Supplemental Material to Original Article – v16-09-2021

A multidimensional survey and cross-sectional analysis of COVID-19 seroprevalence among a police officer cohort: The PoliCOV-19 study

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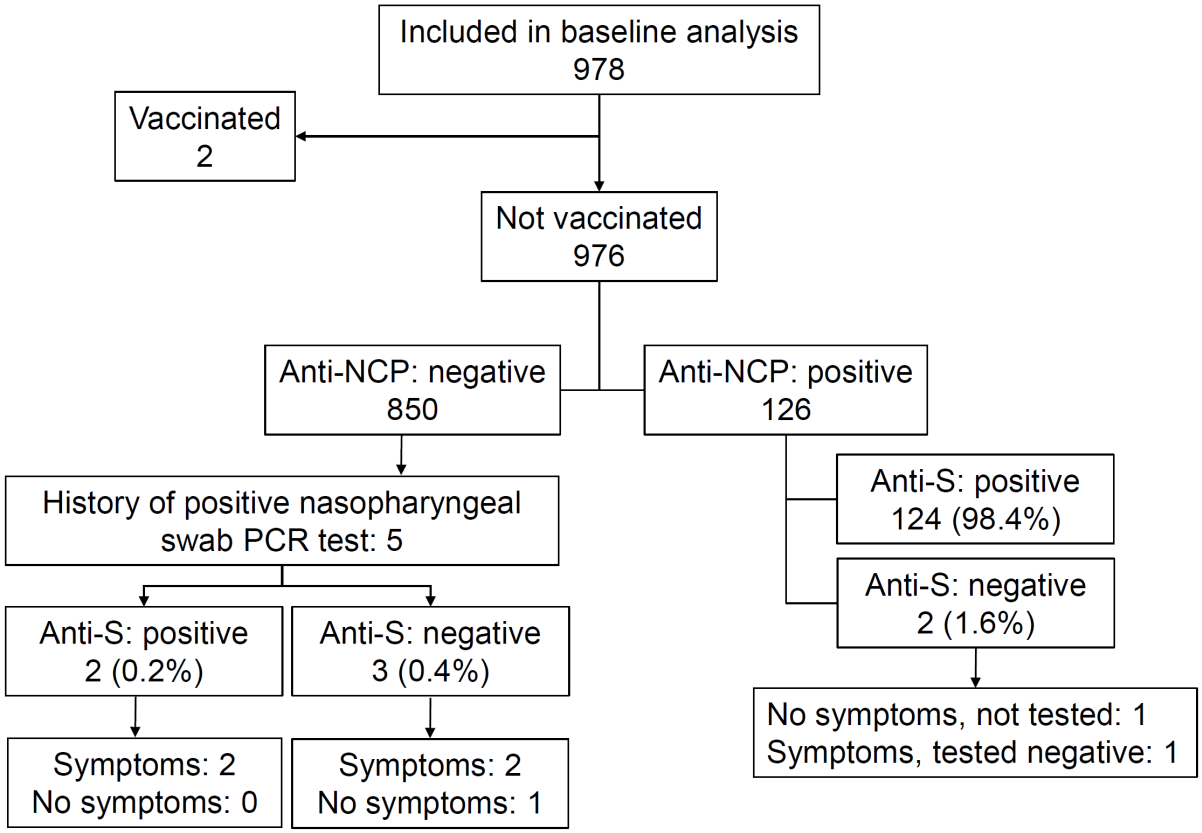
Supplemental figure A: Antibody test results according to the test strategy.



"Tested negative" (right bottom box) refers to reported nasopharyngeal swab test. The two vaccinated individuals were anti-NCP negative, one anti-S seropositive and one anti-S seronegative.

Supplemental table A: Association of working region and the presence of anti-NCP antibodies.

Geographic working region	**OR (95% CI)**	**P value**
Bern City	Reference	
Region Bern	1.57 (0.83 to 2.98)	0.163
Mittelland, Emmental, Oberaargau	1.09 (0.56 to 2.14)	0.799
Bernese Oberland	0.99 (0.47 to 2.10)	0.987
Bernese Seeland, Bernese Jura	**2.38 (1.28 to 4.44)**	**0.006**

N=978

Supplemental table B: Association of working department and the presence of anti-NCP antibodies.

Department	**OR (95% CI)**	**P value**
Regional police	Reference	
Criminal police	1.27 (0.75 to 2.15)	0.381
Department of traffic, environment, prevention	1.00 (0.50 to 2.03)	0.996
Interdepartmental	**0.33 (0.14 to 0.77)**	**0.010**
Others*	-	-

N=978; *not estimable due to zero events.

Supplemental table C: Comparison between seropositive and seronegative individuals categorized according to the selfreported test results from nasopharyngeal swabs or COVID-19 symptoms prior to February 2021.

COVID-19 symptoms and test results from nasopharyngeal swabs	Study participants N=978	Seropositive Anti-NCP	Seronegative
Never had symptoms, was not tested	336 (34%)	7 (5.6%)[1]	329 (39%)
Had symptoms but was not tested	139 (14%)	9 (7.1%)	130 (15%)
Had symptoms or contact but tested negative (nasopharyngeal swab)	398 (41%)	16 (13%)[2]	382 (45%)
Had no symptoms but tested positive in nasopharyngeal swab test (e.g., contact tracing)	6 (0.61%)	5 (4.0%)[3]	1 (0.12%)
Had symptoms and tested positive in nasopharyngeal swab test	93 (10%)	89 (71%)/ 91 (72%)[4]	2 (0.2%)[4]

N = 972 responses; the distribution of responses and results was significant (P<0.001).

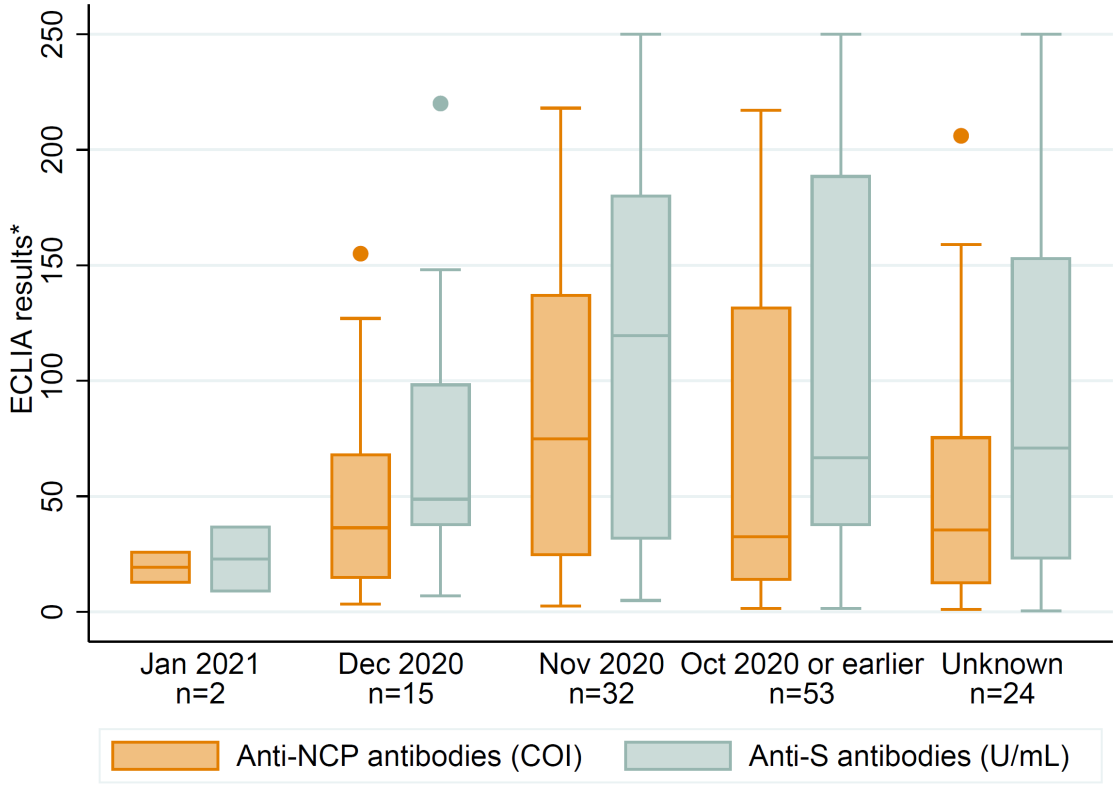
[1] One of the seven anti-NCP seropositive individuals did not display anti-S antibodies in the ECLIA test.

[2] One of the 16 anti-NCP seropositive individuals did not display anti-S antibodies in the ECLIA test.

[3] All five anti-NCP seropositive individuals also displayed anti-S antibodies in the ECLIA test.

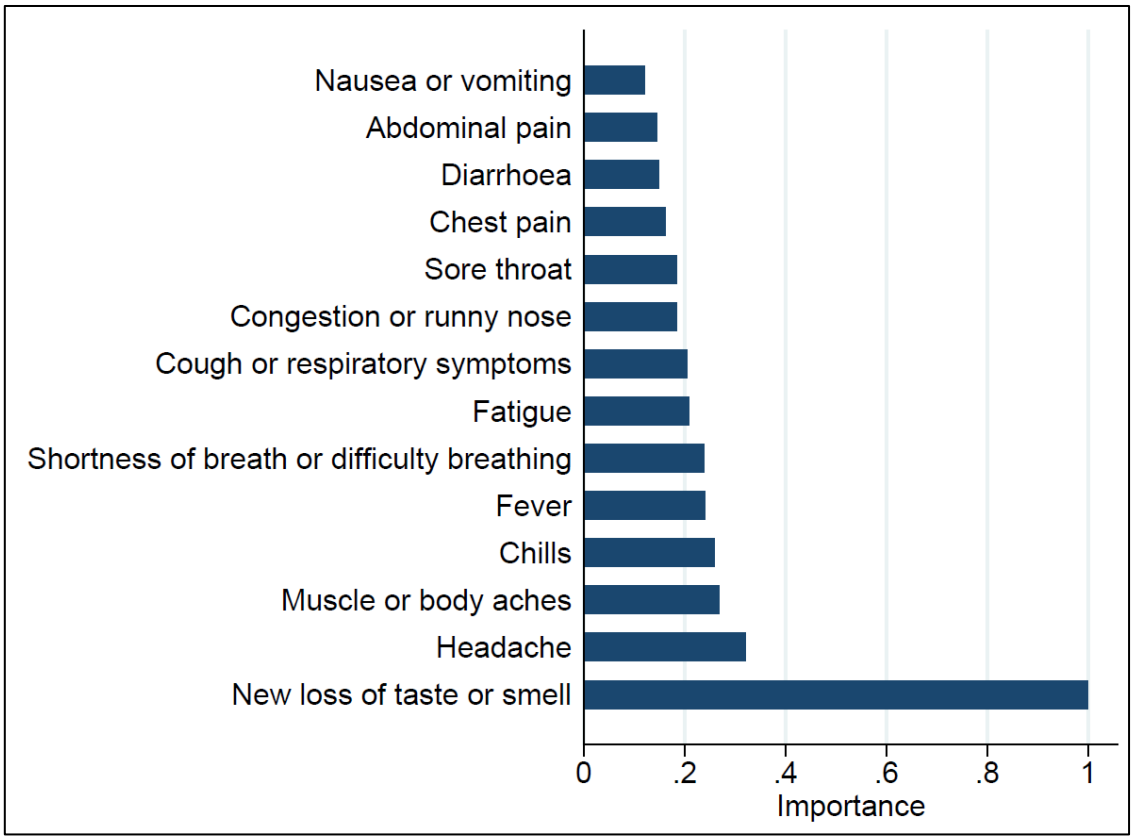
[4] Two anti-NCP seronegative individuals displayed positive anti-S antibodies in the ECLIA test.

Supplemental figure B: Antibody titres of seropositive study participants (blood sampling from February 9 to March 9, 2021) in association with the time point of selfreported test results from nasopharyngeal swabs (x-axis); (N=126).



COI = cut-off index. Units are presented according to the manufacturer's recommendations. Among the 126 seropositive study participants, 99 reported the time point of a positive nasopharyngeal swab test, 3 individuals reported the time point of COVID-19 (without a test but several symptoms consistent with the diseases), and 24 study participants did not know a time point ("unknown").

Supplemental figure C: Random forest algorithm to identify specific symptoms that separated seropositive and negative participants.



The symptom that separated seropositive and negative participants best was "new loss of taste or smell."

Supplemental table D: Comparison between seropositive and seronegative individuals categorized according to the use of personal protective equipment (PPE) and hygiene precautions.

PPE and hygiene precautions	Responses (N=972)	Study participants (N=978)	Seropositive (N=126)	Seronegative (N=852)	P
Masks	978	975 (100%)	126 (100%)	849 (100%)	1.00
Gloves	838	315 (32%)	45 (36%)	270 (32%)	0.36
Goggles or safety glasses	773	68 (7.0%)	5 (4.0%)	63 (7.4%)	0.19
Face shields	759	22 (2.2%)	4 (3.2%)	18 (2.1%)	0.51
Disinfectants	972	956 (98%)	126 (100%)	830 (97%)	0.10
Others	630	41 (4.2%)	1 (0.79%)	40 (4.7%)	0.05
≥3 of the above	978	361 (37%)	49 (39%)	312 (37%)	0.62

Supplemental table E: Subjective assessment (questionnaire) of the source of transmission in seropositive study participants (N=126).

Questions and answers on the source of transmission of SARS-CoV-2	**N Responses**	**Seropositive (N=126)**
Do you know the source of transmission?	125	
No		23 (18%)
Yes, I am certain.		65 (52%)
Probably (likely yes)		10 (7.9%)
Maybe, possibly		11 (8.7%)
Uncertain (likely no)		16 (13%)
Time point of transmission?	102	
Last month (January 2021)		2 (1.6%)
Two months ago (December 2020)		15 (12%)
Three months ago (November 2020)		32 (25%)
Four months or more ago		53 (42%)
Place/Location of transmission?	102	
During working hours: in the office/at the police station		15 (12%)
During working hours: fieldwork outside the police station		18 (14%)
Outside working hours: contact within the family/in the household		48 (38%)
Outside working hours: contact outside the family/household contacts		16 (13%)
Other		5 (4.0%)
If you selected "during working hours," please indicate the (presumed) contact situation.	33	
Next to a colleague who was not wearing a mask*		5 (4.0%)
Desk sharing		1 (0.79%)
Lunch break/eating break		1 (0.79%)
In the police car		6 (4.8%)
Arrest/detention of a suspect		4 (3.2%)
Police operation during demonstration, contact with a crowd		2 (1.6%)
Other		14 (11%)
If you selected "outside working hours," please indicate the (presumed) contact situation.	64	
At home/within the same household		38 (30%)
Outside home: family reunion		10 (7.9%)
Meeting friends, going out, sports activity		9 (7.1%)
Public transport, shopping		2 (1.6%)
Outside Switzerland		1 (0.79%)
Other		4 (3.2%)

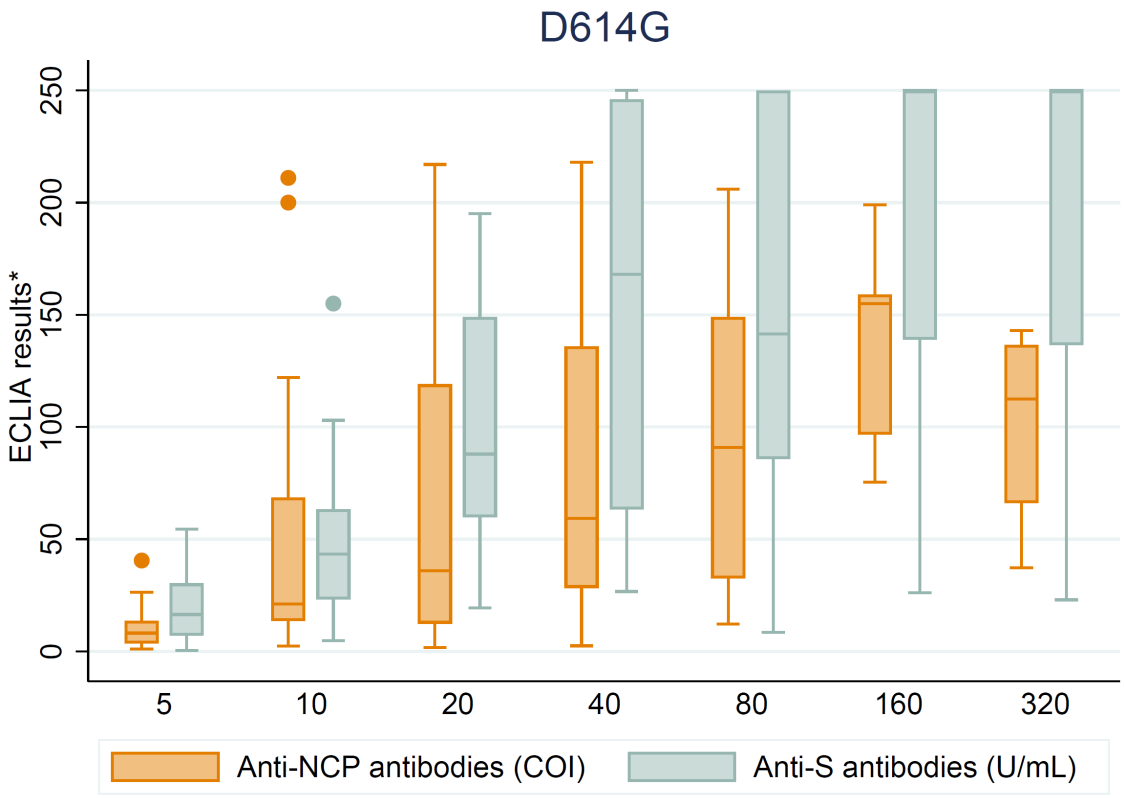
*****Wearing face masks for employees of the Bern Cantonal Police was recommended on August 28, 2020, and made mandatory on October 13, 2020. The questionnaire addressed situations since the onset of the pandemic in Switzerland (February 25, 2020).

Supplemental table F: Spearman's rank correlation coefficients between serum antibody titres of anti-NCP (1) and anti-S antibodies (2) and serum neutralization titres towards SARS-CoV-2 (3, 4, 5).

Variables	(1)	(2)	(3)	(4)	(5)
(1) Anti-NCP antibodies (COI)	1.000				
(2) Anti-S1 antibodies (U/mL)	0.550	1.000			
(3) D614G	0.527	0.675	1.000		
(4) B.1.1.7 (alpha)	0.532	0.687	0.861	1.000	
(5) B.1.351 (beta)	0.363	0.567	0.644	0.647	1.000

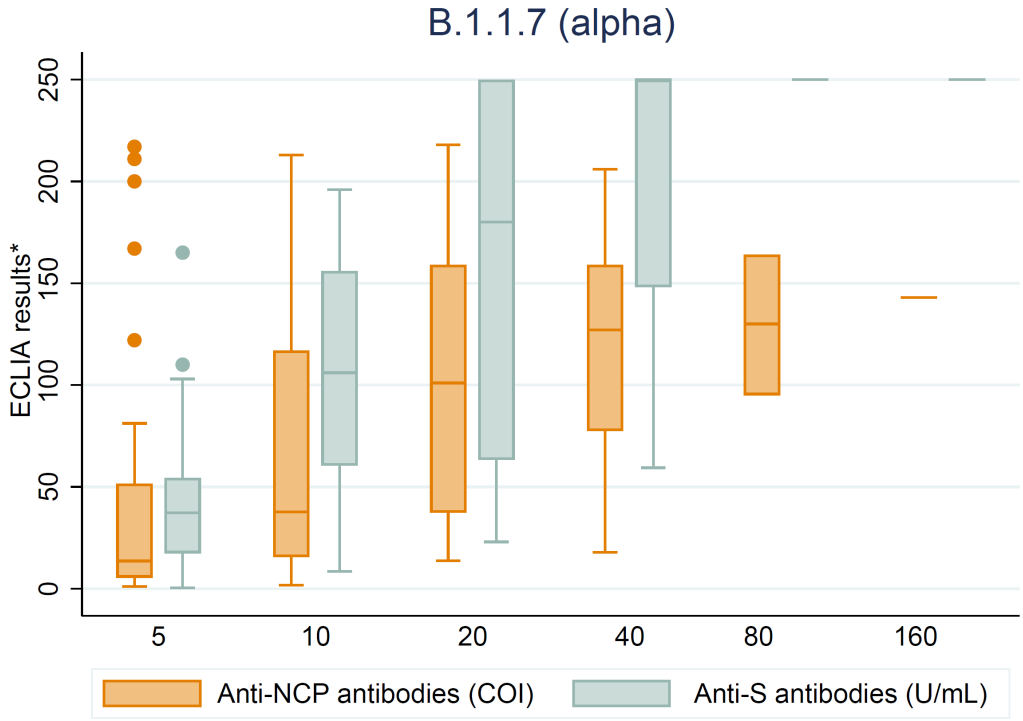
All corresponding P values are <0.001.

Supplemental figure D: Antibody titres (y-axis) of seropositive study participants in association with dilution titres (x-axis) in neutralization assays against isogenic SARS-CoV-2 viruses harbouring the D614G spike (N=126).



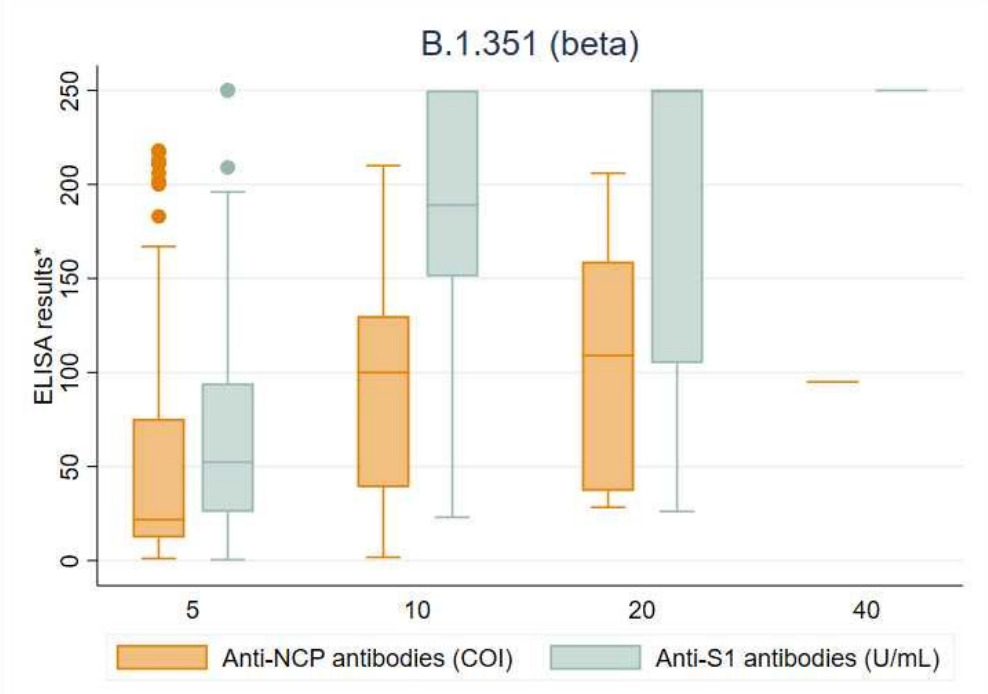
*The units are presented according to the manufacturer's recommendations. COI = cut-off index.

Supplemental figure E: Antibody titres (y-axis) of seropositive study participants in association with dilution titres (x-axis) in neutralization assays against isogenic SARS-CoV-2 harbouring the full-length B.1.1.7 spike (N=126).



*The units are presented according to the manufacturer's recommendations; (N=126). COI = cut-off index.

Supplemental figure F: Antibody titres (y-axis) of seropositive study participants in association with dilution titres (x-axis) in neutralization assays against isogenic SARS-CoV-2 viruses harbouring the full-length B.1.351 spike (N=126).



*The units are presented according to the manufacturer's recommendations. COI = cut-off index.

Supplemental table G: Association of antibody titres and serum neutralization titres.

Serum neutralization titres	**Covariate antibody titres**	**OR (95% CI)**	**P**
Assays with D614G	anti-NCP titres (continuous)	1.008 (1.003 to 1.014)	0.003
	anti-NCP>37.5	3.1 (1.5 to 6.1)	0.001
	anti-S1 titres (continuous)	1.019 (1.013 to 1.024)	<0.001
	anti-S>65	6.7 (3.2 to 14.3)	<0.001
Serum neutralization titres	**Covariate antibody titres**	**OR (95% CI)**	**P**
Assays with spike from B.1.1.7 (alpha)	anti-NCP titres (continuous)	1.008 (1.002 to 1.014)	0.007
	anti-NCP>37.5	2.9 (1.4 to 6.2)	0.005
	anti-S1 titres (continuous)	1.021 (1.015 to 1.027)	<0.001
	anti-S>65	6.7 (3.1 to 14.7)	<0.001
Serum neutralization titres	**Covariate antibody titres**	**OR (95% CI)**	**P**
Assays with spike from B.1.351 (beta)	anti-NCP titres (continuous)	1.002 (0.995 to 1.010)	0.559
	anti-NCP>37.5	3.0 (1.1 to 8.1)	0.030
	anti-S1 titres (continuous)	1.021 (1.014 to 1.028)	<0.001
	anti-S>65	6.1 (2.1 to 17.9)	0.001

Note that level of serum neutralization titres is modelled as ordered categories because a normal distribution of error terms cannot be assumed; hence, linear regression is not suitable and median regression does not seem adequate, given that dependent variables are discrete values on the log scale.

Anti-NCP antibody titres above the median (>37.5 COI) were associated with about a three-fold increased level of neutralization, whereas anti-S1 antibody titres above the median (>65 U/mL) were associated with about a six-fold increase. The association of antibody titres as a continuous variable was also more pronounced for anti-S1 antibody titres than for anti-NCP antibody titres with odds ratios per unit close to 1.