Fig. S1: Reciprocal antibody titers and area under the curve comparisons for quantification of anti-spike (S) and anti-S-receptor binding domain (S-RBD) IgG, IgM, and IgA as well as neutralizing antibodies (nAbs). The optical density (OD) at 490nm for each three-fold, serially diluted plasma sample was measured in the indirect ELISAs. The average OD of the negative control samples ± the standard deviation (SD) as well as the average cut-off calculated by summing the average of the negative values and three times the standard deviation of the negatives for all ELISAs (**A**). ELISAs measuring IgG, IgM, IgA in serial dilution against the spike (S) protein (**B, D, F**) and IgG, IgM, and IgA against the S-receptor binding domain (S-RBD; **H, J, L**) are shown, with hospitalized patients represented by black lines and the limit of detection (LOD) based on the cut-off indicated by the horizontal stippled line. The correlation between the antibody titer and the area under the curve (AUC) are shown for IgG, IgM, and IgA against S (**C,E,G**) and for IgG, IgM, and IgA against S-RBD (**I, K, M**). The neutralizing antibody (nAb) titer and the calculated AUC is shown (**N**) with the correlation between nAb AUC and titer (**O**).

A

	S-IgG	S-IgM	S-IgA	S-RBD-IgG	S-RBD-IgM	S-RBD-IgA
Mean negative OD490nm ± SD	0.140 ± 0.017	0.154 ± 0.014	0.069 ± 0.006	0.132 ± 0.025	0.108 ± 0.028	0.101 ± 0.032
Mean cut-off OD490nm ± SD	0.233 ± 0.043	0.106 ± 0.015	0.306 ± 0.029	0.273 ± 0.058	0.171 ± 0.082	0.197 ± 0.072

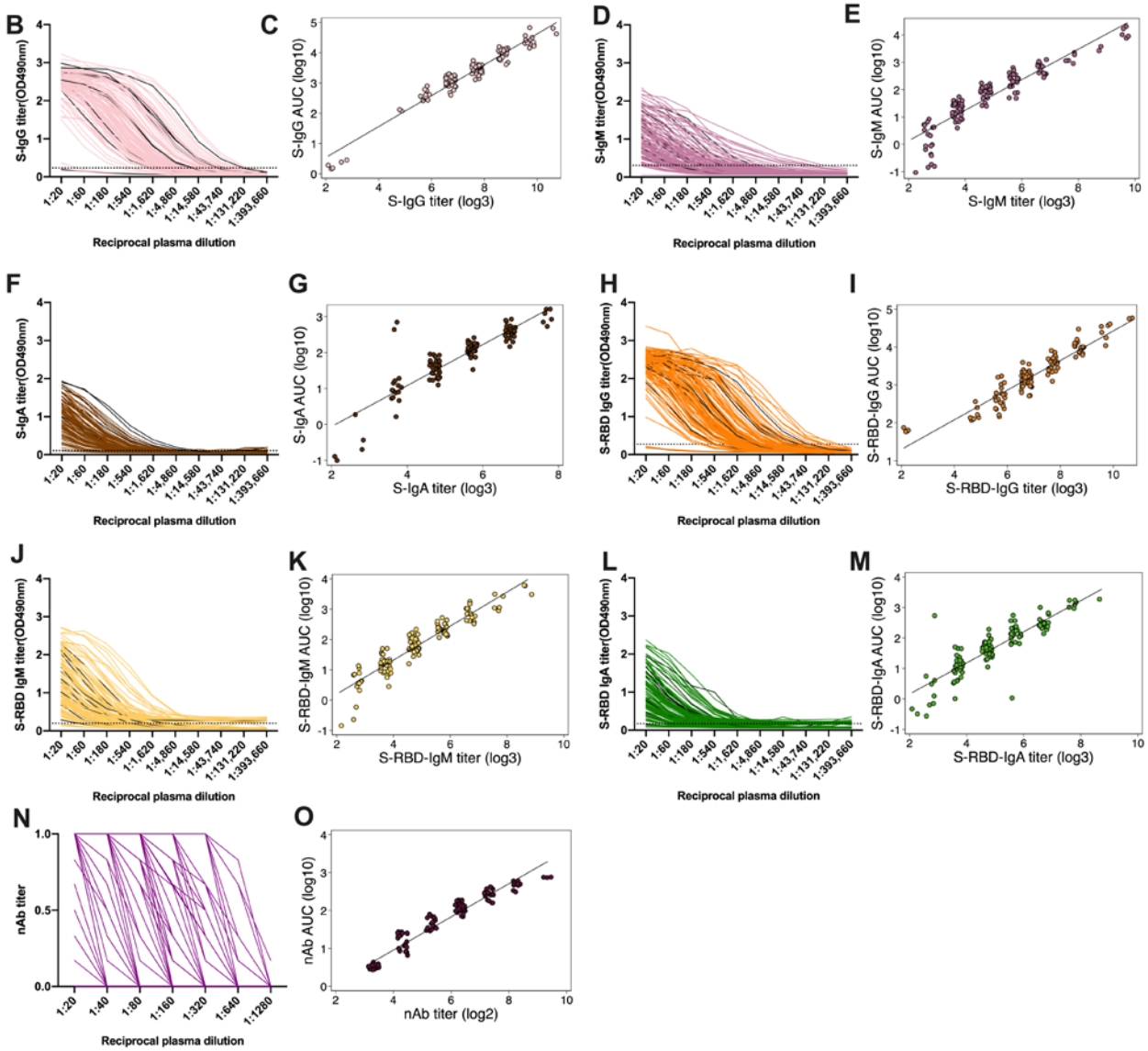

Fig. S2. Unadjusted boxplots showing age-associated antibody responses for male and female convalescent plasma donors. Box plots by sex and age categories are shown for anti-spike (S) protein domain S1 IgG arbitrary units (AU) (**A**), anti-S-IgG area under the curve (AUC) (**B**), anti-S-receptor binding domain (S-RBD) AUC (**C**), neutralizing antibody (nAb) AUC (**D**), and convalescent plasma scores based on antibody quartiles presented in Figure 4A (**E**). Sex differences in each age category were analyzed using simple t-tests, and significance is indicated on top of each comparison where appropriate (* = *p*-value <0.05).

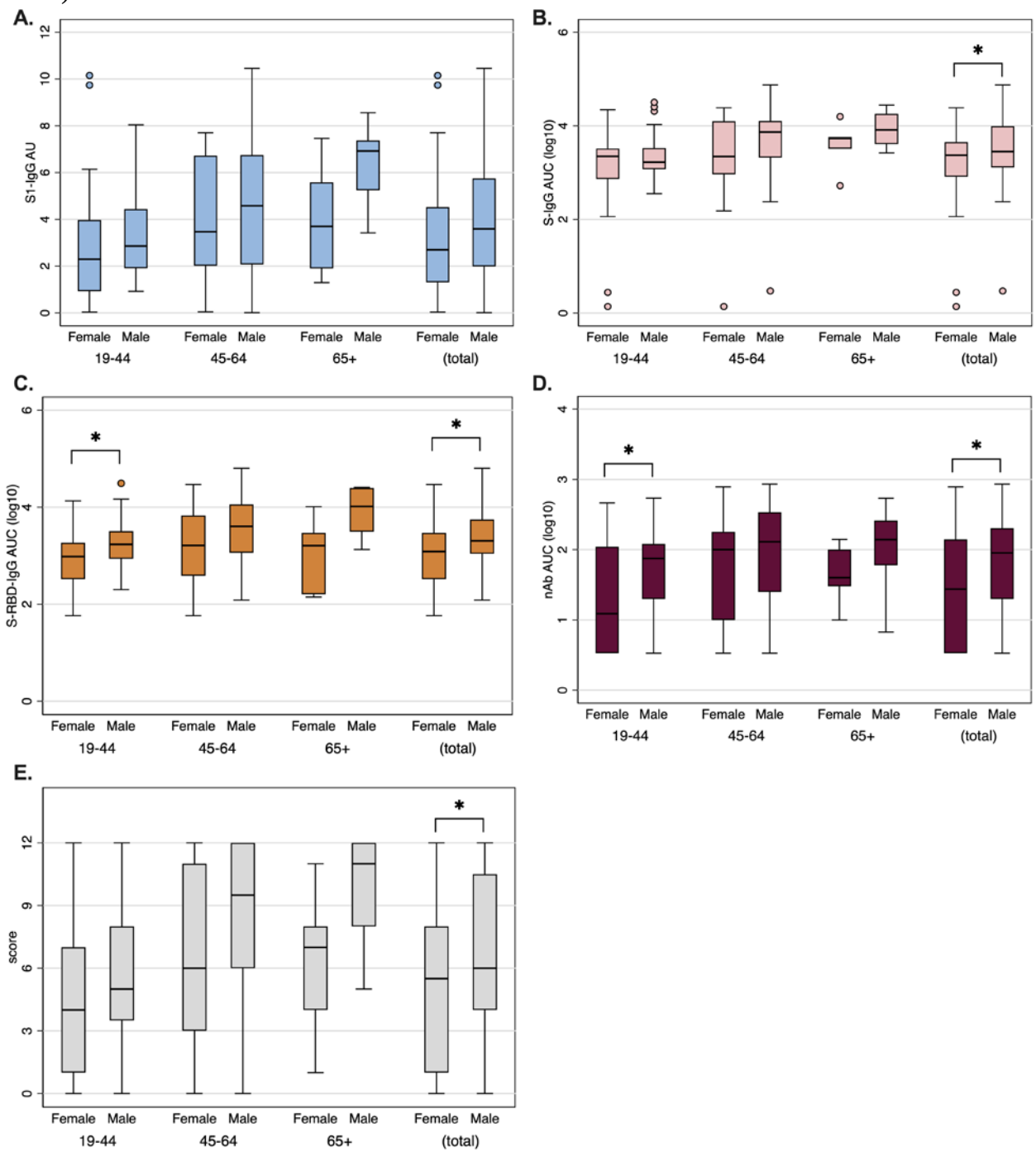

Table S1. Unadjusted neutralizing (NT) area under the curve (AUC) values, anti-spike (S) protein domain S1 IgG arbitrary units (AU), anti-S IgG AUC values, and anti-S-receptor binding domain (S-RBD) IgG AUC values for all 126 patients and stratified by sex.

Med (IQR)	All (N = 126)	Females (N = 58)	Males (N = 68)	Sex p-value
nAb AUC (log10)				
Sex	1.78 (1-1.78)	1.44 (.53-2.14)	1.95 (1.3-2.3)	**0.023**
Age Categories				
19-44	1.57 (1-2.08)	1.09 (.53-2.04)	1.87 (1.3-2.08)	**0.043**
45-64	2.04 (1.3-2.48)	2 (1-2.25)	2.11 (1.4-2.53)	0.383
65+	2 (1.48-2.2)	1.6 (1.48-2)	2.14 (1.78-2.41)	0.330
Hospitalized				
No	1.74 (1-2.14)	1.33 (.53-2.08)	1.95 (1.3-2.2)	**0.012**
Yes	2.48 (2-2.73)	2.39 (2-2.5)	2.73 (2.08-2.73)	0.790
S1-IgG AU				
Sex	3.15 (1.79-3.15)	2.7 (1.31-4.52)	3.59 (1.99-5.75)	0.067
Age Categories				
19-44	2.75 (1.6-4.33)	2.29 (.93-3.97)	2.86 (1.91-4.44)	0.321
45-64	4.36 (2.04-6.72)	3.47 (2.02-6.72)	4.58 (2.07-6.75)	0.283
65+	5.58 (3.42-7.37)	3.7 (1.91-5.58)	6.92 (5.25-7.37)	0.100
Hospitalized				
No	2.90 (1.79-4.54)	2.5 (1.31-3.97)	3.19 (1.95-4.66)	**0.026**
Yes	8.04 (6.97-10.15)	7.45 (6.97-9.74)	8.97 (8.04-10.38)	0.429
S-IgG AUC (log10)				
Sex	3.41 (3.05-3.41)	3.37 (2.91-3.65)	3.45 (3.11-3.99)	**0.034**
Age Categories				
19-44	3.27 (3.03-3.51)	3.35 (2.87-3.51)	3.22 (3.07-3.53)	0.180
45-64	3.53 (3.16-4.1)	3.34 (2.97-4.1)	3.87 (3.32-4.1)	0.156
65+	3.76 (3.51-4.2)	3.73 (3.51-3.76)	3.91 (3.61-4.25)	0.257
Hospitalized				
No	3.35 (3.05-3.61)	3.34 (2.91-3.51)	3.36 (3.09-3.84)	**0.044**
Yes	4.24 (3.9-4.5)	4.21 (3.78-4.34)	4.5 (4.18-4.71)	0.143
S-RBD-IgG AUC (log10)				
Sex	3.21 (2.79-3.21)	3.09 (2.52-3.47)	3.31 (3.04-3.75)	**0.001**
Age Categories				
19-44	3.15 (2.75-3.46)	2.98 (2.52-3.27)	3.23 (2.94-3.51)	**0.020**
45-64	3.32 (3.05-3.93)	3.21 (2.59-3.83)	3.61 (3.06-4.06)	0.097
65+	3.5 (3.13-4.04)	3.21 (2.21-3.47)	4.02 (3.5-4.4)	0.051
Hospitalized				
No	3.16 (2.77-3.58)	3.04 (2.52-3.37)	3.27 (2.99-3.69)	**0.001**
Yes	4 (3.59-4.47)	3.92 (3.38-4.13)	4.32 (4-4.49)	0.189
Composite score				
Sex	6 (2-6)	5.5 (1-8)	6 (4-10.5)	**0.032**
Age Categories				
19-44	5 (2-8)	4 (1-7)	5 (3.5-8)	0.143

45-64	8 (3-11)	6 (3-11)	9.5 (6-12)	0.281
65+	8 (5-12)	7 (4-8)	11 (8-12)	0.105
Hospitalized				
No	6 (2-9)	4.5 (1-8)	6 (4-10)	**0.021**
Yes	12 (9-12)	12 (9-12)	12 (11-12)	0.642

Table S2. Linear regression model coefficients (95% CI) for neutralizing (NT) area under the curve (AUC) values, anti-spike (S) protein domain S1 IgG arbitrary units (AU), anti-S IgG AUC values, and anti-S-receptor binding domain (S-RBD) IgG AUC values for all 126 patients and stratified by sex, age, hospitalization, and days since PCR+ nasal swab.

	Coefficient	95% CI	p-value
nAb AUC (log10)			
Male	0.273	(.03, .516)	**0.028**
Age/10	0.1	(.018, .181)	**0.017**
Hospitalization	0.862	(.433, 1.291)	**<0.001**
Days since swab / 10	-0.192	(-.334, -.05)	**0.008**
S1-IgG AU			
Male	0.857	(.163, 1.55)	**0.016**
Age/10	0.457	(.225, .689)	**<0.001**
Hospitalization	4.746	(3.522, 5.971)	**<0.001**
Days since swab / 10	0.109	(-.295, .514)	0.593
S-IgG AUC (log10)			
Male	0.299	(.023, .575)	**0.034**
Age/10	0.077	(-.015, .169)	0.101
Hospitalization	0.982	(.495, 1.469)	**<0.001**
Days since swab / 10	-0.011	(-.172, .15)	0.892
S-RBD-IgG AUC (log10)			
Male	0.365	(.16, .57)	**0.001**
Age/10	0.084	(.016, .153)	**0.016**
Hospitalization	0.905	(.543, 1.267)	**<0.001**
Days since swab / 10	-0.066	(-.186, .053)	0.274
Composite score			
Male	1.462	(.157, 2.766)	**0.028**
Age/10	0.672	(.236, 1.108)	**0.003**
Hospitalization	5.411	(3.108, 7.714)	**<0.001**
Days since swab / 10	-0.321	(-1.082, .439)	0.405

Estimates adjusted for all other predictors in table.
Coefficients represent increase in AUC, AU or score for a one unit increase in predictor.

Table S3. The convalescent plasma samples were categorized into quartiles based on their neutralizing area under the curve (AUC) value, anti-S1 IgG arbitrary units (AU), anti-S AUC value, or anti-RBD AUC value resulting in scores ranging from 0 (lowest quartile for each antibody measure) to 12 (highest quartile for each antibody measure) to model the optimal antibody responses in convalescent plasma. Composite scores were computed to provide a single metric as a proxy for the overall quality of the antibody response (see Materials and Methods).

ID	Sex	Age	Hospitalized	Days since swab	S1-IgG[a]		S-IgG[b]		S-RBD-IgG[c]		NT[d]		Total score[e]
					AU	score	AUC (log10)	score	AUC (log10)	score	AUC (log10)	score	
C73487	Female	33	no	54	0.034	0	0.440	0	1.763	0	0.525	0	0
C39734	Female	52	no	39	0.043	0	0.139	0	1.763	0	0.525	0	0
C45961	Female	38	no	44	0.045	0	0.139	0	1.763	0	0.525	0	0
C37228	Female	50	no	33	0.050	0	0.139	0	1.763	0	0.525	0	0
C12820	Female	24	no	48	0.487	0	2.885	0	2.066	0	0.525	0	0
C34673	Female	33	no	48	0.549	0	2.792	0	2.252	0	0.525	0	0
C28556	Male	59	no	44	0.551	0	2.378	0	2.085	0	0.525	0	0
C71928	Male	48	no	54	0.853	0	2.635	0	2.158	0	0.525	0	0
C15373	Male	43	no	57	0.921	0	2.551	0	2.302	0	0.525	0	0
C20679	Female	32	no	39	0.927	0	2.622	0	2.410	0	0.525	0	0
C96984	Male	53	no	56	1.270	0	2.991	0	2.664	0	0.525	0	0
C37621	Male	43	no	41	1.444	0	3.029	0	2.656	0	0.525	0	0
C44301	Female	25	no	44	1.561	0	3.051	0	2.628	0	0.525	0	0
C60992	Male	25	no	41	1.734	0	2.883	0	2.612	0	0.525	0	0
C31889	Female	58	no	55	1.766	0	2.914	0	2.377	0	0.525	0	0
C51794	Female	43	no	60	1.794	0	2.806	0	2.574	0	0.525	0	0
C31691	Female	61	-	27	0.410	0	2.184	0	2.306	0	1.000	1	1
C73155	Female	40	no	24	0.740	0	2.865	0	2.516	0	1.367	1	1
C93249	Female	21	no	35	0.750	0	2.537	0	2.489	0	1.000	1	1
C91511	Male	44	no	40	1.151	0	2.866	0	2.538	0	1.000	1	1
C65543	Female	72	no	43	1.297	0	2.722	0	2.207	0	1.602	1	1
C62037	Female	40	no	44	1.337	0	2.777	0	2.654	0	1.000	1	1
C95514	Male	58	no	48	0.010	0	0.472	0	3.060	1	0.525	0	1
C29812	Female	30	no	49	1.204	0	2.911	0	2.976	1	0.525	0	1
C46211	Female	23	no	39	1.310	0	3.321	1	2.688	0	0.525	0	1
C70293	Female	43	no	50	1.791	0	3.336	1	2.770	0	0.826	0	1
C92770	Male	34	no	41	1.949	1	2.955	0	2.753	0	0.525	0	1
C93871	Female	27	-	39	0.836	0	2.063	0	2.519	0	1.777	2	2
C32822	Male	42	no	51	1.321	0	2.612	0	2.927	1	1.602	1	2
C17767	Male	28	no	37	1.400	0	3.026	0	2.794	1	1.000	1	2
C44137	Female	31	no	47	0.632	0	3.104	1	2.342	0	1.000	1	2
C93862	Female	21	no	47	2.157	1	3.048	0	3.029	1	0.525	0	2
C55112	Male	25	no	42	1.600	0	2.838	0	3.022	1	2.081	2	3
C26999	Male	36	no	20	1.738	0	3.062	1	2.774	0	1.904	2	3
C47459	Female	51	no	36	2.036	1	2.967	0	2.785	1	1.398	1	3
C92883	Female	62	no	46	2.016	1	3.160	1	2.585	0	1.299	1	3
C45925	Female	46	no	46	2.566	1	3.232	1	3.053	1	0.525	0	3
C63869	Male	32	no	57	2.819	1	3.304	1	3.072	1	0.525	0	3
C69096	Male	37	no	35	2.460	1	3.086	1	3.142	1	1.299	1	4
C39071	Male	27	no	44	2.901	1	3.220	1	2.948	1	1.398	1	4
C73966	Male	44	no	37	2.907	1	3.209	1	3.172	1	1.701	1	4
C97651	Female	28	no	53	3.100	1	3.360	1	3.163	1	1.000	1	4
C82351	Male	26	no	55	1.987	1	3.357	1	3.530	2	0.525	0	4
C36143	Female	77	no	51	1.905	1	3.762	2	2.147	0	1.000	1	4
C40818	Male	28	no	51	4.415	2	3.116	1	2.712	0	1.000	1	4
C96809	Female	22	no	45	3.582	2	3.168	1	2.856	1	0.525	0	4
C51492	Female	48	no	45	2.383	1	3.223	1	3.093	1	2.042	2	5
C17629	Male	28	no	37	2.550	1	3.150	1	3.116	1	1.953	2	5
C55106	Male	40	no	39	2.750	1	3.088	1	3.187	1	1.953	2	5
C56823	Male	31	no	31	3.000	1	3.397	1	3.125	1	2.078	2	5
C89892	Male	37	no	39	1.875	1	3.106	1	3.214	2	1.299	1	5
C45611	Male	40	no	37	2.760	1	3.346	1	3.651	2	1.479	1	5
C76624	Female	19	no	44	2.433	1	3.514	2	2.987	1	1.299	1	5
C26179	Male	47	no	32	3.191	1	3.542	2	3.063	1	1.479	1	5
C21431	Male	29	no	43	4.313	2	3.184	1	2.911	1	1.299	1	5
C66274	Male	66	no	13	3.421	2	3.610	2	3.127	1	0.826	0	5
C44503	Male	32	no	38	2.910	1	2.826	0	3.485	2	2.531	3	6
C16009	Male	32	no	41	1.850	1	3.181	1	3.252	2	2.145	2	6
C61528	Male	52	no	46	1.920	1	3.240	1	3.219	2	2.145	2	6
C52386	Male	48	no	30	2.070	1	3.322	1	3.241	2	1.845	2	6
C74517	Male	28	no	50	2.287	1	3.129	1	3.322	2	1.777	2	6
C29562	Male	22	no	35	2.490	1	3.229	1	3.266	2	2.000	2	6
C16179	Female	55	no	43	2.680	1	3.135	1	3.212	2	2.078	2	6
C15069	Male	26	no	56	1.988	1	3.501	2	2.988	1	2.042	2	6
C65737	Male	51	no	52	2.568	1	3.508	2	3.322	2	1.000	1	6
C55142	Female	20	no	49	2.770	1	3.445	2	3.266	2	1.000	1	6
C51850	Female	61	no	42	3.704	2	3.344	1	3.146	1	2.145	2	6
C94896	Female	26	no	59	3.974	2	3.441	2	3.151	1	1.179	1	6
C36346	Male	56	no	37	4.484	2	3.512	2	2.919	1	1.738	1	6
C19733	Female	28	no	61	4.757	2	3.415	2	3.081	1	1.398	1	6
C21063	Female	25	no	31	1.950	1	3.438	2	2.980	1	2.476	3	7
C76378	Male	64	no	40	3.190	1	3.526	2	3.143	1	2.204	3	7
C45407	Female	37	no	26	3.300	2	3.385	1	3.575	2	2.042	2	7
C20591	Male	39	no	33	3.762	2	3.228	1	3.294	2	2.000	2	7
C48739	Female	24	yes	44	4.236	2	3.534	2	3.210	1	2.000	2	7
C96063	Female	41	no	63	4.331	2	3.449	2	3.164	1	1.777	2	7
C65871	Female	33	no	45	3.660	2	3.582	2	3.250	2	1.479	1	7
C87068	Female	70	no	45	5.582	3	3.513	2	3.208	1	1.479	1	7
C41378	Female	29	no	37	2.714	1	3.595	2	3.383	2	2.665	3	8
C37580	Female	42	no	31	3.610	2	3.439	2	3.513	2	2.145	2	8
C20750	Female	68	no	30	3.700	2	3.729	2	3.470	2	2.000	2	8
C63802	Male	33	no	48	4.303	2	3.606	2	3.464	2	2.000	2	8
C61063	Male	20	no	31	4.370	2	3.578	2	3.434	2	1.777	2	8
C45271	Male	20	no	50	4.592	2	3.513	2	3.270	2	2.145	2	8
C22310	Male	26	no	35	4.636	2	3.476	2	3.410	2	1.953	2	8
C31573	Male	75	no	29	5.248	2	3.423	2	3.497	2	1.777	2	8
C20061	Female	62	no	42	6.754	3	3.653	2	3.371	2	1.479	1	8
C98638	Male	38	no	32	4.240	2	3.327	1	4.062	3	2.476	3	9
C15728	Female	56	no	39	4.355	2	3.478	2	3.829	3	2.000	2	9
C88509	Male	37	no	42	4.475	2	3.789	3	3.737	3	1.543	1	9
C35279	Female	52	yes	56	7.706	3	3.782	2	3.380	2	1.953	2	9
C73346	Male	45	yes	55	5.670	3	3.899	3	3.593	2	1.398	1	9
C39992	Female	55	no	49	3.470	2	4.154	3	3.230	2	2.505	3	10
C57623	Male	38	no	44	4.464	2	4.404	3	3.678	2	2.557	3	10
C14870	Male	53	no	48	4.539	2	4.103	3	3.620	2	2.791	3	10
C82212	Male	56	no	40	4.620	2	3.838	3	3.634	2	2.416	3	10
C44595	Female	42	no	43	6.144	3	3.742	2	3.656	2	2.412	3	10
C31562	Male	67	no	40	8.561	3	3.756	2	4.397	3	2.081	2	10
C35598	Male	44	no	56	7.904	3	4.027	3	3.421	2	1.845	2	10
C73414	Female	42	no	45	4.520	2	4.123	3	3.955	3	2.416	3	11
C43444	Male	19	no	43	4.660	2	3.960	3	3.753	3	2.228	3	11
C34334	Female	47	no	29	5.368	2	4.099	3	3.739	3	2.893	3	11
C89395	Male	40	no	52	5.378	3	3.540	2	3.739	3	2.663	3	11
C66706	Female	60	no	46	5.410	3	3.508	2	3.889	3	2.253	3	11
C87780	Male	52	no	45	5.833	3	4.070	3	3.930	3	2.003	2	11
C14896	Male	26	no	38	6.001	3	3.956	3	3.685	3	2.081	2	11
C87421	Female	51	no	46	6.722	3	4.187	3	3.993	3	2.112	2	11
C17619	Female	65	no	43	7.464	3	4.197	3	4.011	3	2.145	2	11
C30931	Male	51	yes	52	8.975	3	4.184	3	4.002	3	2.081	2	11
C57641	Female	39	no	42	5.668	3	4.234	3	3.912	3	2.381	3	12
C23915	Male	55	no	36	6.100	3	4.089	3	4.059	3	2.478	3	12
C22734	Male	62	no	40	6.370	3	4.027	3	4.160	3	2.531	3	12
C91439	Male	63	no	47	6.745	3	4.268	3	4.651	3	2.922	3	12
C78051	Male	66	no	48	6.758	3	4.068	3	4.043	3	2.204	3	12
C59429	Male	63	no	38	6.777	3	4.040	3	3.832	3	2.476	3	12
C26280	Female	57	yes	39	6.972	3	4.183	3	3.929	3	2.300	3	12
C31413	Male	78	no	49	7.085	3	4.255	3	3.989	3	2.414	3	12
C62246	Female	45	yes	46	7.202	3	4.386	3	4.471	3	2.505	3	12
C70295	Male	37	no	48	7.226	3	4.311	3	4.168	3	2.381	3	12
C98311	Male	70	no	43	7.371	3	4.443	3	4.409	3	2.732	3	12
C74999	Male	48	no	35	7.530	3	4.763	3	4.714	3	2.734	3	12
C86001	Male	42	yes	38	8.039	3	4.503	3	4.494	3	2.734	3	12
C58055	Female	26	yes	52	9.739	3	4.236	3	3.915	3	2.476	3	12
C97441	Female	40	yes	62	10.150	3	4.343	3	4.131	3	2.557	3	12
C47998	Male	63	yes	39	10.383	3	4.874	3	4.804	3	2.934	3	12
C48630	Male	50	yes	47	10.456	3	4.706	3	4.317	3	2.734	3	12

[a] Score = 0 if log AUC < 1.794 (25th pct) ; score = 1 if ≥ 1.794 (25th pct) and < 3.145 (50th pct) ; score = 2 if ≥ 3.145 (50th pct) and < 5.386 (75th pct) ; score = 3 if > 5.386 (75th pct)

[b] Score = 0 if log AUC < 3.051 (25th pct) ; score = 1 if ≥ 3.051 (25th pct) and < 3.406 (50th pct) ; score = 2 if ≥ 3.406 (50th pct) and < 3.789 (75th pct) ; score = 3 if > 3.789 (75th pct)

[c] Score = 0 if log AUC < 2.785 (25th pct) ; score = 1 if ≥ 2.785 (25th pct) and < 3.211 (50th pct) ; score = 2 if ≥ 3.211 (50th pct) and < 3.678 (75th pct) ; score = 3 if > 3.678 (75th pct)

[d] Score = 0 if log AUC < 1.000 (25th pct) ; score = 1 if ≥ 1.000(25th pct) and < 1.777 (50th pct) ; score = 2 if ≥ 1.777 (50th pct) and < 2.204 (75th pct) ; score = 3 if > 2.204 (75th pct)

[e] Score = S1-IgG score + S-IgG score + S-RBD score + NT score. Range 0-12, mean = 6.048, median = 6