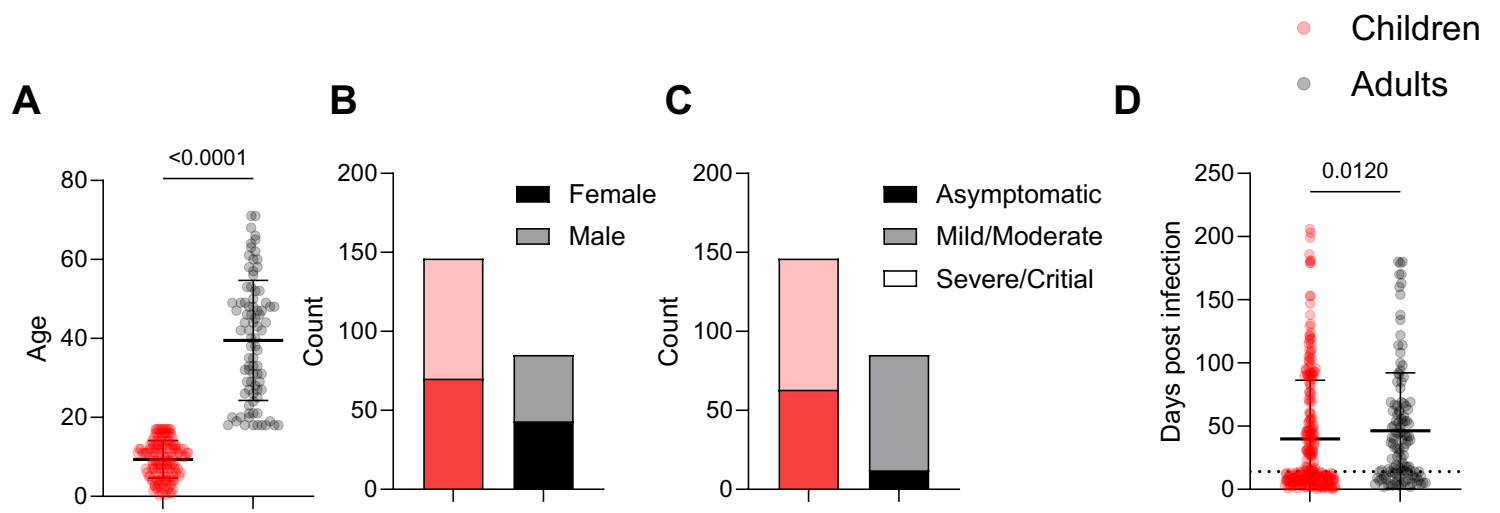


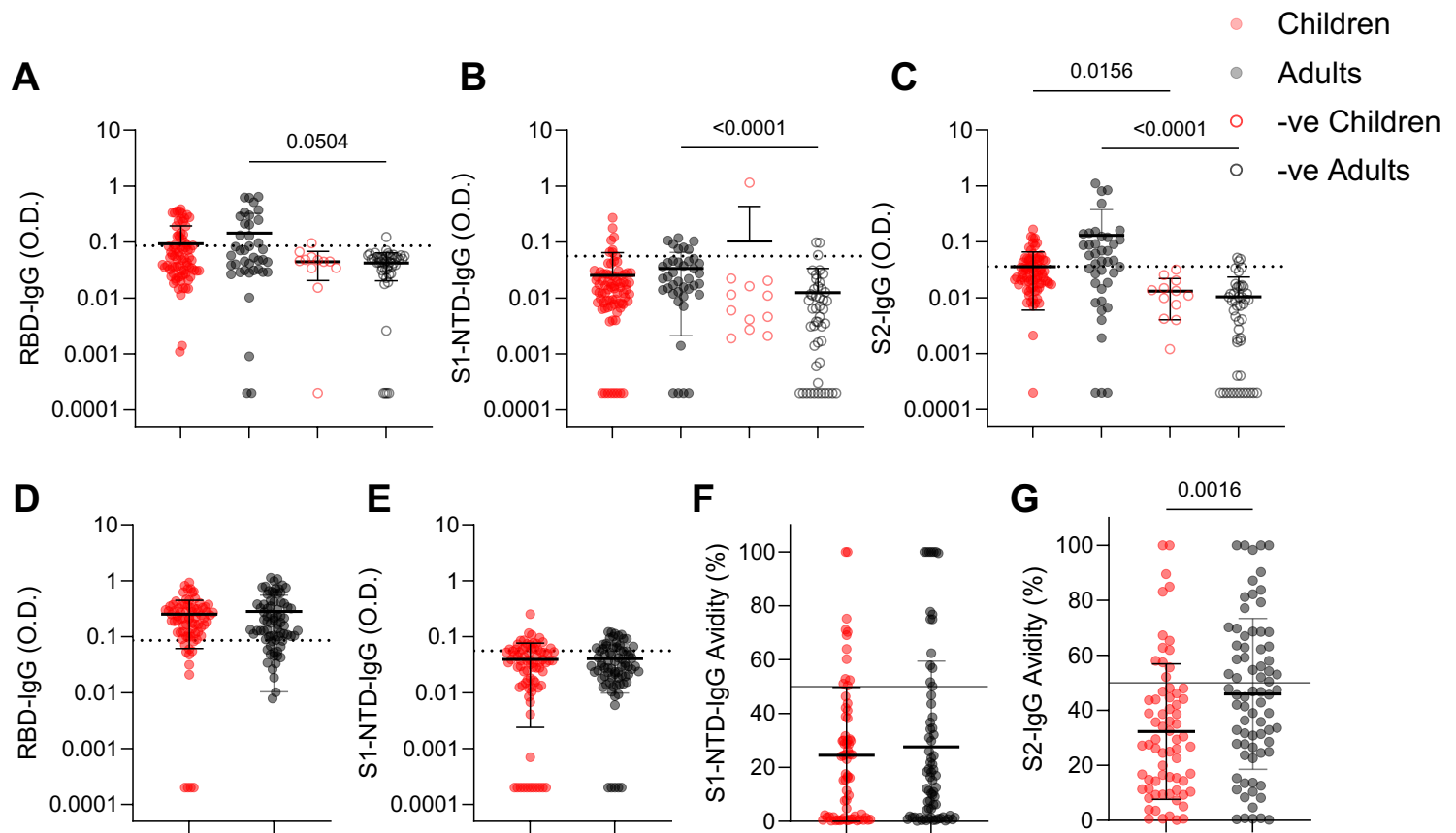
Supplementary table 1: Subcohort characteristics

Subcohort	SARS-CoV-2 RT-PCR+		
% (n)	Children	Adults	p-value
Total samples	75	111	
Total participants	52	80	
Age (mean±SD, range)	8.7±4.3, 0.92-17	40.8±14.7, 18-71	<2.2x10⁻¹⁶
Female	50.0% (26)	50.0% (40)	1
Asymptomatic	32.7%(17)	13.8%(11)	
Mild/Moderate	67.3%(35)	86.3%(69)	0.016
Severe/Critical	0% (0)	0% (0)	
Sample time point information – days post symptom onset (n= , median (IQR), range)			
All time points	n=75 38 (12.5-90), 2-138 days	n=111 29 (10-54), 2-180 days	0.19
Acute time points	n=22, 9 (5-11), 2-14 days	n =40 8 (4.8-11), 2-14 days	0.97
Convalescent time points	n=53 48 (33-93), 15-138 days	n=71 49 (32.5-68), 15-180 days	0.32
Participants with 1 timepoint	61.5% (32)	61.3% (49)	
Participants with 2 timepoints	32.7% (17)	38.8% (31)	0.1
Participants with 3 timepoints	5.8% (3)	0	
Participants with 4 timepoints	0	0	

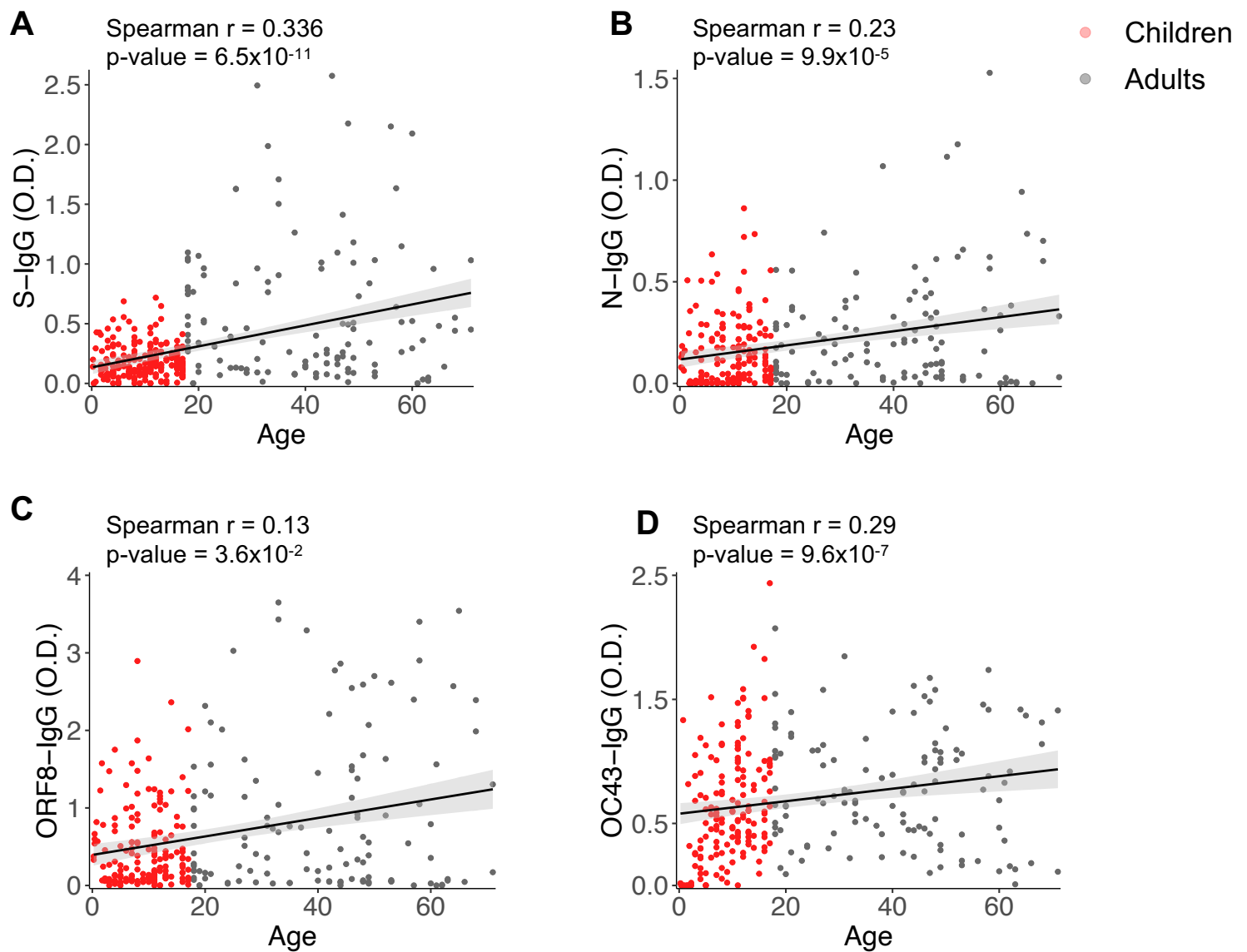
N.B. Statistical comparisons between children and adults made using two-sided Mann-Whitney test for continuous variables (age and time) and two-sided Fisher’s exact test for categorical (sex and symptom category). Significant differences in bold.
IQR = interquartile region



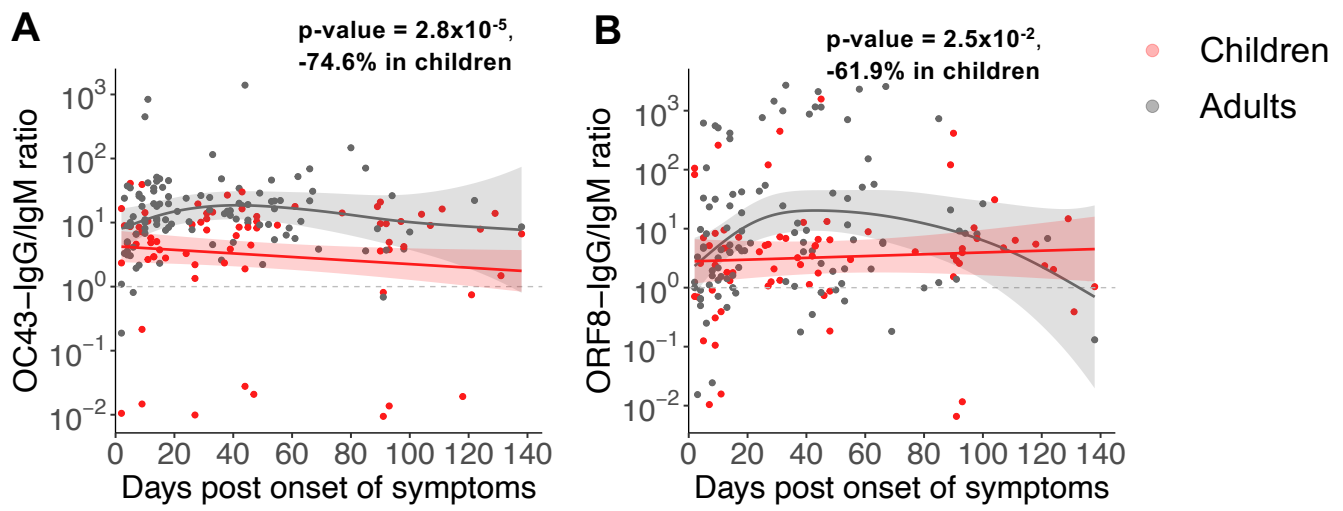
Supplementary Figure 1. Participant information. The age (A), sex (B), symptom category (C) and time post infection (D) of children, red, $n=146$ individuals and $n=257$ samples and adults, black, $n=85$ individuals and $n=122$ samples, used for antibody assessment. Statistical comparisons of age and days post infection made using two-sided Mann-Whitney test with p-values shown. Between sexes and symptoms, Fisher's exact test was used. Dotted line (D) represents day 14 and the difference between acute and convalescent samples. Mean and standard deviation are represented (AD).



Supplementary Figure 2. Spike domain specificity of response. The IgG response to SARS-CoV-2 Spike RBD (AD), (A), ORF8 (B) and OC43 Spike (C), and IgG avidity against S1-NTD (F) and S2 (G) domains at acute (ABC) (children $n=79$, adults $n=40$) and convalescent (>14 days, DEFG) (children $n=79$, adults $n=77$ for IgG, children $n=68$, adults $n=72$ for S1-NTD IgG avidity, and children $n=69$, adults $n=75$ for S2 IgG avidity) time points. SARS-CoV-2 infected children's response is shown in red and adults in black, with uninfected (-ve) children as red open circles and uninfected adults as black open circles. Comparisons between multiple groups by two-sided Kruskal-Wallis test with Dunn's multiple comparisons (ABC), and between two groups by two-sided Mann-Whitney test with significant p -values <0.05 shown. Dotted lines represent the lower cut off based on the mean+2SD response of $n=48$ pre-pandemic controls (ABCDE). Solid lines represent 50% avidity (FG). Individual data points are shown, with lines and error bars showing mean and standard deviations. Lower bars are not shown if at 0 or below (ABC).

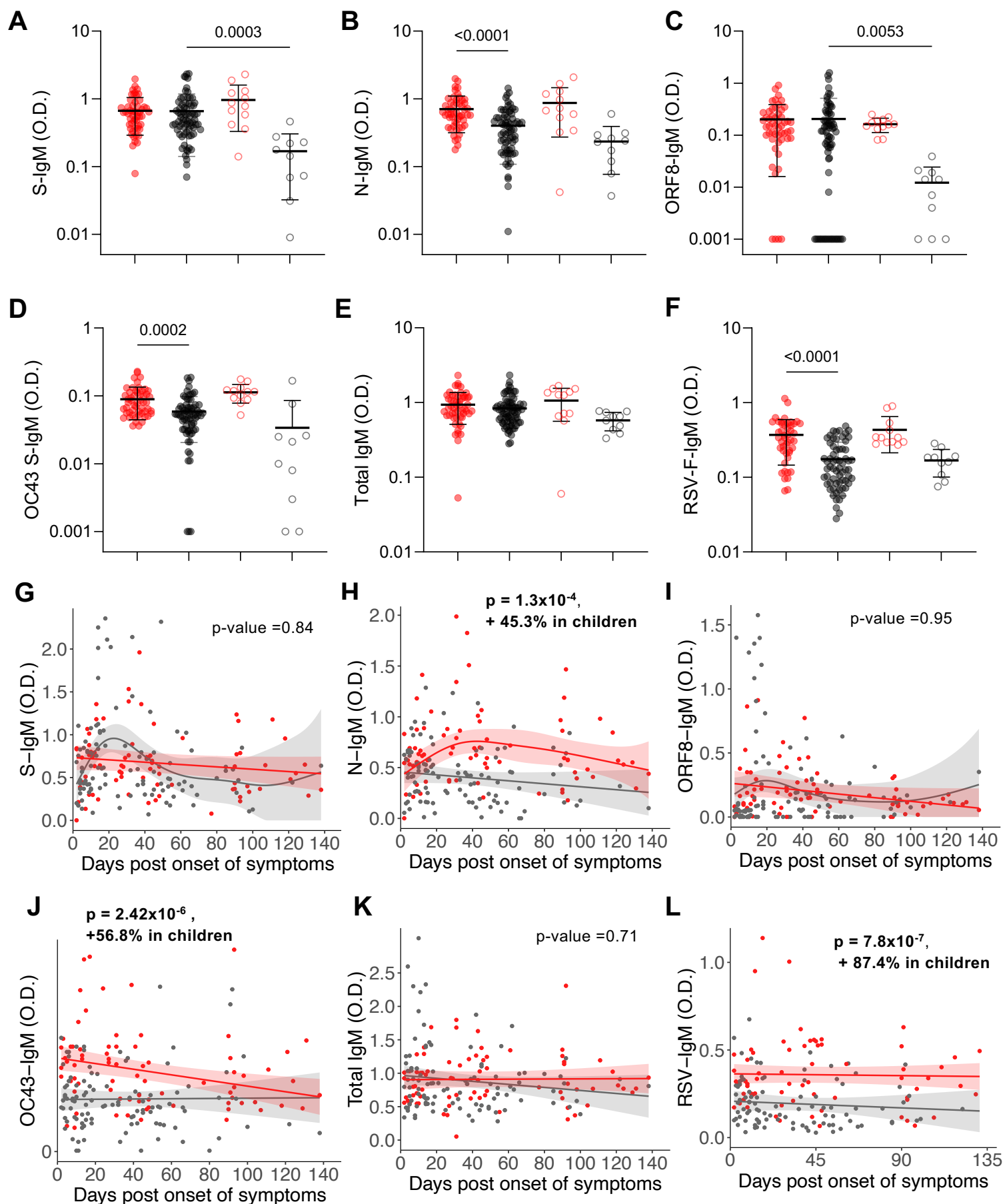


Supplementary Figure 3. SARS-CoV-2 IgG responses increase with age. The IgG response to SARS-CoV-2 Spike (A) Nucleocapsid (B), ORF8 (C) and OC43 Spike (D) increase with age. Children's response is shown in red and adults in black. Spearman's correlation with r and p -values shown in each graph and lines represent linear regression.

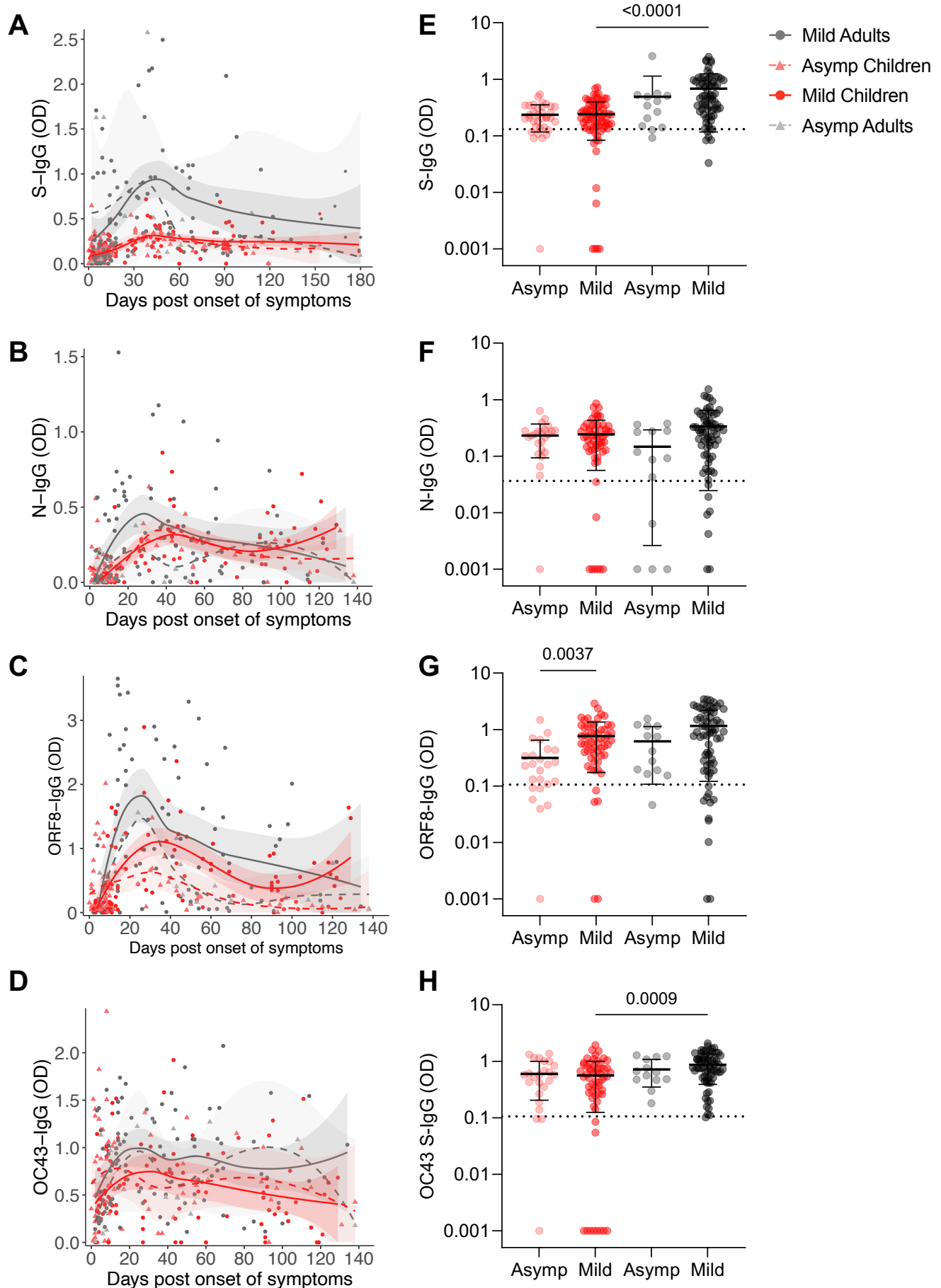


Supplementary Figure 4. Higher magnitude of IgG switched response longitudinally in adults. (AB) Longitudinal plot of IgG-to-IgM ratios targeting OC43 (A) and ORF8 (B) tracked until day 138. Points represent 104 samples from 79 adults in grey and 74 samples from 52 children in red. Fitted values are derived from GAMM of logarithm in base 10 of the antibody feature accounting for participants' ID as a random effect and age group as a fixed effect (A,B). 95% confidence intervals are depicted by the shaded areas. The p-value corresponds to the significance of age group as a parametric coefficient in the model.

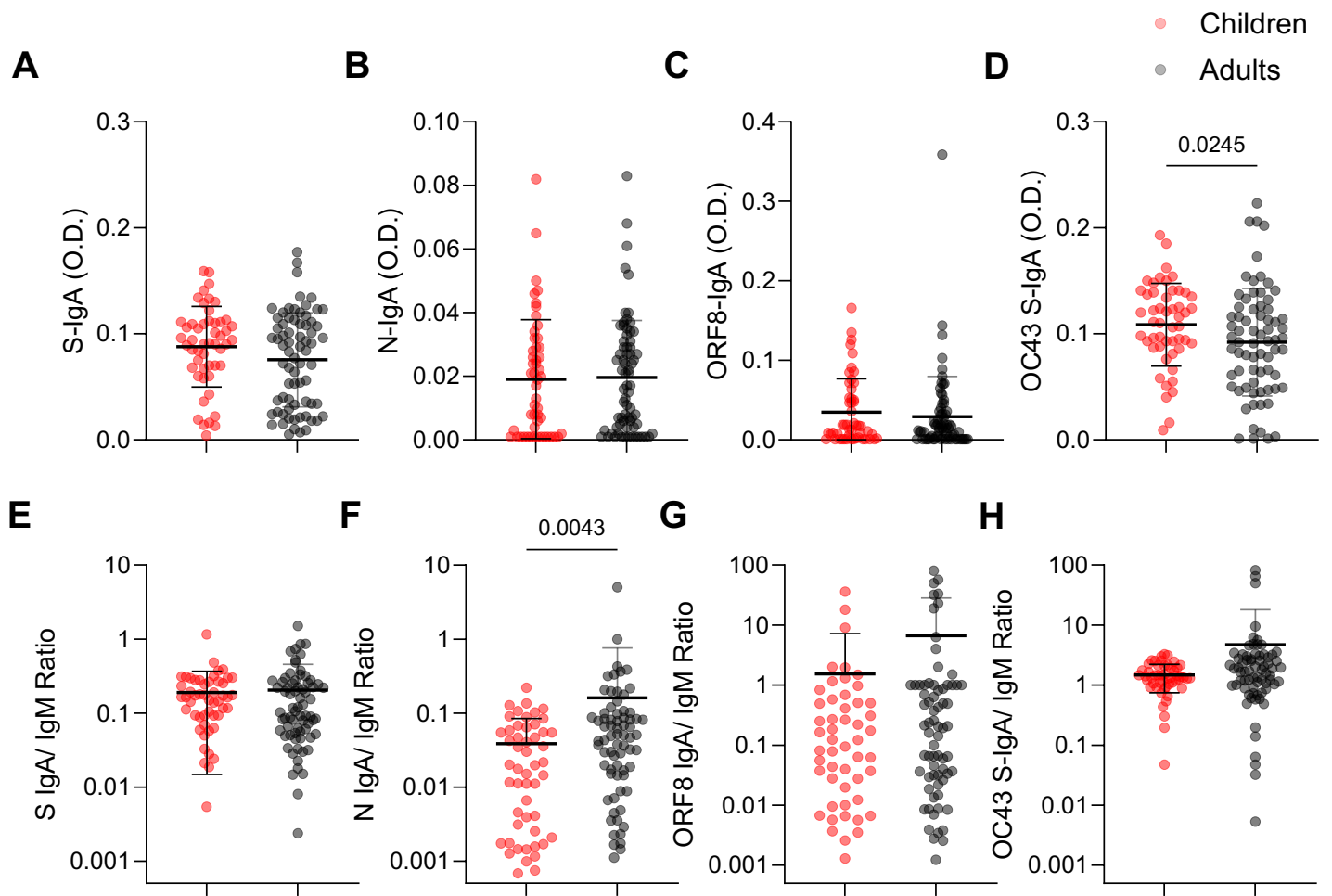
- Children
- Adults
- -ve Children
- -ve Adults



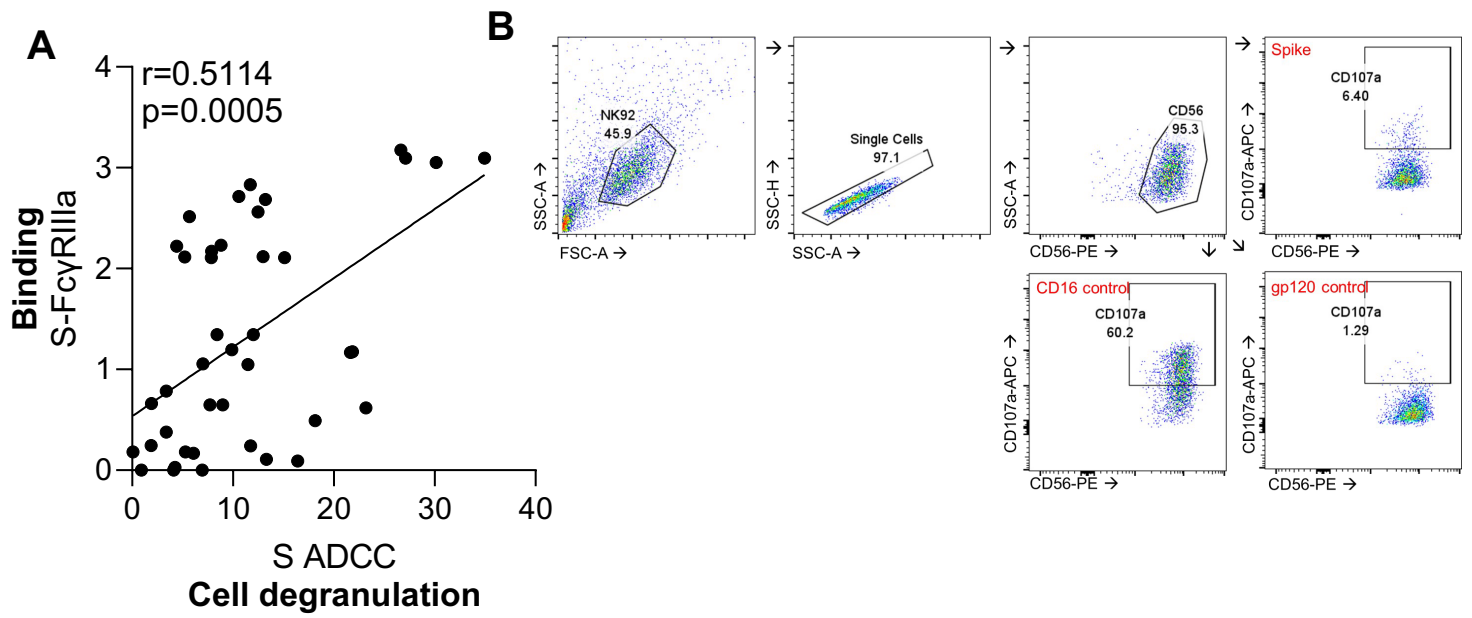
Supplementary Figure 5. Convalescent IgM raised against multiple proteins of respiratory viruses in children. Children in red (n=47) and adults in black (n=71) IgM responses at convalescent time points (from day 15 post symptom onset or hospital admission) against SARS-CoV-2 S (A), N (B), ORF8 (C), OC43 S (D), total serum IgM (E) and RSV-F (F). Statistical differences assessed with two-sided Kruskal-Wallis test and Dunn's multiple comparisons with significant p-values shown. Individual data points are shown, with lines and error bars showing mean and standard deviations. Lower bars are not shown if at 0 or below. Longitudinal plots of IgM levels up to day 138 (GHIJK) or day 131 (L). Points represent n= 105 samples from 79 adults in grey and n= 75 samples from 52 children in red (GHIJ), or 103 samples from 77 adults and 75 samples from 52 children (K), or 96 samples from 73 adults and 68 samples from 49 children (L). Fitted values are derived from GAMM accounting for participants' ID as a random effect and age group alone (GIJKL) or with symptoms (H) as fixed effects. 95% confidence intervals are depicted by the shaded areas. The p-value corresponds to the significance of age group or other fixed effect as a parametric coefficient in the model and the average change of response is indicated.



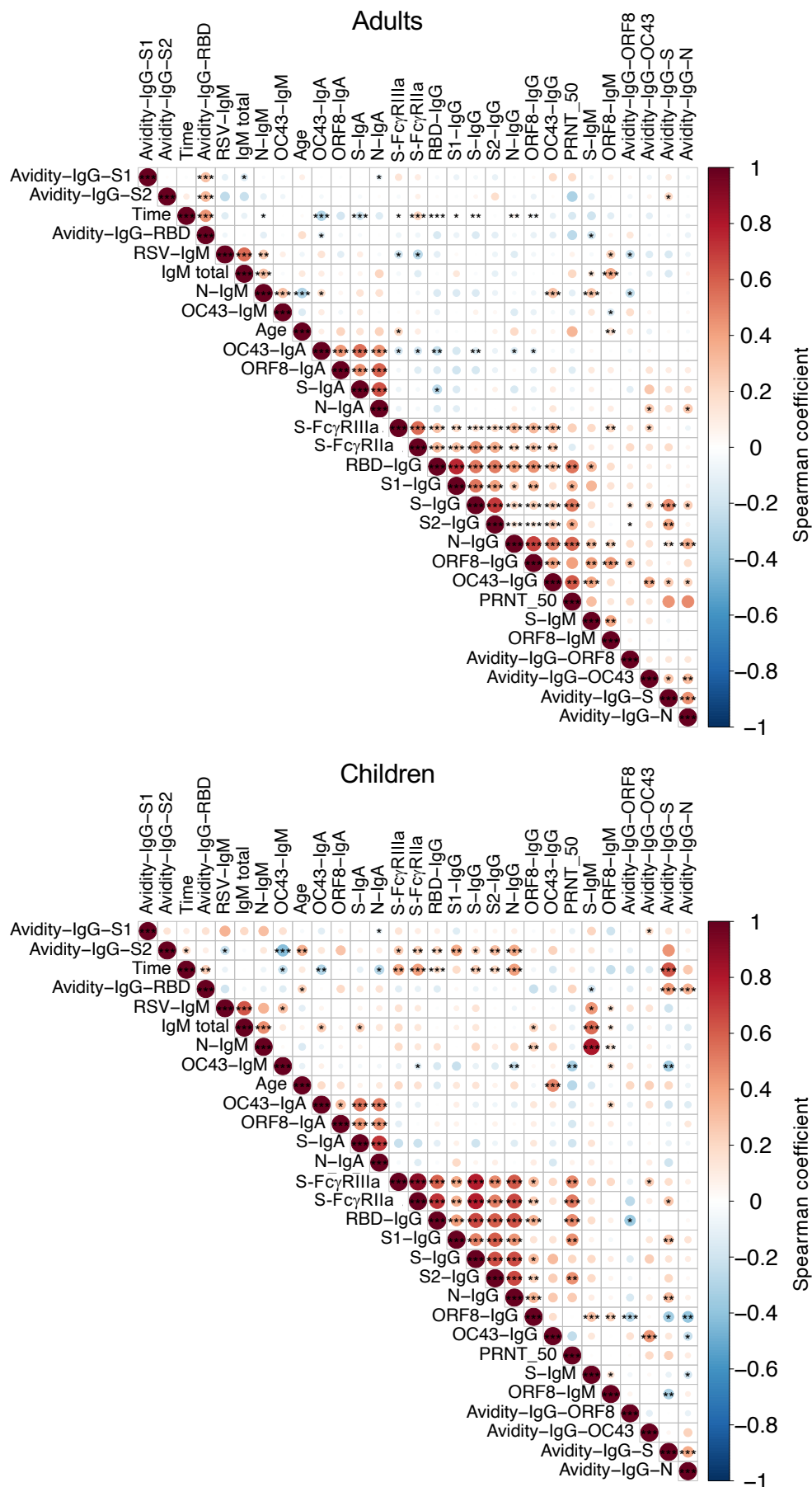
Supplementary Figure 6. Mild and asymptomatic responses against Spike and Nucleocapsid but not ORF8 are equivalent in children. Asymptomatic (pale red, dotted red line) and symptomatic (red, solid red line) children and asymptomatic (light grey, dotted black line) and symptomatic (black, solid red line) adult IgG responses over time (ABCD) and at convalescent time points (after day 14 post symptom onset or hospital admission for asymptomatic donors) (EFGH). Data shown as individual points with LOESS curve and 95% confidence interval (ABDC) or with mean and SD values (EFGH). Data shows n=35 (AE), n=24 (BCDFGH), asymptomatic children, n=76 (AE), n=58 (BCDFGH) mildly infected children, n=13 asymptomatic adults (A-H) and n=69



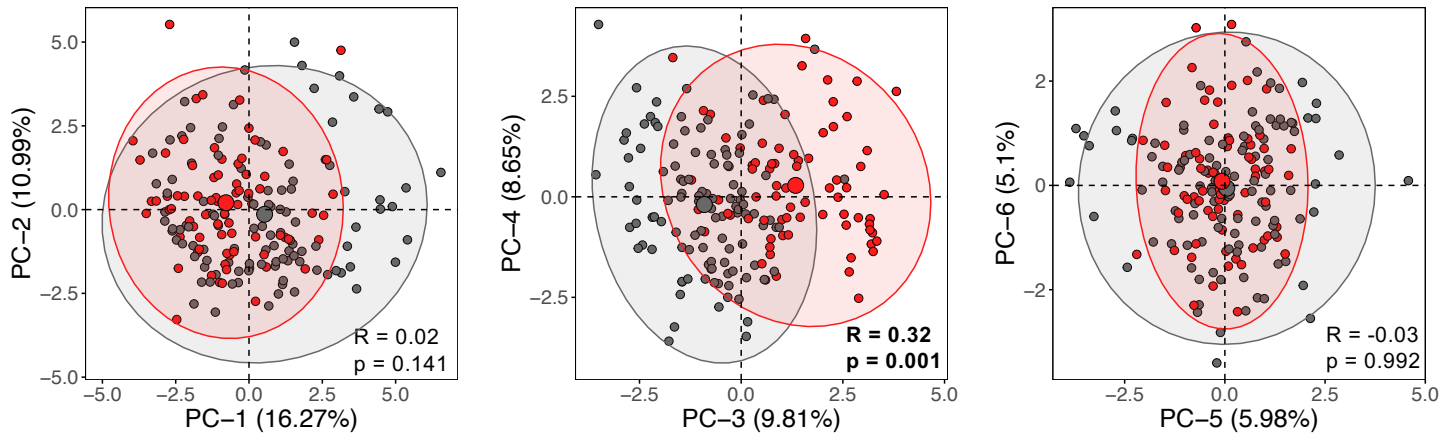
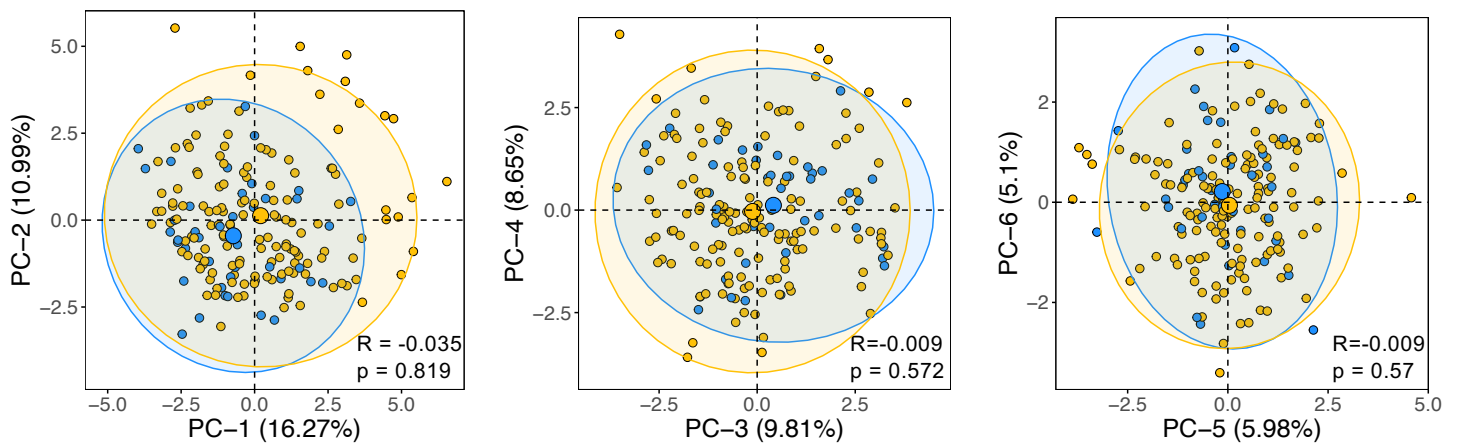
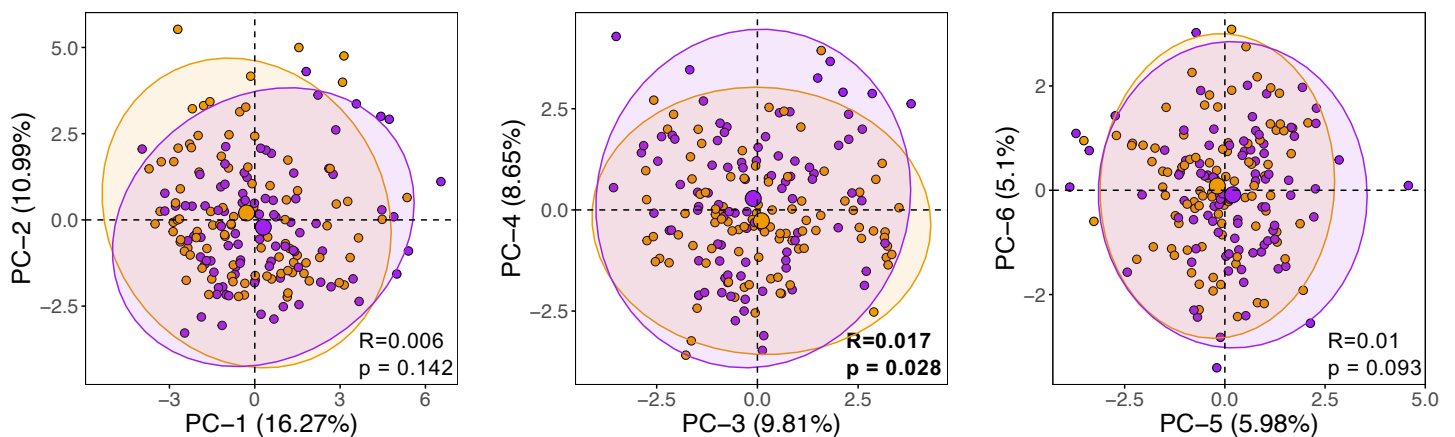
Supplementary Figure 7. Low SARS-CoV-2 IgA responses in children and adults. (ABCD) IgA response in SARS-CoV-2 mildly infected children (C, red) and adults (A, black) (acute and convalescent timepoints). (EFGH) The ratio of IgA/ IgM response showing differences in class switching between children and adults. Responses are against (AE) SARS-CoV-2 Spike, (BF) Nucleocapsid, (CG) ORF8 and (DH) OC43 Spike. Individual data points are shown for n=51 children and n=71 adults, with lines and error bars showing mean and standard deviations. Lower bars are not shown if at 0 or below Significant differences assessed with two-sided Mann-Whitney U test and significant p-values <0.05 shown.



Supplementary Figure 8. Fc γ RIIIa binding correlates with ADCC cell degranulation. (A) Correlation between binding and NK92 cell degranulation in n=42 adults with mild SARS-CoV-2 infection. (B) FACS gating strategy used for A, with representative responses to Spike, irrelevant negative control protein gp120 and positive control CD16.



Supplementary Figure 9. Distinct coordinated immune responses in adults and children. Correlograms of Spearman correlations are represented with positive correlations in red and negative correlations in blue. Both the colour and the size of the circle are proportional to the correlation coefficient. Significant correlations are overlaid with stars (***: p-value < 0.001, **: p-value < 0.01, and *: p-value < 0.05). Variables were ordered using hierarchical clustering for the adults and this order was kept in the children correlogram.

AAge category  Adults  Children**B**Symptoms  Asymptomatic  Symptomatic**C**Sex  Female  Male

Supplementary Figure 10. Principal component analysis of antibody measurements reveals distinct clustering depending on the age group. A PCA was performed using 20 antibody measurements from 188 samples. Each point represents a sample, and 95% concentration ellipses are overlaid to indicate clustering patterns. Significance between the groups was assessed with an ANOSIM (Analysis of Similarities) test, p-value and R statistics are indicated. R ranges from -1 to 1, if around 0 the groups are similar, the closest to 1 the most the groups are separated. Both points and ellipses are coloured by age category (A), symptoms (B) or sex (C).