436	37.301%	1	8/14/21	0.84
7/20/21	84	6522824	2.47%	56	0.000%	24619335	37.302%	366	37.302%	1	8/19/21	0.84
7/25/21	71	6522879	2.47%	47	0.000%	24619702	37.303%	308	37.303%	0	8/24/21	

<b>US Population</b>	330000000	
<b>Current Total Cases</b>	22000000	Cumulative cases to date (estimate)
<b>Current Active Cases</b>	675000	Is greater than confirmed cases because many never tested; We assume these are infectious for one period (5 days)
<b>Compliant (C) %</b>	90%	Percentage of population being careful—mask wearing, distancing, etc.
<b>R0 Compliant</b>	0.4	Assumed R0 for Compliers, mostly infect other compliants (but see C->N fraction below)
<b>Compliant Population</b>	297000000	<b>derived, don't change</b>
<b>Non-compliant (N) % (1-C)</b>	10%	<b>derived, don't change</b> E.g. the young, essential workers with insufficient PPE, others who don't mask, distance, etc.
<b>R0 Non-compliant</b>	1.4	Assumed R0 for Non-compliers
<b>Non-compliant Population</b>	33000000	<b>derived, don't change</b>
<b>Cycle time (days)</b>	5	Time in which new cases emerge, and average time for which infected assumed infectious
<b>Assume % of Total Cases so far C</b>	25%	Backcasting higher than steady-state—we assume a lot of C people were infected e.g. before masking
<b>Assume % of Active Cases C</b>	10%	Adjusted so simulation is roughly continuous going forward
<b>Assume N transmission fraction to C</b>	5%	Noncompliers don't affect many compliants because they are being careful
<b>Assume C transmission fraction to N</b>	15%	Compliers affect more noncompliers because they are not being careful
<b>CFR</b>	0.6%	Extrapolated to match current death rate of ~750/day to above numbers

Date	New Cases	C immune	C immune	C new cases	C new cases	N immune	N immune	N new cases	N immune	Deaths (later)	Deaths (later)	Rt
	/ day	Total	as % of C	/ cycle	as % of C	Total	as % of N	/cycle	As % of N	/ day	As of	Population
11/2/20	135000	5500000	1.85%	67500	0.023%	16500000	50.000%	607500	50.000%	810	12/2/20	0.70
11/7/20	94850	5567500	1.87%	68238	0.023%	17107500	51.841%	406013	51.841%	569	12/7/20	0.67
11/12/20	63340	5635738	1.90%	54671	0.018%	17513513	53.071%	262029	53.071%	380	12/12/20	0.65
11/17/20	40907	5690409	1.92%	39448	0.013%	17775542	53.865%	165086	53.865%	245	12/17/20	0.63
11/22/20	25840	5729857	1.93%	26811	0.009%	17940627	54.366%	102387	54.366%	155	12/22/20	0.62
11/27/20	16085	5756668	1.94%	17546	0.006%	18043014	54.676%	62877	54.676%	97	12/27/20	0.62
12/2/20	9916	5774214	1.94%	11199	0.004%	18105891	54.866%	38380	54.866%	59	1/1/21	0.61
12/7/20	6074	5785413	1.95%	7027	0.002%	18144271	54.983%	23342	54.983%	36	1/6/21	0.61
12/12/20	3705	5792440	1.95%	4358	0.001%	18167613	55.053%	14165	55.053%	22	1/11/21	0.61
12/17/20	2253	5796798	1.95%	2681	0.001%	18181778	55.096%	8585	55.096%	14	1/16/21	0.61
12/22/20	1368	5799479	1.95%	1641	0.001%	18190364	55.122%	5200	55.122%	8	1/21/21	0.61
12/27/20	830	5801120	1.95%	1000	0.000%	18195563	55.138%	3148	55.138%	5	1/26/21	0.61
1/1/21	503	5802120	1.95%	608	0.000%	18198711	55.148%	1905	55.148%	3	1/31/21	0.61
1/6/21	304	5802729	1.95%	369	0.000%	18200616	55.153%	1153	55.153%	2	2/5/21	0.61
1/11/21	184	5803098	1.95%	224	0.000%	18201769	55.157%	698	55.157%	1	2/10/21	0.61
1/16/21	112	5803322	1.95%	136	0.000%	18202467	55.159%	422	55.159%	1	2/15/21	0.61
1/21/21	68	5803458	1.95%	82	0.000%	18202889	55.160%	255	55.160%	0	2/20/21	0.61
1/26/21	41	5803540	1.95%	50	0.000%	18203144	55.161%	154	55.161%	0	2/25/21	0.61
1/31/21	25	5803590	1.95%	30	0.000%	18203298	55.162%	93	55.162%	0	3/2/21	0.61
2/5/21	15	5803620	1.95%	18	0.000%	18203392	55.162%	57	55.162%	0	3/7/21	0.61
2/10/21	9	5803638	1.95%	11	0.000%	18203448	55.162%	34	55.162%	0	3/12/21	0.61
2/15/21	5	5803649	1.95%	7	0.000%	18203483	55.162%	21	55.162%	0	3/17/21	0.61
2/20/21	3	5803656	1.95%	4	0.000%	18203503	55.162%	13	55.162%	0	3/22/21	0.61
2/25/21	2	5803660	1.95%	2	0.000%	18203516	55.162%	8	55.162%	0	3/27/21	0.61

Date	New Cases	C immune	C immune	C new cases	C new cases	N immune	N immune	N new cases	N immune	Deaths (later)	Deaths (later)	Rt
	/ day	Total	as % of C	/ cycle	as % of C	Total	as % of N	/cycle	As % of N	/ day	As of	Population
3/2/21	1	5803662	1.95%	1	0.000%	18203523	55.162%	5	55.162%	0	4/1/21	0.61
3/7/21	1	5803664	1.95%	1	0.000%	18203528	55.162%	3	55.162%	0	4/6/21	0.61
3/12/21	0	5803665	1.95%	1	0.000%	18203531	55.162%	2	55.162%	0	4/11/21	0.61
3/17/21	0	5803665	1.95%	0	0.000%	18203533	55.162%	1	55.162%	0	4/16/21	0.61
3/22/21	0	5803666	1.95%	0	0.000%	18203534	55.162%	1	55.162%	0	4/21/21	0.61
3/27/21	0	5803666	1.95%	0	0.000%	18203534	55.162%	0	55.162%	0	4/26/21	0.61
4/1/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	5/1/21	0.61
4/6/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	5/6/21	0.61
4/11/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	5/11/21	0.61
4/16/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	5/16/21	0.61
4/21/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	5/21/21	0.61
4/26/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	5/26/21	0.61
5/1/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	5/31/21	0.61
5/6/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	6/5/21	0.61
5/11/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	6/10/21	0.61
5/16/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	6/15/21	0.61
5/21/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	6/20/21	0.61
5/26/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	6/25/21	0.61
5/31/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	6/30/21	0.61
6/5/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	7/5/21	0.61
6/10/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	7/10/21	0.61
6/15/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	7/15/21	0.61
6/20/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	7/20/21	0.61
6/25/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	7/25/21	0.61
6/30/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	7/30/21	0.61
7/5/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	8/4/21	0.61
7/10/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	8/9/21	0.61
7/15/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	8/14/21	0.61
7/20/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	8/19/21	0.61
7/25/21	0	5803666	1.95%	0	0.000%	18203535	55.162%	0	55.162%	0	8/24/21	