# LA-report

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### 7/12/2021

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#### 1 EXPLORATORY DATA ANALYSIS

We start with importing our data set and storing it in data frame "data", using read.csv function.

data <- read.csv("C:\\Users\\LENOVO\\OneDrive\\Desktop\\praveen\\EDA\\LA-1\\USA Covid Data.csv", header
show(data)</pre>

##		State	Total.Cases	${\tt Total.Deaths}$	Total.Recovered	Active.Cases
##	1	Alabama	551298	11358	NA	NA
##	2	Alaska	68674	370	66087	2217
##	3	Arizona	898283	18004	867042	13237
##	4	Arkansas	353095	5933	341896	5266
##	5	California	3828483	63758	2077558	1687167
##	6	Colorado	560419	7056	467669	85694
##	7	Connecticut	349743	8278	339469	1996
##	8	Delaware	109900	1695	107493	712
##	9	Florida	2382980	37985	2215966	129029
##	10	Georgia	1137560	21467	1056403	59690
##	11	Hawaii	38121	518	NA	NA
##	12	Idaho	195552	2162	115460	77930
##	13	Illinois	1394235	25733	1358187	10315
##	14	Indiana	756070	13892	730685	11493
##	15	Iowa	405303	6149	366566	32588
##	16	Kansas	319586	5166	309373	5047
##	17	Kentucky	466244	7250	53643	405351
##	18	Louisiana	484577	10763	NA	NA
##	19	Maine	69156	861	NA	NA
##	20	Maryland	462736	9755	11041	441940

##	21	Massachusetts	710519	18008	69116	33 1348
	22	Michigan	1000908	21031	86829	
##	23	Minnesota	606034	7693	59763	
##	24	Mississippi	323214	7436	3129	
##	25	Missouri	626126	10114	56237	
##	26	Montana	114102	1671	11200	
##	27	Nebraska	224873	2262		VA NA
##	28	Nevada	336562	5705	31594	
##	29	New Hampshire	99652	1374	9808	
##	30	New Jersey	1024748	26490	98319	
##	31	New Mexico	205996	4347	19518	
##	32	New York	2176123	54065	199236	129698
##	33	North Carolina	1016262	13460	99447	72 8330
##	34	North Dakota	110779	1528	10912	27 124
##	35	Ohio	1113006	20366	108598	
##	36	Oklahoma	459675	7406	44996	30 2309
##	37	Oregon	209764	2788	19593	32 11044
##	38	Pennsylvania	1217879	27821	117692	21 13137
##	39	Puerto Rico	275539	2552	12122	27 151760
##	40	South Carolina	598229	9843	57517	73 13213
##	41	South Dakota	124641	2039	12242	24 178
##	42	Tennessee	868738	12583	85356	3 2592
##	43	Texas	3010445	52722	290330	06 54417
##	44	Utah	417653	2387	40766	7602
##	45	Vermont	24440	258	2406	37 115
##	46	Virginia	681599	11436	5732	21 612842
##	47	Washington	456423	6029	22719	94 223200
##	48	West Virginia	164346	2901	16039	90 1055
##	49	Wisconsin	678232	8154	1	NA NA
##	50	Wyoming	62737	751	6142	
##		Total.Cases.1.m		Death.1.mil.		
##			112437		2316	2830286
##			93875		506	2395221
	3		123412		2474	5126795
##	-		117004		1966	3808827
##	5		96894		1614	70392011
##			97316		1225	3190081
##			98097		2322	9645449
##	-		112861		1741	740119 31249599
	9 10		110951 107141		1769 2022	12006950
	11		26924		366	1754418
	12		109426		1210	1413139
	13		110026		2031	25989308
	14		112306		2064	10918291
	15		128461		1949	5216309
	16		109698		1773	1455337
	17		104359		1623	6941164
	18		104237		2315	7810833
	19		51447		641	2765484
	20		76540		1614	10927231
	21		103086		2613	23969707
	22		100223		2106	14953233
	23		107460		1364	10377218
			20. 200			

	24		108601	2499	2911438
##			102018	1648	7800545
##			106759	1563	1457325
	27	=	116249	1169	3056982
	28	=	109268	1852	3555730
##			73289	1011	2448734
	30	:	115371	2982	14458068
##			98242	2073	3686555
	32	:	111862	2779	59267467
	33		96897	1283	13902865
	34	=	145367	2005	447733
##			95217	1742	13728606
##		=	116168	1872	4040035
##			49734	661	5471841
	38		95132	2173	14680614
##			81353	753	464073
	40		116190	1912	8227548
##			140892	2305	490627
	42		127210	1843	8227135
	43		103823	1818	32192208
	44	-	130274	745	5141040
##			39167	413	1741050
##			79854	1340	10293262
##			59938	792	7673465
##			91703	1619	3030600
##			116486	1400	3604344
##	50	-	108399	1298	791749
##		Tests.1.mil.population	=		
##		577234	4903185		
## ##	2	577234 3274195	4903185 731545		
## ## ##	2 3	577234 3274195 704354	4903185 731545 7278717		
## ## ## ##	2 3 4	577234 3274195 704354 1262119	4903185 731545 7278717 3017804		
## ## ## ##	2 3 4 5	577234 3274195 704354 1262119 1781525	4903185 731545 7278717 3017804 39512223		
## ## ## ## ##	2 3 4 5 6	577234 3274195 704354 1262119 1781525 553955	4903185 731545 7278717 3017804 39512223 5758736		
## ## ## ## ##	2 3 4 5 6 7	577234 3274195 704354 1262119 1781525 553955 2705378	4903185 731545 7278717 3017804 39512223 5758736 3565287		
## ## ## ## ## ##	2 3 4 5 6 7 8	577234 3274195 704354 1262119 1781525 553955 2705378 760060	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764		
## ## ## ## ## ##	2 3 4 5 6 7 8 9	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737		
## ## ## ## ## ## ##	2 3 4 5 6 7 8 9	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423		
## ## ## ## ## ## ##	2 3 4 5 6 7 8 9 10 11	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872		
## ## ## ## ## ## ##	2 3 4 5 6 7 8 9 10 11 12	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065		
## ## ## ## ## ## ## ##	2 3 4 5 6 7 8 9 10 11 12 13	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821		
## ## ## ## ## ## ## ##	2 3 4 5 6 7 8 9 10 11 12 13 14	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219		
## ## ## ## ## ## ## ## ##	2 3 4 5 6 7 8 9 10 11 12 13 14 15	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070		
## ## ## ## ## ## ## ## ##	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314		
## ## ## ## ## ## ## ## ## ## ## ## ##	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673		
######################################	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794		
## ## ## ## ## ## ## ## ## ## ##	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212		
## ## ## ## ## ## ## ## ## ## ## ## ##	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327 1807444	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212 6045680		
######################################	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327 1807444 3477649	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212 6045680 6892503		
######################################	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327 1807444 3477649 1497291	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212 6045680 6892503 9986857		
######################################	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327 1807444 3477649 1497291 1840052	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212 6045680 6892503 9986857 5639632		
# # # # # # # # # # # # # # # # # # #	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327 1807444 3477649 1497291 1840052 978257	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212 6045680 6892503 9986857 5639632 2976149		
#######################################	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327 1807444 3477649 1497291 1840052	4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212 6045680 6892503 9986857 5639632		

##	27	1580319	1934408
##	28	1154399	3080156
##	29	1800922	1359711
##	30	1627759	8882190
##	31	1758157	2096829
##	32	3046613	19453561
##	33	1325587	10488084
##	34	587528	762062
##	35	1174479	11689100
##	36	1020992	3956971
##	37	1297340	4217737
##	38	1146745	12801989
##	39	137018	3386941
##	40	1597981	5148714
##	41	554594	884659
##	42	1204704	6829174
##	43	1110234	28995881
##	44	1603589	3205958
##	45	2790193	623989
##	46	1205933	8535519
##	47	1007692	7614893
##	48	1691044	1792147
##	49	619044	5822434
##	50	1368012	578759

This data set we are working on is state-wise stats for Covid-19 in USA. The data contains the several stats like active cases, total cases, total recovery etc.

to make our data more rich, we will add a few more columns, based on our need.

```
f_data <- mutate(data, Percent_Death = (data$Total.Deaths*100)/data$Total.Cases)
f_data <- mutate(f_data, Percent.Recovered = (data$Total.Recovered*100)/data$Total.Cases)
show(f_data)</pre>
```

##		State	Total.Cases	Total.Deaths	Total.Recovered	Active.Cases
##	1	Alabama	551298	11358	NA	NA
##	2	Alaska	68674	370	66087	2217
##	3	Arizona	898283	18004	867042	13237
##	4	Arkansas	353095	5933	341896	5266
##	5	California	3828483	63758	2077558	1687167
##	6	Colorado	560419	7056	467669	85694
##	7	Connecticut	349743	8278	339469	1996
##	8	Delaware	109900	1695	107493	712
##	9	Florida	2382980	37985	2215966	129029
##	10	Georgia	1137560	21467	1056403	59690
##	11	Hawaii	38121	518	NA	NA
##	12	Idaho	195552	2162	115460	77930
##	13	Illinois	1394235	25733	1358187	10315
##	14	Indiana	756070	13892	730685	11493
##	15	Iowa	405303	6149	366566	32588
##	16	Kansas	319586	5166	309373	5047
##	17	Kentucky	466244	7250	53643	405351
##	18	Louisiana	484577	10763	NA	NA

	40		20452	004	37.4	37.4
##		Maine	69156	861	NA	NA
##		Maryland	462736	9755	11041	441940
##	21	Massachusetts	710519	18008	691163	1348
##	22	Michigan	1000908	21031	868294	111583
##	23	Minnesota	606034	7693	597632	709
##	24	Mississippi	323214	7436	312956	2822
##	25	Missouri	626126	10114	562379	53633
##	26	Montana	114102	1671	112003	428
##	27	Nebraska	224873	2262	NA	NA
##	28	Nevada	336562	5705	315944	14913
##	29	New Hampshire	99652	1374	98083	195
##	30	New Jersey	1024748	26490	983195	15063
##	31	New Mexico	205996	4347	195187	6462
##	32	New York	2176123	54065	1992360	129698
##		North Carolina	1016262	13460	994472	8330
##	34	North Dakota	110779	1528	109127	124
##	35	Ohio	1113006	20366	1085985	6655
##	36	Oklahoma	459675	7406	449960	2309
##	37	Oregon	209764	2788	195932	11044
##	38	Pennsylvania	1217879	27821	1176921	13137
##	39	Puerto Rico	275539	2552	121227	151760
	40	South Carolina	598229	9843	575173	13213
##		South Dakota	124641	2039	122424	178
	42	Tennessee	868738	12583	853563	2592
	43	Texas	3010445	52722	2903306	54417
	44	Utah	417653	2387	407664	7602
##	45	Vermont	24440	258	24067	115
##	46	Virginia	681599	11436	57321	612842
##	47	Washington	456423	6029	227194	223200
##	48	West Virginia	164346	2901	160390	1055
##	49	Wisconsin	678232	8154	NA	NA
##	50	Wyoming	62737	751	61420	566
##		Total.Cases.1.mil		Death.1.mil.		
##			112437		2316	2830286
##	2		93875		506	2395221
##	3		123412		2474	5126795
##			117004		1966	3808827
##			96894			70392011
##			97316		1225	3190081
##			98097		2322	9645449
##			112861		1741	740119
##			110951		1769	31249599
##	10		107141			12006950
##	11		26924		366	1754418
	12		109426		1210	1413139
	13		110026			25989308
	14		112306			10918291
##	15		128461		1949	5216309
##	16		109698		1773	1455337
##	17		104359		1623	6941164
	18		104237		2315	7810833
	19		51447		641	2765484
	20		76540			10927231
##	21		103086		2613	23969707

	22		100223		2106	14953233
	23		107460		1364	10377218
	24		108601		2499	2911438
	25		102018		1648	7800545
	26		106759		1563	1457325
	27		116249		1169	3056982
	28	=	109268		1852	3555730
	29		73289		1011	2448734
	30	=	115371		2982	14458068
	31		98242		2073	3686555
	32	<u>-</u>	111862		2779	59267467
	33		96897		1283	13902865
	34	<u>-</u>	145367		2005	447733
	35		95217		1742	13728606
	36	<u>-</u>	116168	:	1872	4040035
	37		49734		661	5471841
	38		95132	2	2173	14680614
	39		81353		753	464073
	40		116190		1912	8227548
	41		140892		2305	490627
	42		127210		1843	8227135
	43		103823	:	1818	32192208
	44	=	130274		745	5141040
	45		39167		413	1741050
	46		79854	:	1340	10293262
	47		59938		792	7673465
	48		91703		1619	3030600
	49		116486		1400	3604344
##	49 50	:	108399	:	1298	791749
## ##	50	Tests.1.mil.population	108399 Population	Percent_Death	1298	791749 ent.Recovered
## ## ##	50 1	Tests.1.mil.population 577234	108399 Population 4903185	Percent_Death 2.0602288	1298	791749 ent.Recovered NA
## ## ## ##	50 1 2	Tests.1.mil.population 577234 3274195	108399 Population 4903185 731545	Percent_Death	1298	791749 ent.Recovered NA 96.232927
## ## ## ##	50 1 2 3	Tests.1.mil.population 577234 3274195 704354	108399 Population 4903185 731545 7278717	Percent_Death 2.0602288 0.5387774 2.0042681	1298	791749 ent.Recovered NA 96.232927 96.522143
## ## ## ## ##	50 1 2 3 4	Tests.1.mil.population 577234 3274195 704354 1262119	108399 Population 4903185 731545 7278717 3017804	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332
## ## ## ## ## ##	50 1 2 3 4 5	Tests.1.mil.population 577234 3274195 704354 1262119 1781525	108399 Population 4903185 731545 7278717 3017804 39512223	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828
## ## ## ## ## ##	50 1 2 3 4 5 6	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955	108399 Population 4903185 731545 7278717 3017804 39512223 5758736	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883
## ## ## ## ## ##	50 1 2 3 4 5 6 7	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378	108399 Population 4903185 731545 7278717 3017804 39512223 5758736 3565287	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414
## ## ## ## ## ##	50 1 2 3 4 5 6 7 8	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827
## ## ## ## ## ## ##	50 1 2 3 4 5 6 7 8 9	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381
## ## ## ## ## ## ##	50 1 2 3 4 5 6 7 8 9 10	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695
## ## ## ## ## ## ## ## ## ## ## ## ##	50 1 2 3 4 5 6 7 8 9 10 11	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA
## ## ## ## ## ## ## ## ## ## ## ## ##	50 1 2 3 4 5 6 7 8 9 10 11 12	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119
## ## ## ## ## ## ## ## ## ## ## ## ##	50 1 2 3 4 5 6 7 8 9 10 11 12 13	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119 97.414496
######################################	50 1 2 3 4 5 6 7 8 9 10 11 12 13 14	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119 97.414496 96.642507
######################################	50 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119 97.414496 96.642507 90.442459
######################################	50 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119 97.414496 96.642507 90.442459 96.804303
######################################	50 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119 97.414496 96.642507 90.442459 96.804303 11.505349
#####################	50 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119 97.414496 96.642507 90.442459 96.804303 11.505349 NA
########################	50 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119 97.414496 96.642507 90.442459 96.804303 11.505349 NA
########################	50 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327 1807444	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212 6045680	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119 97.414496 96.642507 90.442459 96.804303 11.505349 NA NA NA 2.386026
##########################	50 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327 1807444 3477649	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212 6045680 6892503	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119 97.414496 96.642507 90.442459 96.804303 11.505349 NA NA 2.386026 97.275794
##########################	50 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327 1807444 3477649 1497291	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212 6045680 6892503 9986857	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119 97.414496 96.642507 90.442459 96.804303 11.505349 NA NA 2.386026 97.275794 86.750630
##########################	50 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	Tests.1.mil.population 577234 3274195 704354 1262119 1781525 553955 2705378 760060 1454976 1130872 1239108 790760 2050953 1621797 1653310 499547 1553642 1680185 2057327 1807444 3477649	Population 4903185 731545 7278717 3017804 39512223 5758736 3565287 973764 21477737 10617423 1415872 1787065 12671821 6732219 3155070 2913314 4467673 4648794 1344212 6045680 6892503	Percent_Death	1298	791749 ent.Recovered NA 96.232927 96.522143 96.828332 54.265828 83.449883 97.062414 97.809827 92.991381 92.865695 NA 59.043119 97.414496 96.642507 90.442459 96.804303 11.505349 NA NA 2.386026 97.275794

##	25	1270979	6137428	1.6153298	89.818822
##	26	1363543	1068778	1.4644792	98.160418
##	27	1580319	1934408	1.0059011	NA
##	28	1154399	3080156	1.6950814	93.873937
##	29	1800922	1359711	1.3787982	98.425521
##	30	1627759	8882190	2.5850258	95.945052
##	31	1758157	2096829	2.1102352	94.752811
##	32	3046613	19453561	2.4844643	91.555487
##	33	1325587	10488084	1.3244616	97.855868
##	34	587528	762062	1.3793228	98.508743
##	35	1174479	11689100	1.8298194	97.572250
##	36	1020992	3956971	1.6111383	97.886550
##	37	1297340	4217737	1.3291127	93.405923
##	38	1146745	12801989	2.2843813	96.636940
##	39	137018	3386941	0.9261847	43.996313
##	40	1597981	5148714	1.6453565	96.145957
##	41	554594	884659	1.6358983	98.221292
##	42	1204704	6829174	1.4484229	98.253213
##	43	1110234	28995881	1.7513025	96.441091
##	44	1603589	3205958	0.5715271	97.608302
##	45	2790193	623989	1.0556465	98.473813
##	46	1205933	8535519	1.6778194	8.409783
##	47	1007692	7614893	1.3209238	49.777071
##	48	1691044	1792147	1.7651783	97.592883
##	49	619044	5822434	1.2022435	NA
##	50	1368012	578759	1.1970607	97.900760

Now, we will add values at places that have no values, except in the 2 columns that we have manually added. We add the mean of that column.

```
f_data$Total.Recovered[is.na(f_data$Total.Recovered)] <- mean(f_data$Total.Recovered,na.rm=TRUE)

f_data$Active.Cases[is.na(f_data$Active.Cases)] <- mean(f_data$Active.Cases,na.rm=TRUE)

show(f_data)</pre>
```

##		State	Total.Cases	${\tt Total.Deaths}$	${\tt Total.Recovered}$	Active.Cases
##	1	Alabama	551298	11358	607724.5	100356
##	2	Alaska	68674	370	66087.0	2217
##	3	Arizona	898283	18004	867042.0	13237
##	4	Arkansas	353095	5933	341896.0	5266
##	5	California	3828483	63758	2077558.0	1687167
##	6	Colorado	560419	7056	467669.0	85694
##	7	Connecticut	349743	8278	339469.0	1996
##	8	Delaware	109900	1695	107493.0	712
##	9	Florida	2382980	37985	2215966.0	129029
##	10	Georgia	1137560	21467	1056403.0	59690
##	11	Hawaii	38121	518	607724.5	100356
##	12	Idaho	195552	2162	115460.0	77930
##	13	Illinois	1394235	25733	1358187.0	10315
##	14	Indiana	756070	13892	730685.0	11493
##	15	Iowa	405303	6149	366566.0	32588
##	16	Kansas	319586	5166	309373.0	5047

##	17	Kentucky	466244	7250	53643.	0 405351
	18	Louisiana	484577	10763	607724.	
##	19	Maine	69156	861	607724.	5 100356
##	20	Maryland	462736	9755	11041.	0 441940
##	21	Massachusetts	710519	18008	691163.	0 1348
##	22	Michigan	1000908	21031	868294.	0 111583
##	23	Minnesota	606034	7693	597632.	0 709
##	24	Mississippi	323214	7436	312956.	0 2822
##	25	Missouri	626126	10114	562379.	0 53633
##	26	Montana	114102	1671	112003.	0 428
##	27	Nebraska	224873	2262	607724.	5 100356
##	28	Nevada	336562	5705	315944.	0 14913
##	29	New Hampshire	99652	1374	98083.	0 195
##	30	New Jersey	1024748	26490	983195.	0 15063
##	31	New Mexico	205996	4347	195187.	0 6462
##	32	New York	2176123	54065	1992360.	0 129698
##	33	North Carolina	1016262	13460	994472.	0 8330
##	34	North Dakota	110779	1528	109127.	0 124
##	35	Ohio	1113006	20366	1085985.	0 6655
##	36	Oklahoma	459675	7406	449960.	0 2309
##	37	Oregon	209764	2788	195932.	0 11044
##	38	Pennsylvania	1217879	27821	1176921.	
##	39	Puerto Rico	275539	2552	121227.	
##	40	South Carolina	598229	9843	575173.	
##	41	South Dakota	124641	2039	122424.	
##	42	Tennessee	868738	12583	853563.	
##	43	Texas	3010445	52722	2903306.	
##	44	Utah	417653	2387	407664.	
##	45	Vermont	24440	258	24067.	
##	46	Virginia	681599	11436	57321.	
##	47	Washington	456423	6029	227194.	
##	48	West Virginia	164346	2901	160390.	
##	49 50	Wisconsin	678232 62737	8154 751	607724. 61420.	
##	50	Wyoming Total.Cases.1.m				
##	1	Total.Cases.I.m	112437	Deadii.I.miI.	2316	2830286
##	_		93875		506	2395221
##			123412		2474	5126795
##			117004		1966	3808827
##	5		96894		1614	70392011
##	6		97316		1225	3190081
##	7		98097		2322	9645449
##	8		112861		1741	740119
##	9		110951		1769	31249599
##	10		107141		2022	12006950
##	11		26924		366	1754418
##	12		109426		1210	1413139
##	13		110026		2031	25989308
##	14		112306		2064	10918291
##	15		128461		1949	5216309
##	16		109698		1773	1455337
##			104359		1623	6941164
##			104237		2315	7810833
##	19		51447		641	2765484

##	20		76540	1	614	10927231
##		:	103086		2613	23969707
##	22		100223		2106	14953233
##	23	:	107460		.364	10377218
##			108601		2499	2911438
##			102018		648	7800545
##			106759		563	1457325
##			116249		169	3056982
	28	<u>:</u>	109268		.852	3555730
	29		73289	1	.011	2448734
##	30	<u>:</u>	115371		2982	14458068
##	31		98242		2073	3686555
##	32	:	111862	2	2779	59267467
##	33		96897	1	.283	13902865
##	34		145367	2	2005	447733
##	35		95217	1	742	13728606
##	36		116168	1	.872	4040035
##	37		49734		661	5471841
##	38		95132	2	2173	14680614
##	39		81353		753	464073
##	40	:	116190	1	912	8227548
##	41	=	140892	2	2305	490627
##	42	-	127210	1	.843	8227135
##	43	:	103823	1	.818	32192208
##	44	<u>:</u>	130274		745	5141040
##	45		39167		413	1741050
##	46		79854	1	.340	10293262
##	47		59938		792	7673465
##			91703		.619	3030600
	49		116486		.400	3604344
	50		108399		.298	791749
##		Tests.1.mil.population			Perc	
##	1	577234	4903185	2.0602288		AN
##	2	3274195	731545	0.5387774		96.232927
	3	704354	7278717	2.0042681		96.522143
	4	1262119	3017804	1.6802843		96.828332
##	_	1781525	39512223	1.6653594		54.265828
##		553955	5758736	1.2590580		83.449883
	7	2705378	3565287	2.3668808		97.062414 97.809827
## ##	8	760060 1454976	973764 21477737	1.5423112 1.5940125		92.991381
	10	1130872	10617423	1.8871093		92.865695
##	11	1239108	1415872	1.3588311		92.003093 NA
	12	790760	1787065	1.1055883		59.043119
	13	2050953	12671821	1.8456716		97.414496
	14	1621797	6732219	1.8373960		96.642507
	15	1653310	3155070	1.5171366		90.442459
##	16	499547	2913314	1.6164663		96.804303
##	17	1553642	4467673	1.5549798		11.505349
##	18	1680185	4648794	2.2211124		NA
##	19	2057327	1344212	1.2450113		NA
##	20	1807444	6045680	2.1081135		2.386026
##	21	3477649	6892503	2.5344854		97.275794
##	22	1497291	9986857	2.1011921		86.750630

##	23	1840052	5639632	1.2694007	98.613609
##	24	978257	2976149	2.3006429	96.826251
##	25	1270979	6137428	1.6153298	89.818822
##	26	1363543	1068778	1.4644792	98.160418
##	27	1580319	1934408	1.0059011	NA
##	28	1154399	3080156	1.6950814	93.873937
##	29	1800922	1359711	1.3787982	98.425521
##	30	1627759	8882190	2.5850258	95.945052
##	31	1758157	2096829	2.1102352	94.752811
##	32	3046613	19453561	2.4844643	91.555487
##	33	1325587	10488084	1.3244616	97.855868
##	34	587528	762062	1.3793228	98.508743
##	35	1174479	11689100	1.8298194	97.572250
##	36	1020992	3956971	1.6111383	97.886550
##	37	1297340	4217737	1.3291127	93.405923
##	38	1146745	12801989	2.2843813	96.636940
##	39	137018	3386941	0.9261847	43.996313
##	40	1597981	5148714	1.6453565	96.145957
##	41	554594	884659	1.6358983	98.221292
##	42	1204704	6829174	1.4484229	98.253213
##	43	1110234	28995881	1.7513025	96.441091
##	44	1603589	3205958	0.5715271	97.608302
##	45	2790193	623989	1.0556465	98.473813
##	46	1205933	8535519	1.6778194	8.409783
##	47	1007692	7614893	1.3209238	49.777071
##	48	1691044	1792147	1.7651783	97.592883
##	49	619044	5822434	1.2022435	NA
##	50	1368012	578759	1.1970607	97.900760

\_ \_ \_ \_ \_

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Now we summarise our data using summary method, to check the max, min, mean, median etc values of different columns.

\_\_ \_.\_\_

#### summary(f\_data)

```
Total.Cases
                                          Total.Deaths
##
       State
                                                          Total.Recovered
##
   Length:50
                              : 24440
                                                 : 258
                                                                 : 11041
                       Min.
                                         Min.
                                                          Min.
                       1st Qu.: 206938
                                          1st Qu.: 2428
##
   Class :character
                                                          1st Qu.: 131916
##
   Mode :character
                       Median: 461206
                                         Median: 7421
                                                          Median: 458815
##
                       Mean
                              : 675425
                                          Mean
                                                 :12067
                                                          Mean
                                                                 : 607725
##
                       3rd Qu.: 840571
                                          3rd Qu.:13784
                                                          3rd Qu.: 822844
##
                       Max.
                              :3828483
                                          Max.
                                                 :63758
                                                          Max.
                                                                 :2903306
##
##
                      Total.Cases.1.mil.population Death.1.mil.population
     Active.Cases
##
   Min.
         :
                115
                      Min.
                             : 26924
                                                    Min.
                                                          : 366
##
   1st Qu.:
               2380
                      1st Qu.: 95636
                                                    1st Qu.:1287
##
   Median : 13175
                      Median :106950
                                                    Median:1756
##
   Mean
          : 100356
                      Mean
                            :100993
                                                    Mean
                                                          :1663
   3rd Qu.: 100356
                      3rd Qu.:112755
                                                    3rd Qu.:2056
##
##
   Max.
           :1687167
                      Max.
                             :145367
                                                    Max.
                                                           :2982
##
##
                                                Population
    Total.Tests
                       Tests.1.mil.population
                                                                  Percent_Death
##
   Min.
          : 447733
                       Min.
                              : 137018
                                               Min. : 578759
                                                                  Min.
                                                                         :0.5388
   1st Qu.: 2781684
                       1st Qu.:1043302
                                               1st Qu.: 1975013
                                                                  1st Qu.:1.3256
```

```
## Median: 5178674 Median: 1344565
                                            Median: 4558234
                                                              Median :1.6159
         : 9973373 Mean
##
                            :1439948
                                                 : 6597227
                                                                    :1.6302
   Mean
                                            Mean
                                                              Mean
   3rd Qu.:10924996
                      3rd Qu.:1688329
                                            3rd Qu.: 7530849
                                                              3rd Qu.:1.8767
  Max.
          :70392011
                      Max.
                            :3477649
                                            Max.
                                                   :39512223
                                                              Max.
                                                                     :2.5850
##
##
##
  Percent.Recovered
          : 2.386
##
  Min.
## 1st Qu.:91.277
## Median :96.580
## Mean
          :85.658
## 3rd Qu.:97.659
## Max.
          :98.614
  NA's
          :6
```

We make important observations like mean death % is around 1.6 and over 85 % of all patients have recovered. we now check the total cases, total active cases, total recovered cases and total deaths across USA

```
sum(f_data$Total.Cases)

## [1] 33771259

sum(f_data$Active.Cases)

## [1] 5017801

sum(f_data$Total.Recovered)

## [1] 30386227
```

## [1] 603373

sum(f\_data\$Total.Deaths)

Similarly, we now check the mean cases, mean active cases, mean recovered cases and mean deaths across USA.

```
mean(f_data$Total.Cases)
## [1] 675425.2
```

```
mean(f_data$Active.Cases)
```

## [1] 100356

```
mean(f_data$Total.Recovered)
```

## [1] 607724.5

#### mean(f\_data\$Total.Deaths)

```
## [1] 12067.46
```

We now check the top 5 and least 5 states in terms of active cases and total deaths.

```
f_data %>% rownames_to_column() %>% top_n(-5, Active.Cases) %>% pull("State", "Active.Cases")
               428
##
                                195
                                                 124
                                                                  178
                                                                                   115
         "Montana" "New Hampshire"
                                     "North Dakota"
##
                                                      "South Dakota"
                                                                            "Vermont"
f_data %>% rownames_to_column() %>% top_n(5, Active.Cases) %>% pull("State", "Active.Cases")
                                                                223200
##
        1687167
                       405351
                                    441940
                                                  612842
                   "Kentucky"
                                              "Virginia" "Washington"
## "California"
                                "Maryland"
f_data %>% rownames_to_column() %>% top_n(-5, Total.Deaths) %>% pull("State", "Total.Deaths")
##
         370
                              861
                                        258
                                                   751
                    518
                          "Maine" "Vermont" "Wyoming"
    "Alaska"
              "Hawaii"
f_data %>% rownames_to_column() %>% top_n(5, Total.Deaths) %>% pull("State", "Total.Deaths")
##
            63758
                            37985
                                            54065
                                                           27821
                                                                           52722
                                       "New York" "Pennsylvania"
##
     "California"
                        "Florida"
                                                                         "Texas"
```

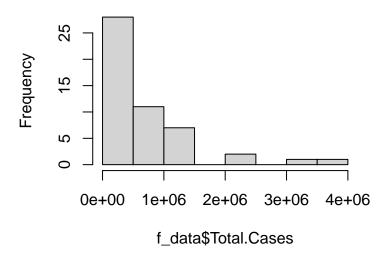
Here we can observe that California has most number of active cases, and has had maximum deaths. While Montana has least no of active cases, and Alaska he least no of total deaths.

### 2 PLOTS

#### 2.1 Histograms

hist(f\_data\$Total.Cases)

### Histogram of f\_data\$Total.Cases

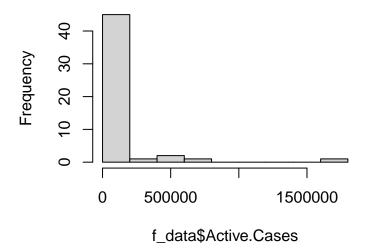


in the above figure we see frequency of states having total cases in distinct half million ranges. NOTE: 1e+06 = 1000000

we will now observe some other histograms on available stats.

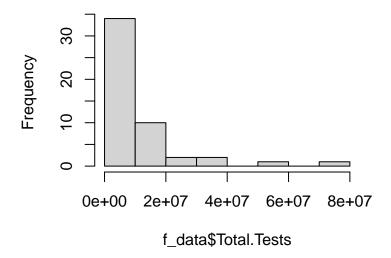
hist(f\_data\$Active.Cases)

## Histogram of f\_data\$Active.Cases



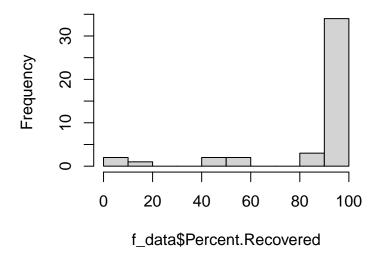
hist(f\_data\$Total.Tests)

# Histogram of f\_data\$Total.Tests



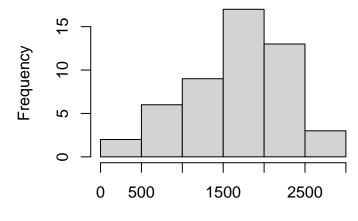
hist(f\_data\$Percent.Recovered)

## Histogram of f\_data\$Percent.Recovered



hist(f\_data\$Death.1.mil.population)

## Histogram of f\_data\$Death.1.mil.population

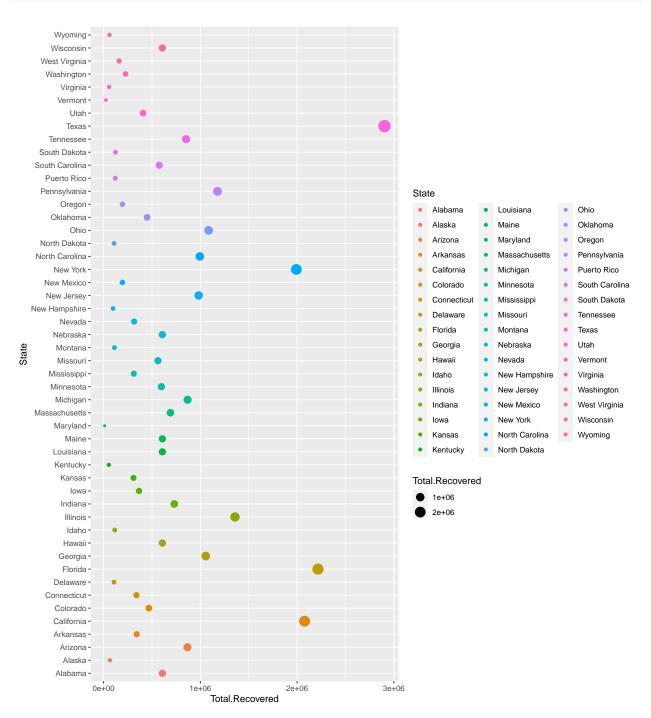


f\_data\$Death.1.mil.population

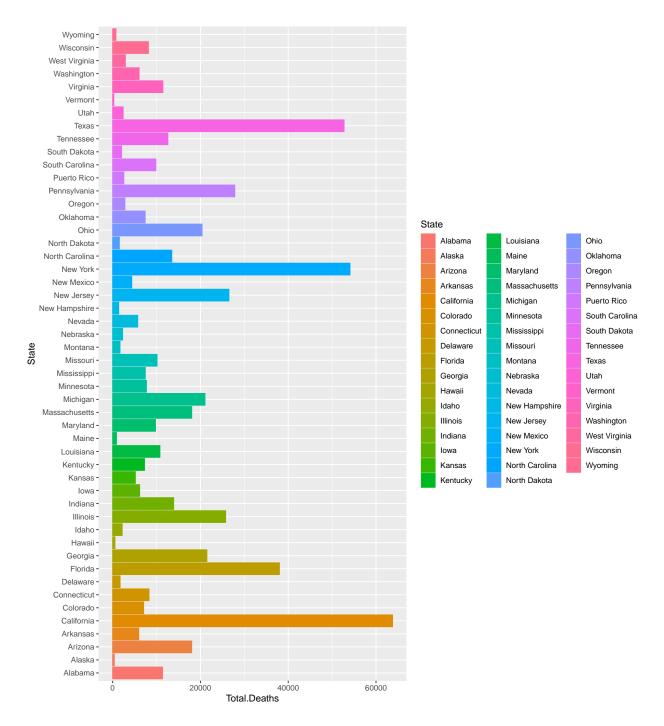
#### 2.2 GGplots

Next we move on to observe several state wise stats using ggplot. we will use bar representation and point representation alternatively to observe.

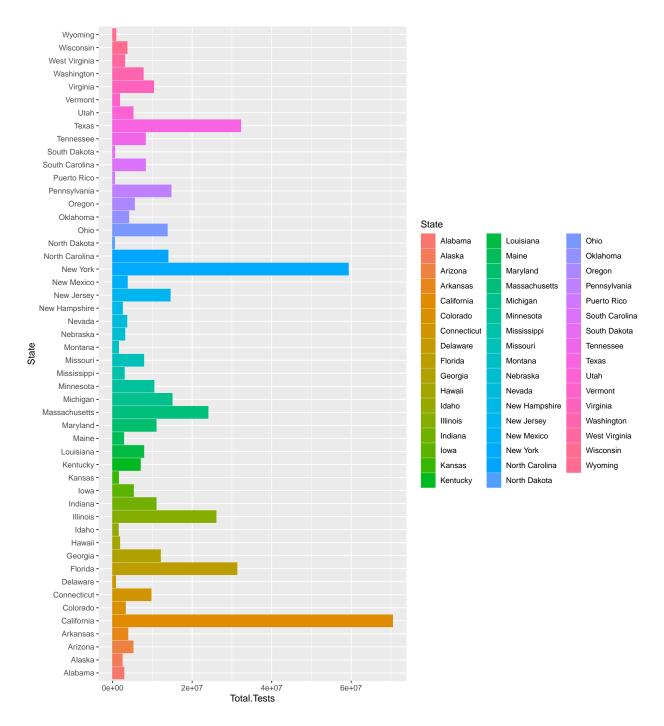
 $ggplot(f_{data}, aes(x = Total.Recovered, y = State, col = State, size = Total.Recovered)) + geom_point()$ 



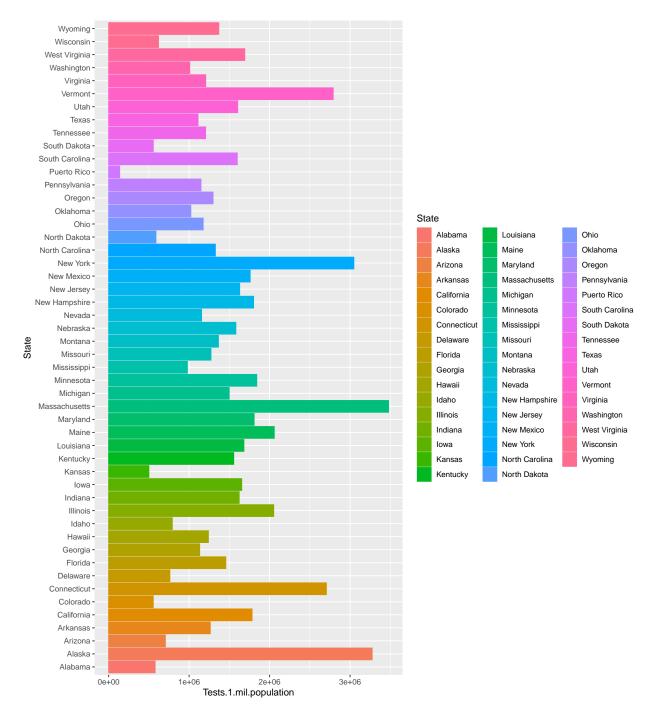
 $ggplot(f_data, aes(x = Total.Deaths, y = State, col = State, fill = State)) + geom_bar(stat = "identity") + geom_bar(stat = "identity")$ 



ggplot(f\_data, aes(x = Total.Tests, y = State, col = State, fill = State)) + geom\_bar(stat = "identity"



 $ggplot(f_data, aes(x = Tests.1.mil.population, y = State, col = State, fill = State)) + geom_bar(stat = State)) + geom_bar(state)) + geom_bar(state) + geom_bar(state)) + geom_bar(state) + geom_bar(sta$ 



Next we see the percentage deaths and recovered in each state

```
ggplot(f_data, aes(x = Percent_Death, y = State, col = State, size = Percent_Death)) + geom_point()
```

