Lab Exercise - Hierarchical II

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Lip cancer

Here is the lip cancer data given to you in terribly unreproducible and error-prone format.

- `aff.i` is proportion of male population working outside in each region
- `observe.i` is observed deaths in each region
- `expect.i` is expected deaths, based on region-specific age distribution and national-level age-specific mortality rates.

Question 1

Run three different models in Stan with three different set-up's for estimating θ_i, that is the relative risk of lip cancer in each region:

1. θ_i is same in each region $= \theta$
2. θ_i is different in each region and modeled separately
3. θ_i is different in each region and modeled hierarchically

Model 0 - θ_i is same in each region $= \theta$

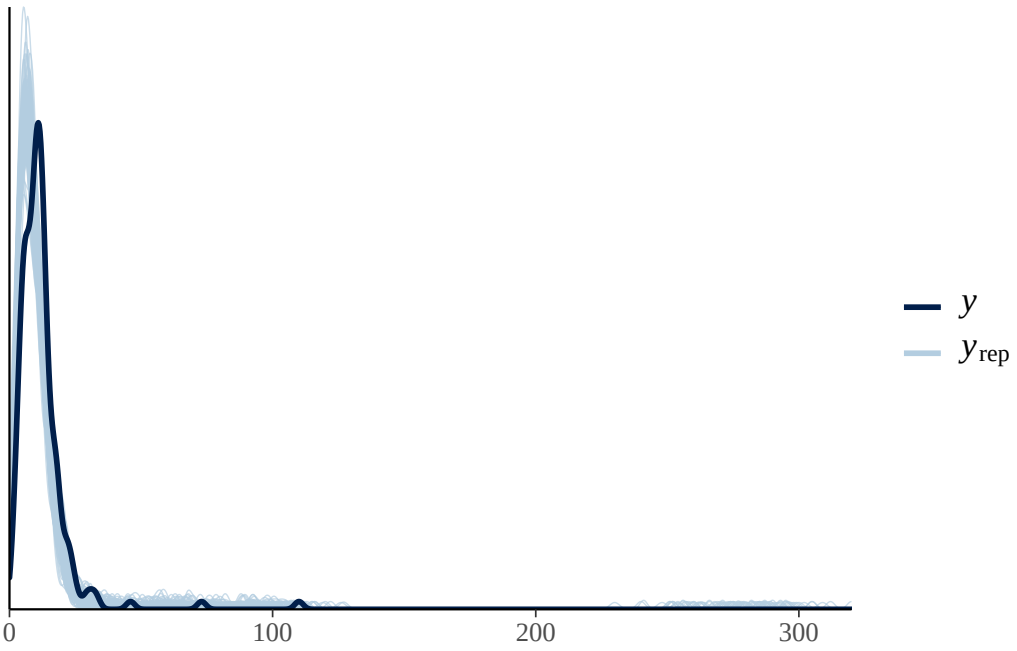

Figure 1: Model-0: distribution of probability of death

Model 1 - θ_i is different in each region and modeled separately

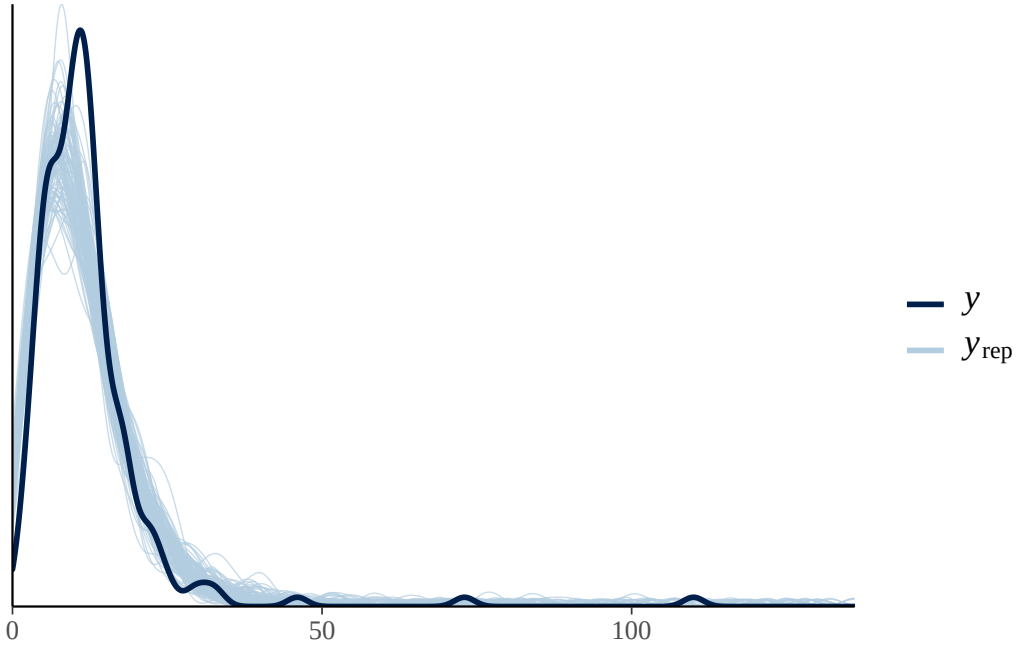

Figure 2: Model-1: distribution of probability of death

Model 2 - θ_i is different in each region and modeled hierarchically

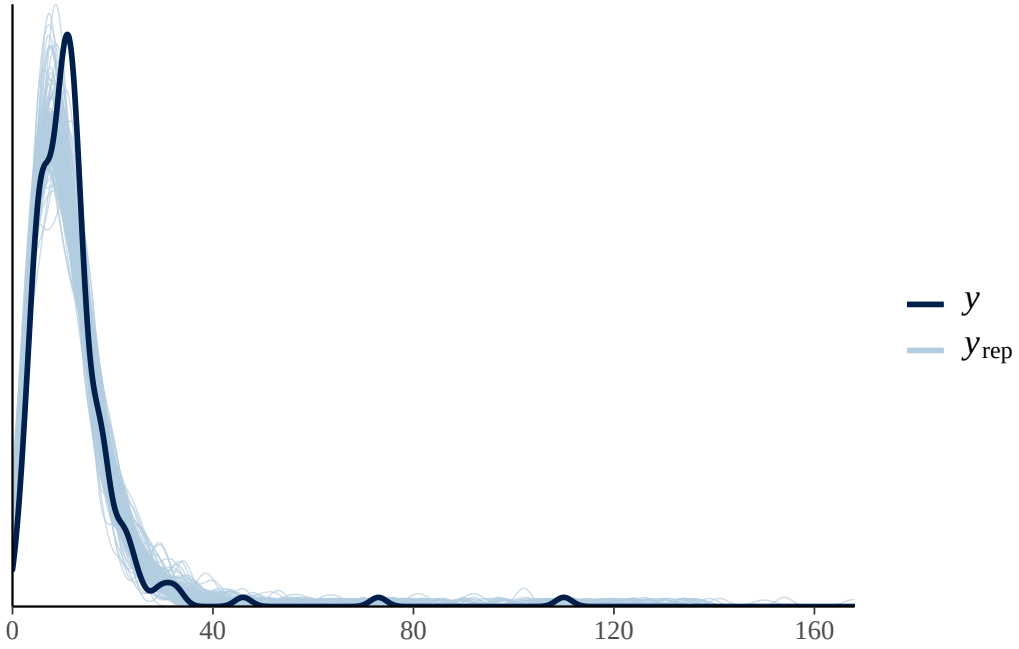

Figure 3: Model-2: distribution of probability of death

Question 2

Make three plot (appropriately labeled and described) that illustrate the differences in estimated RRs across regions and the differences in SMRs across models.

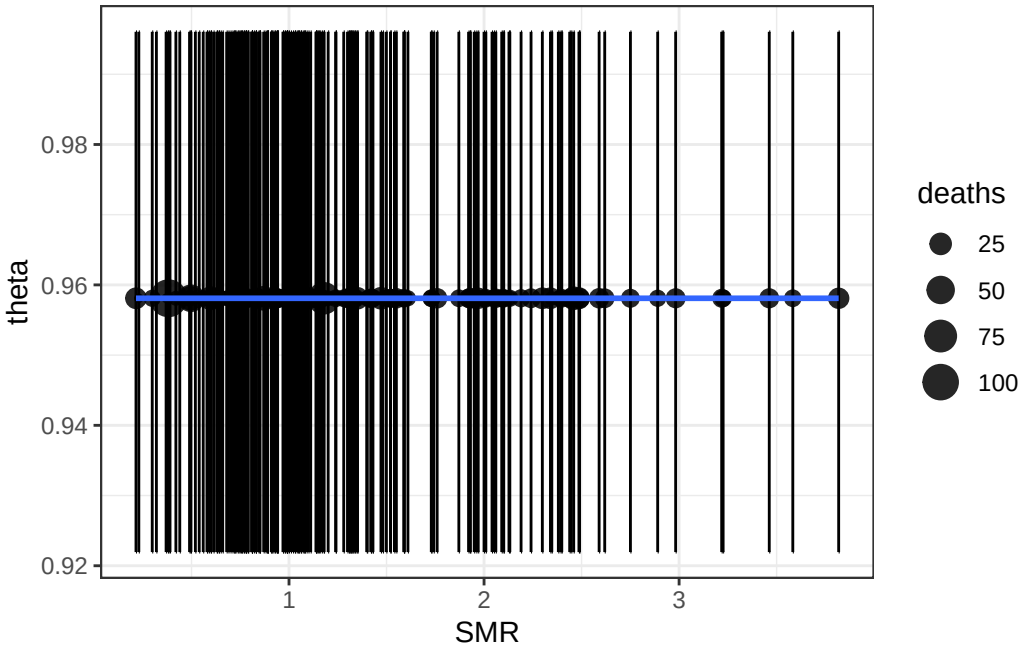

Figure 4: Start Model (Theta equal for all regions): Theta vs. SMR, per region

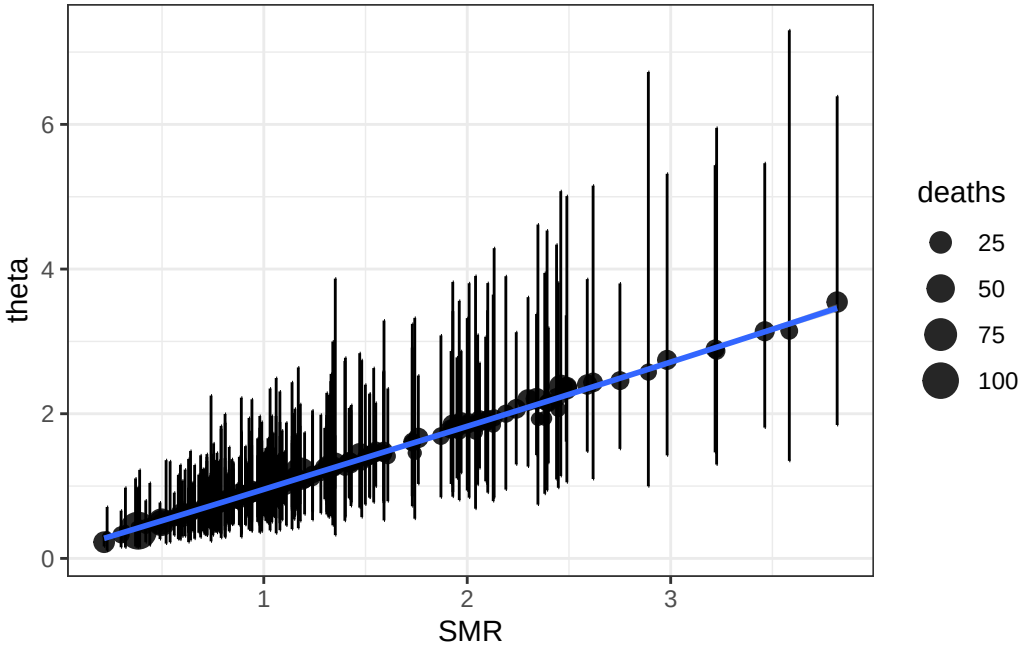

Figure 5: Partial Model (Theta modelled Separatedly): Theta vs. SMR, per region

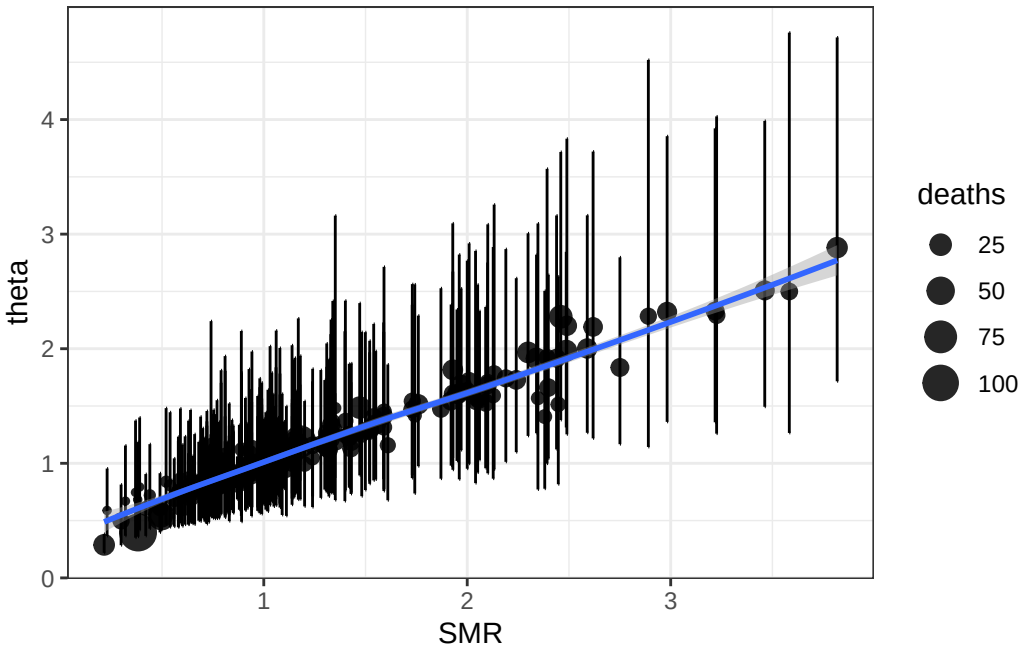

Figure 6: Full Model (Hierarchical): Theta vs. SMR, per region

Plotting the SMR, per region, for each model.

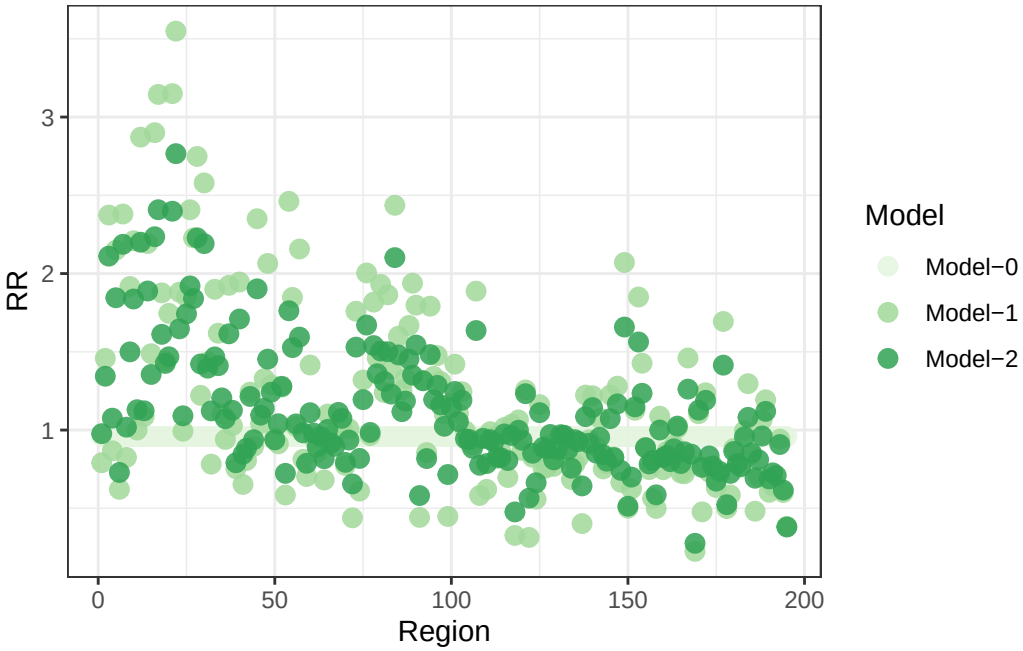

Figure 7: Comparison of SMR for each model across models

Apendix - Parameters for Models studied

Table 1: Model 0 - Parameters

	x
mean	0.9580967
se_mean	0.0009768
sd	0.0193361
2.5%	0.9219474
25%	0.9441258
50%	0.9578084
75%	0.9708234
97.5%	0.9960470
n_eff	391.8557757
Rhat	0.9998997

Table 2: Model 1 - Parameters

	mean	se_mean	sd	n_eff	Rhat
	1.4235103	0.0460808	0.6061031	173.0030	1.0099936
alpha[1]	-0.3418296	0.0121981	0.4168648	1167.9078	1.0001896
alpha[2]	0.2846780	0.0072177	0.2697232	1396.5037	0.9995101
alpha[3]	0.5313037	0.0125588	0.2656060	447.2823	1.0005023
alpha[4]	-0.3299379	0.0107740	0.4383272	1655.1582	0.9965423
alpha[5]	0.5364393	0.0082180	0.3060444	1386.8614	0.9980320
alpha[6]	-0.7165703	0.0107572	0.2555368	564.3025	1.0038581
alpha[7]	0.5125663	0.0112147	0.2331938	432.3746	1.0012838
alpha[8]	-0.5545154	0.0132792	0.3233705	593.0039	0.9980868
alpha[9]	0.7415341	0.0063942	0.2398980	1407.6250	1.0022948
alpha[10]	0.7795830	0.0054515	0.2177758	1595.8562	0.9973512
alpha[11]	-0.1266255	0.0102254	0.4460940	1903.2519	0.9976895
alpha[12]	0.8285894	0.0094217	0.3074012	1064.5259	0.9998826
alpha[13]	-0.0074242	0.0067136	0.2979773	1969.9306	0.9986291
alpha[14]	0.6622864	0.0056245	0.2150043	1461.2502	0.9970748
alpha[15]	0.3404863	0.0075480	0.2806244	1382.2402	0.9975389
alpha[16]	0.9044144	0.0079706	0.2665449	1118.2957	0.9990031
alpha[17]	1.0219802	0.0065856	0.2443736	1376.9672	0.9980335
alpha[18]	0.6025478	0.0042064	0.2163529	2645.4891	0.9973067
alpha[19]	0.0695813	0.0115211	0.2345690	414.5275	1.0029185
alpha[20]	0.4498834	0.0110461	0.4098408	1376.6095	1.0043018
alpha[21]	0.8567800	0.0112234	0.3185282	805.4675	0.9981680
alpha[22]	1.0761933	0.0085357	0.2296200	723.6732	1.0015760
alpha[23]	0.4574362	0.0073286	0.2990699	1665.3602	0.9972425
alpha[24]	-0.1170238	0.0101381	0.4144499	1671.2098	0.9998657
alpha[25]	0.3122529	0.0108278	0.2676253	610.9019	1.0000776
alpha[26]	0.8492860	0.0055631	0.2329867	1753.9680	1.0003199
alpha[27]	0.6621885	0.0085374	0.2826266	1095.9067	0.9985764
alpha[28]	0.8231282	0.0079635	0.2514154	996.7331	0.9992270

Table 2: Model 1 - Parameters *(continued)*

	mean	se_mean	sd	n_eff	Rhat
alpha[29]	-0.0679985	0.0142458	0.5290617	1379.2322	0.9986379
alpha[30]	0.5891398	0.0129751	0.3482319	720.3019	0.9996997
alpha[31]	0.1837327	0.0109699	0.3880696	1251.4565	1.0031166
alpha[32]	-0.4983333	0.0133847	0.4824447	1299.2078	0.9994749
alpha[33]	0.7114392	0.0066573	0.2999530	2030.0578	0.9976653
alpha[34]	0.4052701	0.0068168	0.2889198	1796.3570	0.9978291
alpha[35]	-0.0793588	0.0101545	0.3954851	1516.8562	0.9984370
alpha[36]	-0.4375654	0.0135996	0.2964898	475.2986	1.0069140
alpha[37]	0.5891849	0.0066984	0.2765323	1704.3273	0.9980764
alpha[38]	-0.1207323	0.0089771	0.3807050	1798.4813	0.9998907
alpha[39]	-0.1725066	0.0068457	0.3142872	2107.7223	0.9996802
alpha[40]	0.4457646	0.0090611	0.3240790	1279.2135	1.0018514
alpha[41]	-0.4529810	0.0115155	0.4426533	1477.6246	0.9995593
alpha[42]	-0.2359094	0.0076606	0.3515787	2106.2851	0.9984903
alpha[43]	0.1012287	0.0086587	0.2853096	1085.7318	1.0011751
alpha[44]	-0.1619365	0.0073204	0.2936095	1608.6704	0.9982112
alpha[45]	0.8685193	0.0056478	0.2033503	1296.3751	1.0000809
alpha[46]	-0.1738037	0.0078796	0.2405925	932.2915	1.0002669
alpha[47]	0.4162385	0.0073353	0.3044991	1723.2076	0.9982604
alpha[48]	0.7491244	0.0094297	0.3667890	1512.9836	0.9987990
alpha[49]	0.1647641	0.0067291	0.2768961	1693.2373	0.9963786
alpha[50]	0.0134698	0.0090702	0.3024908	1112.2082	0.9994768
alpha[51]	-0.3543365	0.0093869	0.3007202	1026.3056	1.0006102
alpha[52]	0.0637057	0.0079864	0.2861165	1283.4716	0.9973641
alpha[53]	-0.4911252	0.0095201	0.3745980	1548.2896	0.9974037
alpha[54]	0.9952026	0.0062761	0.2740860	1907.1956	0.9998380
alpha[55]	0.5146625	0.0098255	0.3613485	1352.5250	0.9987135
alpha[56]	-0.0820229	0.0065982	0.2351985	1270.6346	0.9991833
alpha[57]	0.8799779	0.0078897	0.2607921	1092.6080	0.9971767
alpha[58]	-0.4793121	0.0115285	0.3266464	802.8114	0.9999706
alpha[59]	-0.2605026	0.0083415	0.3974329	2270.0720	0.9970613
alpha[60]	0.5318317	0.0097148	0.3587571	1363.7466	0.9967814
alpha[61]	-0.0517466	0.0083404	0.3613168	1876.7425	0.9984491
alpha[62]	-0.0944032	0.0078880	0.3859654	2394.2060	0.9974327
alpha[63]	-0.1714985	0.0075371	0.2699800	1283.0780	0.9988307
alpha[64]	-0.3304920	0.0108648	0.4333714	1591.0291	1.0004041
alpha[65]	0.2136494	0.0098327	0.3885741	1561.7016	0.9983199
alpha[66]	0.0895235	0.0075630	0.2897602	1467.8891	0.9984816
alpha[67]	0.1614381	0.0120380	0.4422048	1349.3839	1.0003749
alpha[68]	-0.0258543	0.0126852	0.4285048	1141.0762	0.9986289
alpha[69]	-0.1781048	0.0074952	0.2576691	1181.8397	0.9988930
alpha[70]	-0.0648120	0.0095095	0.4022906	1789.6167	0.9976067
alpha[71]	0.1367515	0.0077914	0.3712340	2270.2002	0.9970400
alpha[72]	-0.6700373	0.0137715	0.5384365	1528.6449	0.9979370
alpha[73]	0.4385070	0.0089449	0.3343343	1397.0487	0.9977314
alpha[74]	-0.6759221	0.0103676	0.3427841	1093.1625	0.9972657

Table 2: Model 1 - Parameters *(continued)*

	mean	se_mean	sd	n_eff	Rhat
alpha[75]	0.2740914	0.0087367	0.3979796	2075.0243	0.9986405
alpha[76]	0.5726694	0.0088008	0.3074841	1220.6717	0.9970951
alpha[77]	-0.0802248	0.0062800	0.2702840	1852.3187	0.9966928
alpha[78]	0.6237625	0.0059323	0.2562558	1865.9390	0.9982627
alpha[79]	0.2857988	0.0117572	0.4441580	1427.1307	0.9981104
alpha[80]	0.5421765	0.0090868	0.4271415	2209.6170	0.9992891
alpha[81]	0.0152382	0.0117629	0.3943336	1123.8263	0.9968189
alpha[82]	0.6415658	0.0061581	0.2829170	2110.6599	0.9976313
alpha[83]	0.3541645	0.0074160	0.3088332	1734.2270	0.9979852
alpha[84]	0.6230251	0.0106681	0.2793366	685.6146	0.9979883
alpha[85]	0.3138585	0.0100760	0.3115375	955.9686	1.0004508
alpha[86]	0.3419905	0.0071270	0.2452772	1184.4206	1.0026264
alpha[87]	0.3770040	0.0061767	0.2588531	1756.2695	0.9989242
alpha[88]	0.5170146	0.0042235	0.2305649	2980.1069	0.9970204
alpha[89]	0.7175391	0.0091899	0.4217953	2106.5886	0.9970950
alpha[90]	0.4845179	0.0067728	0.2936616	1880.0011	0.9991875
alpha[91]	-0.6856252	0.0081614	0.3800071	2167.9568	0.9971435
alpha[92]	0.1176890	0.0090368	0.3548063	1541.5289	1.0003638
alpha[93]	0.0588340	0.0078807	0.1922303	594.9942	0.9990003
alpha[94]	0.6177970	0.0063616	0.2722654	1831.6647	0.9972768
alpha[95]	0.3396369	0.0073194	0.2574451	1237.1433	0.9980686
alpha[96]	0.4746810	0.0065350	0.2353032	1296.4839	0.9972217
alpha[97]	0.4284939	0.0066566	0.2080013	976.4042	0.9978282
alpha[98]	0.1827045	0.0068783	0.2735491	1581.6555	0.9969147
alpha[99]	-0.7572858	0.0146814	0.5177168	1243.5159	0.9985409
alpha[100]	-0.0508036	0.0066030	0.1427141	467.1507	0.9997163
alpha[101]	0.3986868	0.0074390	0.2654212	1273.0476	1.0006006
alpha[102]	0.1634711	0.0075905	0.2598389	1171.8289	0.9987318
alpha[103]	0.1717579	0.0092409	0.4152777	2019.5267	0.9969005
alpha[104]	0.1416559	0.0066787	0.2243453	1128.3776	0.9984773
alpha[105]	-0.0339891	0.0075915	0.3249008	1831.6487	1.0019618
alpha[106]	0.0164215	0.0085292	0.3019509	1253.3143	1.0036443
alpha[107]	0.4889395	0.0085200	0.3108571	1331.1967	0.9989948
alpha[108]	-0.5040396	0.0088297	0.4772922	2921.9913	0.9969857
alpha[109]	0.0091022	0.0068193	0.2772832	1653.3429	0.9974469
alpha[110]	-0.3828055	0.0134449	0.4974967	1369.2041	0.9983451
alpha[111]	0.1266777	0.0080506	0.3026247	1413.0495	0.9974354
alpha[112]	0.0443410	0.0070491	0.2694241	1460.8669	0.9978387
alpha[113]	-0.0751420	0.0075188	0.3011348	1604.0782	0.9985432
alpha[114]	0.0558353	0.0092748	0.2823476	926.7434	0.9978871
alpha[115]	0.1073977	0.0091524	0.3322890	1318.1410	1.0001592
alpha[116]	-0.2675209	0.0119337	0.4218498	1249.5862	0.9993782
alpha[117]	0.1540061	0.0070999	0.2336863	1083.3225	0.9997706
alpha[118]	-1.3029589	0.0079261	0.3013337	1445.3777	0.9975626
alpha[119]	0.1881546	0.0066757	0.2226871	1112.7599	0.9987815
alpha[120]	-0.1003838	0.0091465	0.4170555	2079.1305	1.0002607

Table 2: Model 1 - Parameters *(continued)*

	mean	se_mean	sd	n_eff	Rhat
alpha[121]	0.1155705	0.0082398	0.3307481	1611.2605	0.9996183
alpha[122]	-1.0623217	0.0135416	0.5126722	1433.3135	0.9993382
alpha[123]	-0.1178839	0.0065719	0.2901433	1949.1558	0.9980122
alpha[124]	-0.4947681	0.0100810	0.3153695	978.6607	0.9963243
alpha[125]	0.1571114	0.0075952	0.2923498	1481.6013	0.9983015
alpha[126]	-0.3217242	0.0081678	0.3591659	1933.6375	0.9973331
alpha[127]	-0.4251367	0.0069308	0.3055821	1943.9960	0.9972727
alpha[128]	-0.0721097	0.0102856	0.4350012	1788.6515	0.9986273
alpha[129]	-0.2816469	0.0046354	0.2270032	2398.2095	0.9985216
alpha[130]	-0.2003282	0.0054548	0.2653579	2366.4909	0.9972930
alpha[131]	-0.0543868	0.0128036	0.4189283	1070.5679	0.9981768
alpha[132]	0.0044741	0.0078547	0.3331709	1799.1777	1.0002291
alpha[133]	-0.0194968	0.0090233	0.3305833	1342.2487	0.9965076
alpha[134]	-0.2319759	0.0107402	0.4052392	1423.6238	0.9991081
alpha[135]	-0.2845604	0.0107814	0.4473372	1721.5434	0.9975596
alpha[136]	-0.1453187	0.0107188	0.4560694	1810.3833	0.9980631
alpha[137]	-0.8235525	0.0116672	0.4993370	1831.6959	0.9966232
alpha[138]	0.3378871	0.0067503	0.2943128	1900.9504	0.9981201
alpha[139]	0.0295213	0.0075482	0.2802332	1378.3156	0.9985055
alpha[140]	0.2284265	0.0064036	0.3011487	2211.6116	0.9977141
alpha[141]	0.0717484	0.0096737	0.3409031	1241.8667	0.9965797
alpha[142]	0.2511158	0.0108280	0.3607531	1110.0068	0.9995723
alpha[143]	-0.2464717	0.0084876	0.3534973	1734.6189	0.9988579
alpha[144]	-0.0777994	0.0079704	0.3448263	1871.7235	0.9974926
alpha[145]	0.3640951	0.0085365	0.2940168	1186.2824	0.9995733
alpha[146]	-0.0438786	0.0087937	0.3112653	1252.9000	0.9992060
alpha[147]	0.3384072	0.0059002	0.2041557	1197.2822	1.0041699
alpha[148]	-0.2896985	0.0094396	0.3533677	1401.3422	0.9962873
alpha[149]	0.7559541	0.0052649	0.2424968	2121.4764	0.9966708
alpha[150]	-0.5920511	0.0041023	0.1409310	1180.1794	0.9997949
alpha[151]	-0.3424280	0.0081406	0.3204094	1549.1605	0.9974410
alpha[152]	-0.0640798	0.0075769	0.2390226	995.1535	0.9996458
alpha[153]	0.5270631	0.0081961	0.2879695	1234.4569	0.9998144
alpha[154]	0.3998778	0.0061289	0.2696043	1935.0421	0.9976036
alpha[155]	-0.0111279	0.0077917	0.2566471	1084.9504	0.9992794
alpha[156]	-0.2317390	0.0067747	0.2577145	1447.0914	0.9994229
alpha[157]	-0.5903484	0.0126631	0.4731676	1396.2081	0.9997384
alpha[158]	-0.5476641	0.0077409	0.3170564	1677.6146	0.9978192
alpha[159]	0.2150993	0.0063612	0.2616186	1691.4446	0.9968821
alpha[160]	-0.1988277	0.0090032	0.3768825	1752.3509	0.9991501
alpha[161]	0.0045482	0.0064993	0.2766855	1812.3469	0.9989315
alpha[162]	-0.0849593	0.0076359	0.2759721	1306.2045	0.9990581
alpha[163]	0.0388598	0.0079137	0.2700804	1164.7320	1.0011986
alpha[164]	0.0080373	0.0079041	0.3385165	1834.2364	0.9992254
alpha[165]	-0.2561753	0.0064270	0.2995764	2172.7076	0.9967538
alpha[166]	-0.3430908	0.0099947	0.3807954	1451.5920	0.9972738

Table 2: Model 1 - Parameters *(continued)*

	mean	se_mean	sd	n_eff	Rhat
alpha[167]	0.3816712	0.0072883	0.3224897	1957.8353	0.9990238
alpha[168]	-0.2116393	0.0076121	0.3480488	2090.6282	0.9982289
alpha[169]	-1.3761365	0.0063827	0.1974498	956.9877	0.9968452
alpha[170]	0.0255477	0.0087823	0.3337328	1444.0374	1.0017545
alpha[171]	-0.7406336	0.0123569	0.5490203	1974.0621	0.9971473
alpha[172]	0.1616388	0.0076530	0.3225672	1776.5469	0.9985632
alpha[173]	-0.2646514	0.0094217	0.3926956	1737.2130	0.9983917
alpha[174]	-0.1238835	0.0076462	0.3180999	1730.7462	0.9968159
alpha[175]	-0.2619780	0.0075697	0.2901589	1469.3228	0.9982497
alpha[176]	-0.1507156	0.0100161	0.3214644	1030.0638	0.9991604
alpha[177]	0.5330073	0.0082930	0.3298485	1581.9813	0.9981036
alpha[178]	-0.5641259	0.0060166	0.1767566	863.0786	0.9978094
alpha[179]	-0.4423041	0.0107836	0.4205621	1521.0230	0.9987627
alpha[180]	0.0043037	0.0059745	0.2821477	2230.1983	0.9967320
alpha[181]	-0.0890431	0.0074550	0.3220921	1866.6487	0.9977926
alpha[182]	-0.1025965	0.0090912	0.2900555	1017.9268	0.9978079
alpha[183]	0.0894561	0.0070591	0.2829059	1606.1572	0.9990680
alpha[184]	0.4340635	0.0093847	0.3301561	1237.6568	0.9988768
alpha[185]	-0.0539508	0.0085648	0.3378268	1555.7905	0.9972973
alpha[186]	-0.6551691	0.0122006	0.4829733	1567.0641	1.0005743
alpha[187]	-0.4408056	0.0074724	0.2845402	1449.9792	0.9982733
alpha[188]	0.2370681	0.0067643	0.3024640	1999.4134	0.9972037
alpha[189]	0.2133513	0.0071258	0.3024260	1801.2561	0.9968997
alpha[190]	-0.3161160	0.0103626	0.4018186	1503.5607	1.0020616
alpha[191]	-0.2579001	0.0128117	0.4630077	1306.0615	0.9975156
alpha[192]	-0.3051049	0.0086805	0.3285742	1432.7613	0.9998160
alpha[193]	0.0884378	0.0099128	0.3428250	1196.0539	1.0008170
alpha[194]	-0.4057524	0.0054782	0.1938557	1252.2416	0.9983275
alpha[195]	-0.7345113	0.0078092	0.1366152	306.0428	1.0042171

Table 3: Model 2 - Parameters

	mean	se_mean	sd	n_eff	Rhat
mu	0.0937527	0.0011329	0.0362115	1021.6120	0.9967558
sigma_mu	0.3851669	0.0012178	0.0299597	605.2149	1.0050766
beta	1.9038115	0.0126806	0.3326156	688.0265	1.0081251
alpha[1]	-0.1243908	0.0058416	0.2807738	2310.2377	0.9972333
alpha[2]	0.2149063	0.0047044	0.2334381	2462.2765	0.9979526
alpha[3]	0.3449315	0.0045465	0.2054284	2041.5360	1.0001264
alpha[4]	-0.1347490	0.0059509	0.2992261	2528.3684	0.9985140
alpha[5]	0.3501999	0.0055038	0.2790452	2570.5296	0.9991162
alpha[6]	-0.5943964	0.0044167	0.1968821	1987.1207	0.9973416
alpha[7]	0.3512785	0.0041099	0.1750869	1814.9051	0.9986351
alpha[8]	-0.4230039	0.0061860	0.2378020	1477.7625	0.9979039
alpha[9]	0.5693003	0.0049938	0.2326411	2170.2553	0.9982618
alpha[10]	0.6336945	0.0039831	0.1982197	2476.5620	0.9962133
alpha[11]	-0.0041005	0.0062540	0.2965141	2247.8742	0.9977909
alpha[12]	0.5290483	0.0053611	0.2511117	2193.9782	0.9986517
alpha[13]	0.0393677	0.0054701	0.2451323	2008.2506	0.9972490
alpha[14]	0.5149037	0.0048372	0.2030596	1762.2399	0.9986283
alpha[15]	0.2711263	0.0047619	0.2295593	2323.9848	0.9973707
alpha[16]	0.6330715	0.0055039	0.2358003	1835.4471	1.0010311
alpha[17]	0.7562729	0.0051931	0.2214994	1819.2813	1.0018179
alpha[18]	0.4844601	0.0039142	0.2021048	2666.0790	0.9976893
alpha[19]	0.0023295	0.0039194	0.1831535	2183.7213	0.9984787
alpha[20]	0.2840273	0.0055589	0.2844459	2618.3184	0.9978291
alpha[21]	0.5292736	0.0064843	0.2662651	1686.1812	0.9983198
alpha[22]	0.8057681	0.0045666	0.2098684	2112.0332	0.9992483
alpha[23]	0.3088374	0.0048590	0.2414271	2468.7667	0.9977923
alpha[24]	-0.0161316	0.0059671	0.2804755	2209.3727	0.9995349
alpha[25]	0.1942302	0.0044928	0.2022352	2026.1959	0.9973959
alpha[26]	0.6567203	0.0049046	0.2298627	2196.4652	0.9992401
alpha[27]	0.4674126	0.0063881	0.2416665	1431.1450	0.9981939
alpha[28]	0.5931891	0.0058130	0.2267169	1521.1172	0.9997180
alpha[29]	0.0369935	0.0066391	0.3298536	2468.4135	0.9977914
alpha[30]	0.3483467	0.0049104	0.2689529	3000.0000	0.9990074
alpha[31]	0.1381455	0.0057662	0.2749702	2274.0123	0.9986203
alpha[32]	-0.1789910	0.0055005	0.2959164	2894.1947	0.9974133
alpha[33]	0.5199644	0.0058213	0.2486190	1824.0465	0.9973728
alpha[34]	0.2854567	0.0058548	0.2483286	1798.9722	0.9985679
alpha[35]	-0.0085393	0.0052889	0.2749351	2702.3234	0.9974276
alpha[36]	-0.3892005	0.0055979	0.2153484	1479.9123	1.0035348
alpha[37]	0.4346807	0.0057627	0.2325641	1628.6769	1.0010032
alpha[38]	-0.0359890	0.0062871	0.2691779	1833.0881	1.0001674
alpha[39]	-0.0420463	0.0050475	0.2634383	2723.9421	0.9972603
alpha[40]	0.2851191	0.0048754	0.2670352	3000.0000	0.9964293
alpha[41]	-0.1588364	0.0058678	0.2743743	2186.3967	0.9975877
alpha[42]	-0.1066220	0.0049944	0.2493516	2492.6126	0.9976533
alpha[43]	0.0827784	0.0043738	0.2345265	2875.2074	0.9973326

Table 3: Model 2 - Parameters *(continued)*

	mean	se_mean	sd	n_eff	Rhat
alpha[44]	-0.0887158	0.0045140	0.2336214	2678.5981	0.9968116
alpha[45]	0.7048973	0.0040629	0.2050849	2547.9425	0.9983908
alpha[46]	-0.1523180	0.0047301	0.2001876	1791.1203	0.9978705
alpha[47]	0.3498663	0.0058044	0.2595147	1998.9900	0.9996017
alpha[48]	0.4488961	0.0069639	0.3066126	1938.5550	0.9980343
alpha[49]	0.1409384	0.0041234	0.2171227	2772.6548	0.9977279
alpha[50]	0.0678912	0.0058217	0.2269972	1520.3562	1.0009554
alpha[51]	-0.2683446	0.0043071	0.2071252	2312.5387	0.9969133
alpha[52]	0.0503049	0.0050769	0.2387883	2212.1904	0.9966395
alpha[53]	-0.2200988	0.0057835	0.2739592	2243.8553	0.9968907
alpha[54]	0.7360475	0.0059211	0.2500633	1783.6171	0.9974389
alpha[55]	0.3337662	0.0053774	0.2791937	2695.6386	0.9962531
alpha[56]	-0.0580173	0.0043331	0.1957951	2041.7775	0.9973070
alpha[57]	0.6581647	0.0049264	0.2698322	3000.0000	0.9979519
alpha[58]	-0.3390296	0.0050788	0.2294370	2040.8511	0.9991977
alpha[59]	-0.0730880	0.0059980	0.2900562	2338.5468	0.9993666
alpha[60]	0.3948478	0.0071272	0.2988777	1758.5123	0.9970953
alpha[61]	0.0226558	0.0054931	0.2704196	2423.5053	0.9981113
alpha[62]	0.0100030	0.0051166	0.2631071	2644.2677	0.9977736
alpha[63]	-0.1012155	0.0042735	0.2174984	2590.3245	0.9983737
alpha[64]	-0.0870809	0.0065573	0.2803589	1828.0158	0.9970454
alpha[65]	0.2028527	0.0053921	0.2953008	2999.2992	0.9968165
alpha[66]	0.1326544	0.0054228	0.2414521	1982.5229	0.9981906
alpha[67]	0.1774654	0.0058966	0.3012934	2610.8483	0.9971963
alpha[68]	0.0438644	0.0051443	0.2817669	3000.0000	0.9970359
alpha[69]	-0.1520261	0.0049770	0.2056476	1707.2991	0.9989861
alpha[70]	0.0686349	0.0065533	0.2935427	2006.4311	0.9980812
alpha[71]	0.1491680	0.0073575	0.2966533	1625.7108	0.9996919
alpha[72]	-0.1745776	0.0059754	0.3168820	2812.2746	0.9977589
alpha[73]	0.2992949	0.0054824	0.2693941	2414.5436	0.9983755
alpha[74]	-0.3997448	0.0059208	0.2554551	1861.5407	0.9983125
alpha[75]	0.2162103	0.0051059	0.2796627	3000.0000	0.9984271
alpha[76]	0.3927669	0.0059741	0.2448983	1680.4815	0.9988093
alpha[77]	-0.0317818	0.0050483	0.2236366	1962.4666	0.9974426
alpha[78]	0.5101702	0.0045411	0.2196359	2339.3182	1.0005689
alpha[79]	0.2263878	0.0066623	0.2997265	2023.9593	0.9985530
alpha[80]	0.2971401	0.0067023	0.3229854	2322.2882	0.9981044
alpha[81]	0.0463477	0.0054349	0.2614218	2313.6839	0.9991576
alpha[82]	0.4741170	0.0054863	0.2654828	2341.6011	0.9967288
alpha[83]	0.2824046	0.0063594	0.2641986	1725.9617	0.9976902
alpha[84]	0.4283445	0.0056285	0.2232768	1573.6468	1.0004164
alpha[85]	0.2267775	0.0050957	0.2402854	2223.5084	0.9972319
alpha[86]	0.3082582	0.0047306	0.2281338	2325.6511	0.9968512
alpha[87]	0.3358189	0.0047364	0.2235541	2227.7273	0.9993494
alpha[88]	0.4239755	0.0052186	0.2221221	1811.6758	0.9976152
alpha[89]	0.4183601	0.0064785	0.3178501	2407.0814	0.9963109

Table 3: Model 2 - Parameters *(continued)*

	mean	se_mean	sd	n_eff	Rhat
alpha[90]	0.3402859	0.0047413	0.2418865	2602.7745	0.9976848
alpha[91]	-0.3237961	0.0058662	0.2608987	1978.0374	0.9989692
alpha[92]	0.1082690	0.0055919	0.2603753	2168.0969	0.9970474
alpha[93]	0.1288646	0.0036749	0.1621058	1945.8411	0.9989478
alpha[94]	0.4831726	0.0047880	0.2370087	2450.2695	0.9970708
alpha[95]	0.2807601	0.0057372	0.2373555	1711.5883	0.9975737
alpha[96]	0.4082910	0.0042738	0.2213863	2683.3571	0.9975676
alpha[97]	0.4036933	0.0040477	0.1937910	2292.2276	0.9966911
alpha[98]	0.1834749	0.0048813	0.2206860	2044.0163	0.9987164
alpha[99]	-0.2295594	0.0070310	0.3397499	2334.9815	0.9969902
alpha[100]	-0.1050429	0.0030699	0.1226508	1596.1847	0.9980994
alpha[101]	0.3269041	0.0047973	0.2357842	2415.6204	0.9983585
alpha[102]	0.1788320	0.0041886	0.2097571	2507.8024	0.9974085
alpha[103]	0.1536140	0.0062874	0.2835901	2034.4450	0.9983363
alpha[104]	0.1834058	0.0044736	0.1996818	1992.3336	0.9971485
alpha[105]	0.0467476	0.0052052	0.2663909	2619.1311	0.9968715
alpha[106]	0.0731683	0.0050478	0.2177391	1860.6370	1.0010276
alpha[107]	0.3395741	0.0053962	0.2712264	2526.3311	0.9973308
alpha[108]	-0.1618445	0.0065925	0.3023867	2103.8972	0.9969531
alpha[109]	0.0693024	0.0044888	0.2458616	3000.0000	0.9968221
alpha[110]	-0.0716273	0.0070993	0.2973901	1754.7957	0.9995697
alpha[111]	0.1635900	0.0049419	0.2588179	2742.7894	0.9972743
alpha[112]	0.0852676	0.0051553	0.2325595	2034.9695	0.9993987
alpha[113]	0.0213208	0.0049375	0.2389671	2342.4413	0.9986257
alpha[114]	0.1162860	0.0055853	0.2303869	1701.4692	0.9973396
alpha[115]	0.1411165	0.0057702	0.2584523	2006.2270	0.9977893
alpha[116]	-0.0478537	0.0055259	0.2877153	2710.9263	0.9996798
alpha[117]	0.1656767	0.0047669	0.2059819	1867.1842	0.9980965
alpha[118]	-0.9437496	0.0048463	0.2168395	2001.9287	0.9976260
alpha[119]	0.2093475	0.0036755	0.1771669	2323.4330	0.9987473
alpha[120]	0.0271323	0.0071676	0.2987312	1737.0745	0.9985323
alpha[121]	0.1014006	0.0049815	0.2429581	2378.7007	0.9986304
alpha[122]	-0.3986967	0.0063818	0.2825582	1960.3051	0.9977155
alpha[123]	-0.0192818	0.0049350	0.2290487	2154.1367	0.9976132
alpha[124]	-0.2494109	0.0047253	0.2341110	2454.6436	0.9980639
alpha[125]	0.1569750	0.0054144	0.2404696	1972.5064	0.9985960
alpha[126]	-0.1231603	0.0057572	0.2730673	2249.6695	0.9974025
alpha[127]	-0.2864498	0.0043237	0.2100652	2360.5147	0.9978320
alpha[128]	0.0509199	0.0062786	0.2999732	2282.6206	0.9969155
alpha[129]	-0.1923988	0.0040615	0.1895303	2177.6103	0.9975663
alpha[130]	-0.1148245	0.0041960	0.2095469	2494.0154	0.9976946
alpha[131]	0.0466178	0.0059799	0.2955794	2443.2055	0.9973749
alpha[132]	0.0603498	0.0072096	0.2743492	1448.0638	0.9988319
alpha[133]	0.0713248	0.0056645	0.2470810	1902.6589	0.9989517
alpha[134]	-0.0386378	0.0056733	0.2710812	2283.1488	0.9966302
alpha[135]	-0.0727237	0.0051711	0.2832354	3000.0000	0.9990262

Table 3: Model 2 - Parameters *(continued)*

	mean	se_mean	sd	n_eff	Rhat
alpha[136]	0.0319754	0.0079615	0.3209886	1625.5139	1.0000988
alpha[137]	-0.2828730	0.0083284	0.3191192	1468.1750	0.9995197
alpha[138]	0.3074657	0.0055645	0.2431786	1909.8590	0.9966524
alpha[139]	0.0799189	0.0055716	0.2349623	1778.4246	0.9977369
alpha[140]	0.2178581	0.0052820	0.2290909	1881.1425	0.9970447
alpha[141]	0.1323125	0.0061350	0.2444663	1587.8418	0.9980896
alpha[142]	0.2349343	0.0052754	0.2771685	2760.4505	0.9965513
alpha[143]	-0.0764089	0.0062414	0.2654678	1809.1036	1.0008355
alpha[144]	0.0437237	0.0055790	0.2535776	2065.9099	0.9971595
alpha[145]	0.3303105	0.0051856	0.2589136	2492.9377	0.9999535
alpha[146]	0.0434364	0.0049740	0.2351104	2234.2391	0.9977337
alpha[147]	0.3196353	0.0034121	0.1868860	3000.0000	0.9966687
alpha[148]	-0.0983699	0.0060456	0.2478813	1681.1768	0.9984908
alpha[149]	0.5862513	0.0049486	0.2360372	2275.0624	0.9964990
alpha[150]	-0.4901981	0.0027405	0.1367319	2489.2857	0.9980195
alpha[151]	-0.1405629	0.0055700	0.2427201	1898.9199	0.9978880
alpha[152]	-0.0633297	0.0046471	0.1964474	1787.0070	0.9977429
alpha[153]	0.3716619	0.0051031	0.2547611	2492.2485	0.9972042
alpha[154]	0.3133317	0.0045711	0.2503714	3000.0000	0.9980853
alpha[155]	0.0660761	0.0042605	0.2333569	3000.0000	0.9982615
alpha[156]	-0.1211931	0.0048909	0.2068253	1788.2375	0.9972929
alpha[157]	-0.1939566	0.0063313	0.2893321	2088.3803	0.9979689
alpha[158]	-0.2939301	0.0054313	0.2429141	2000.2913	0.9990511
alpha[159]	0.2175978	0.0052862	0.2394962	2052.6579	0.9972512
alpha[160]	-0.0249344	0.0058612	0.2645044	2036.5360	0.9982316
alpha[161]	0.0706349	0.0050681	0.2287604	2037.3665	0.9972263
alpha[162]	-0.0038228	0.0048942	0.2185638	1994.2723	0.9991021
alpha[163]	0.1071828	0.0048142	0.2294448	2271.5011	0.9971420
alpha[164]	0.0626215	0.0049407	0.2684696	2952.6969	0.9962010
alpha[165]	-0.1100867	0.0045155	0.2376373	2769.6644	0.9966275
alpha[166]	-0.1273668	0.0070072	0.2635232	1414.3270	1.0025468
alpha[167]	0.2792664	0.0058380	0.2741477	2205.1679	0.9991390
alpha[168]	-0.0677570	0.0045991	0.2420950	2770.9017	0.9971105
alpha[169]	-1.0854753	0.0041788	0.1695274	1645.7610	0.9968030
alpha[170]	0.0648035	0.0048868	0.2447359	2508.1492	0.9997676
alpha[171]	-0.2300668	0.0071013	0.3106591	1913.7716	0.9979196
alpha[172]	0.1476610	0.0061035	0.2258724	1369.5277	0.9994750
alpha[173]	-0.0733651	0.0051856	0.2807194	2930.5437	0.9970975
alpha[174]	-0.0013592	0.0052361	0.2389405	2082.3761	0.9970525
alpha[175]	-0.0909043	0.0054286	0.2284496	1770.9530	0.9977605
alpha[176]	-0.0250090	0.0051362	0.2610489	2583.1613	0.9979751
alpha[177]	0.3980915	0.0061536	0.2732930	1972.3918	0.9976879
alpha[178]	-0.4280462	0.0037821	0.1625029	1846.0954	0.9980714
alpha[179]	-0.1565610	0.0055776	0.2686852	2320.5424	0.9974750
alpha[180]	0.0700393	0.0052887	0.2302175	1894.8575	0.9979209
alpha[181]	0.0091073	0.0064368	0.2486238	1491.9016	0.9969874

Table 3: Model 2 - Parameters *(continued)*

	mean	se_mean	sd	n_eff	Rhat
alpha[182]	0.0026452	0.0051305	0.2455996	2291.6220	0.9977728
alpha[183]	0.1240247	0.0056220	0.2408555	1835.4145	0.9982200
alpha[184]	0.3543721	0.0060683	0.2580597	1808.4674	1.0001862
alpha[185]	0.0408139	0.0049021	0.2319295	2238.4516	0.9981651
alpha[186]	-0.2232296	0.0060119	0.2785428	2146.6674	0.9973706
alpha[187]	-0.2829571	0.0047849	0.2175435	2066.9920	0.9994722
alpha[188]	0.2368132	0.0055212	0.2363725	1832.8744	0.9972884
alpha[189]	0.2046136	0.0051496	0.2505056	2366.3614	0.9976691
alpha[190]	-0.0747809	0.0070160	0.2877303	1681.8478	0.9963566
alpha[191]	-0.0289800	0.0061637	0.2939332	2274.1555	0.9966710
alpha[192]	-0.1172724	0.0061836	0.2400282	1506.7672	0.9991892
alpha[193]	0.1441604	0.0059167	0.2569292	1885.6501	0.9972325
alpha[194]	-0.3026883	0.0035142	0.1634042	2162.1124	0.9974872
alpha[195]	-0.6270342	0.0027920	0.1044465	1399.4089	1.0028363