

# THE LANCET

## Infectious Diseases

### Supplementary appendix

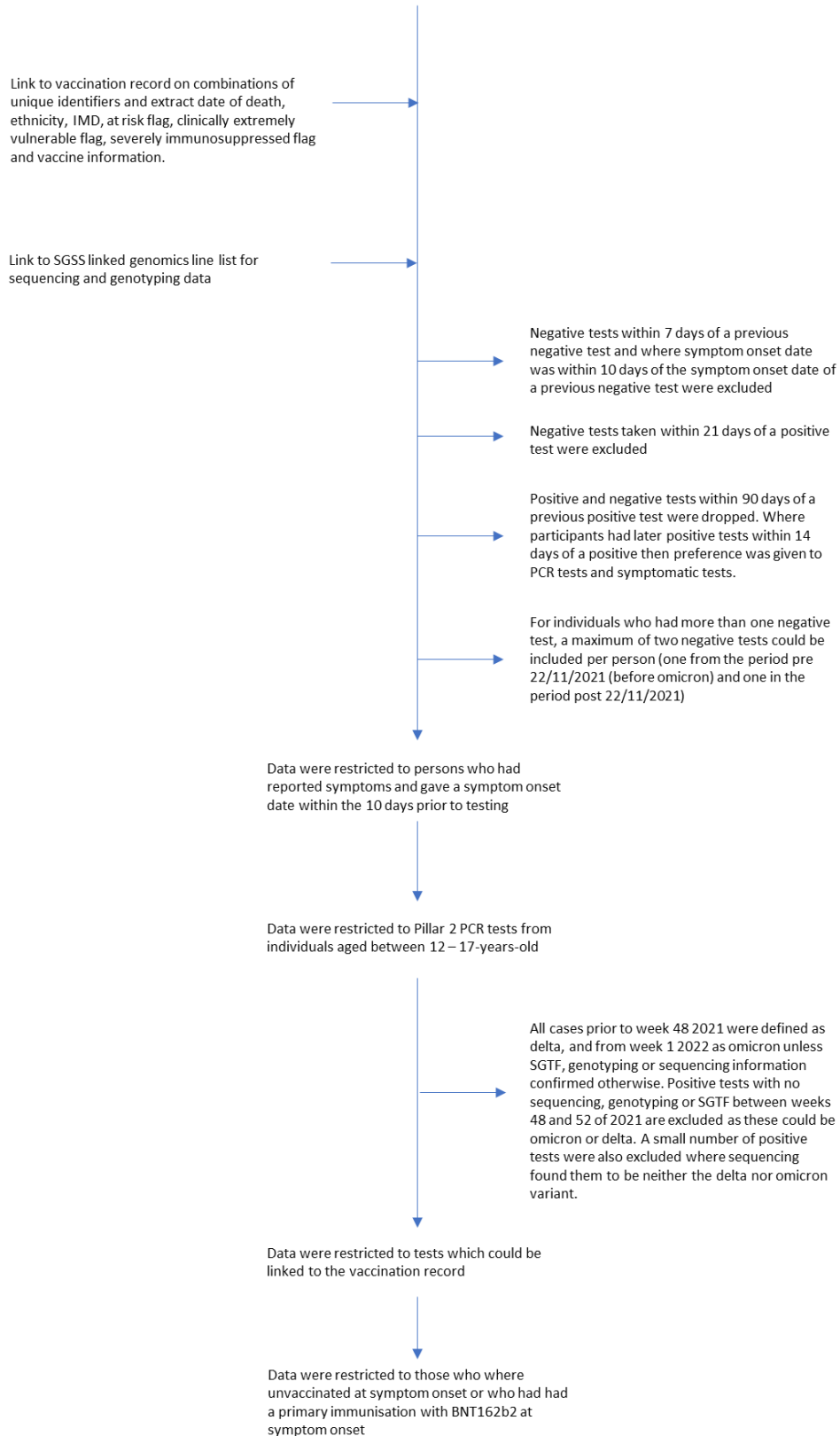
This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Powell AA, Kirsebom F, Stowe J, et al. Protection against symptomatic infection with delta (B.1.617.2) and omicron (B.1.1.529) BA.1 and BA.2 SARS-CoV-2 variants after previous infection and vaccination in adolescents in England, August, 2021–March, 2022: a national, observational, test-negative, case-control study. *Lancet Infect Dis* 2022; published online Nov 24. [https://doi.org/10.1016/S1473-3099\(22\)00729-0](https://doi.org/10.1016/S1473-3099(22)00729-0).

## Supplement Figure 1

### Methods flow chart

Testing data on all positive PCR and LFT tests (Pillar 1 and Pillar 2), and on negative Pillar 2 PCR tests from symptomatic individuals were extracted up to 31<sup>st</sup> March 2022 from 9<sup>th</sup> August 2021.



## **Supplement methods**

### ***Data sources and linkage***

PCR testing for SARS-CoV-2 in England is undertaken by hospital and public health laboratories (Pillar 1) as well as by community testing (Pillar 2). Pillar 2 testing was available to anyone with COVID-19 symptoms, contacts of positive cases, and persons with a positive rapid lateral-flow antigen test.

Sequencing of PCR-positive samples was undertaken through a network of laboratories and whole-genome sequencing was assigned to UKHSA definitions of variants on the basis of mutations. S target-status on PCR-testing can be used to identify novel variants which have been shown to be associated with S target negative results on PCR-testing, whereas non-novel variants almost always return a S target-positive result.

The National Immunisation Management System (NIMS) is used to record all COVID-19 vaccinations. It also contains demographic information on all persons residing in England who are registered with a GP also in England. Addresses were used to determine the index of multiple deprivation (a national indication of level of deprivation that is based on small geographic areas of residence, assessed in quintiles). Data on geographic region (NHS region) and clinical risk-group status were also extracted from the NIMS.

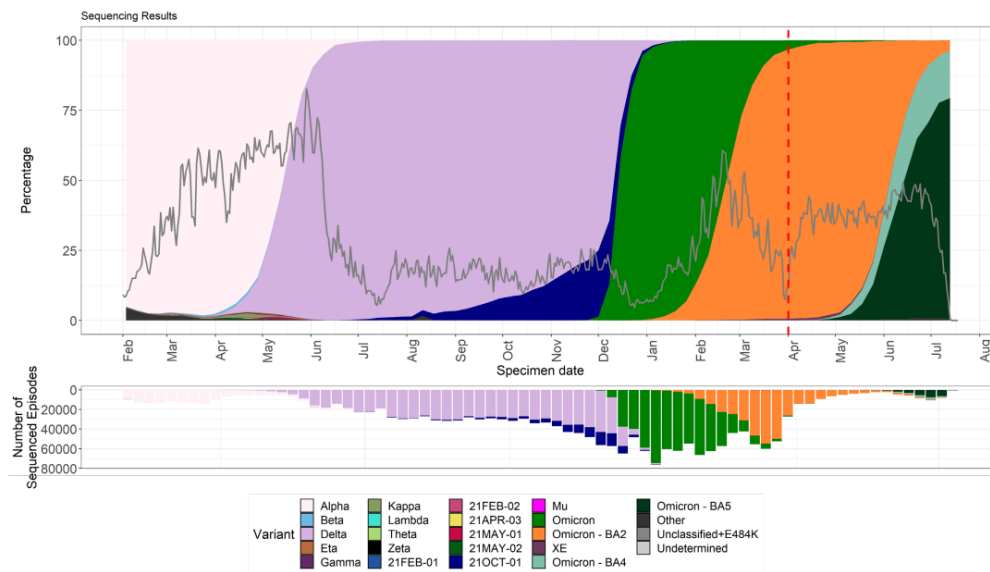
PCR-testing data were linked to NIMS on 31/05/2022 through combinations of the unique NHS number, date of birth, surname, first name and postal code using deterministic linkage. Tests were linked to the NIMS vaccine record based first on NHS number and DOB, then NHS number and postcode, and then NHS number and surname. Remaining unlinked tests were then linked on surname, firstname, postcode and date of birth, and then surname, postcode and date of birth to link tests where the NHS number was missing or incorrect in the testing data.

### ***Variant of previous infection positive predictive value***

Based on sequencing, the positive predictive value of the period assignment for variants was 92.4%, 92.0%, 98.7% and 97.1% for wild type, alpha, delta and omicron respectively. The true positive predictive value for wild type will be higher than this as sequencing was not regularly done early in the pandemic when it was circulating.

**Supplement Figure 2**

**SARS-CoV-2 variant prevalence of available sequenced episodes for England from 1 February 2021 as of 18 July 2022**



Graph taken from SARS-CoV-2 variants of concern and variants under investigation in England. Technical Briefing 44.<sup>1</sup>

Dashed lines indicate period incorporating issue at a sequencing site. The grey line indicates proportion of cases sequenced. The red dashed line denotes the start of England's 'Living with COVID' plan. Note recombinants, such as XD, are not specified but are largely within the 'other' group currently as the numbers are too small.

**Supplement table 1**

**Number of positive and negative PCR-confirmed SARS-CoV-2 test results in individuals tested for SARS-CoV-2 for 12-17-year-olds in England by vaccination status, interval after vaccination and previous infection status. Data is shown for the delta variant.**

Vaccination status	Time after vaccination	Previous infection (before vaccination)				Previous infection (after vaccination)
		None	Wild type	Alpha	Delta	Delta
		case:control	case:control	case:control	case:control	case:control
Unvaccinated		251730:305486	7522:1092	12000:1951	9567:717	9567:717
Dose 1 - Pfizer	0-1 week	21405:30497	626:67	938:135	1003:94	-
	2-14 weeks	104515:45155	3067:58	4677:200	7446:143	31:1
	15-24 weeks	3987:1505	155:1	231:5	281:1	131:1
	25-39 weeks	133:45	3:0	10:1	-	8:0
	40 weeks	9:1	-	-	-	1:0
Dose 2 - Pfizer	0-1 week	5380:1106	185:0	276:3	506:1	109:2
	2-14 weeks	14626:935	497:4	762:4	957:5	362:0
	15-24 weeks	4407:897	134:2	170:5	14:0	78:1
	25-39 weeks	1348:301	48:2	55:1	-	57:1
	40 weeks	15:1	-	-	-	1:0
Booster - Any mRNA vaccine	0-1 week	447:29	12:1	17:0	1:0	29:0
	2-14 weeks	674:9	23:0	21:0	-	36:0
	15-24 weeks	-	-	-	-	-

**Supplement table 2**

**Number of positive and negative PCR-confirmed SARS-CoV-2 test results in individuals tested for SARS-CoV-2 for 12-17-year-olds in England by vaccination status, interval after vaccination and previous infection status. Data is shown for the omicron variant.**

Vaccination status	Time after vaccination	Previous infection (before vaccination)					Previous infection (after vaccination)	
		None case:control	Wild type case:control	Alpha case:control	Delta case:control	Omicron case:control	Delta case:control	Omicron case:control
Unvaccinated		53358:70999	2100:2039	3582:3143	12108:10511	109:106	12108:10511	109:106
Dose 1 - Pfizer	0-1 week	3950:3160	160:51	234:62	1190:420	4:1	0:0	0:0
	2-14 weeks	63120:60277	2200:465	3567:912	12900:4807	12:6	68:56	3:4
	15-24 weeks	7485:10832	291:152	483:301	1007:691	0:0	483:330	82:27
	25-39 weeks	280:574	13:10	21:17	19:21	0:0	85:50	24:6
	40 weeks	17:28	1:1	1:2	0:0	0:0	3:3	0:0
Dose 2 - Pfizer	0-1 week	8267:6871	297:71	414:115	1425:490	3:0	305:88	30:3
	2-14 weeks	28899:22987	939:340	1603:559	4142:1589	1:0	1633:526	33:7
	15-24 weeks	2161:2772	74:65	128:93	90:56	0:1	136:99	21:2
	25-39 weeks	1129:1498	40:44	64:51	2:3	4:5	89:47	2:1
	40 weeks	56:100	1:1	1:3	0:0	1:0	5:7	6:1
Booster - Any mRNA vaccine	0-1 week	1000:1045	27:13	40:17	58:16	2:1	67:22	4:0
	2-14 weeks	2678:2384	80:41	104:52	71:36	7:3	216:53	9:2
	15-24 weeks	102:169	4:3	5:6	0:1	1:1	9:6	1:0

1. UK Health Security Agency. SARS-CoV-2 variants of concern and variants under investigation in England. Technical briefing 44. 2022. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1093275/covid-technical-briefing-44-22-july-2022.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1093275/covid-technical-briefing-44-22-july-2022.pdf) (accessed 17th August 2022).