Supplementary Appendix

Data Sources

COVID-19 Testing Data

In the final dataset, only Pillar 1 and 2 tests after 25 November 2020 were included, and Pillar 2 tests were only included up to 31 March 2022, when all community testing was stopped in England. Tests were linked back to all historic positive testing data to identify the date of the most recent positive test (excluding tests within 90 days) prior.

Testing data included all positive PCR and lateral flow tests (LFTs), and negative PCR tests. Any negative tests taken within 7 days of a previous negative test, and any negative tests where symptom onset date was within the 10 days or a previous symptoms onset date for a negative test were dropped as these likely represent the same episode. Negative tests taken within 21 days of a subsequent positive test were also excluded as chances are high that these are false negatives. Positive and negative tests within 90 days of a previous positive test were also excluded; however, where participants had later positive tests within 14 days of a positive then preference was given to PCR tests over LFTs, and tests from symptomatic individuals. To estimate VE against symptomatic disease in pregnant women, data were restricted to Pillar 2 tests from persons who had reported symptoms and gave a symptom onset date within the 10 days before testing to account for reduced PCR sensitivity beyond this period in an infection event. To estimate maternal VE against symptomatic disease in infants, Pillar 1 data were also included. Testing in days 0-5 of life was only in Pillar 1 and almost always negative – reflecting testing in hospital at birth. Only infants aged 6 days to 8 months at symptom onset or date of test were retained.

To compare VE in pregnant women with VE in their non-pregnant peers, Pillar 2 testing data were extracted for all women aged 20-44 years. Tests included in the analysis to estimate VE in pregnant women were excluded. A random proxy delivery date between 01 October 2021 and 31 December 2021 was generated for each non-pregnant woman and tests which were 3 months after the delivery date dropped to give this group a similar profile in terms of the period of the test to the pregnant women.

National Immunisation Management System (NIMS)

The National Immunisation Management System (NIMS) is a national vaccine register containing demographic information on the whole population of England registered with a GP. It is used to record all COVID-19 vaccinations. Testing data were linked to NIMS using combinations of the unique individual NHS number, date of birth, surname, first name, and postcode using deterministic linkage. NIMS was accessed for dates of vaccination and manufacturer, sex, date of birth, ethnicity, and residential address. Addresses were used to determine index of multiple deprivation quintile. Data on risk group status, clinically extremely vulnerable status, severely immunosuppressed and health/social care worker status were also extracted from the NIMS.

Booster doses were identified as a third dose given at least 84 days after a second dose and administered after 13 September 2021. Individuals with four or more doses of vaccine, heterologous primary schedule or fewer than 19 days between their first and second dose were excluded.

Only tests from women who could be linked to the NIMS and tests from infants whose mother could be linked to the NIMS were included. Tests from pregnant women who received anything other than a ChAdOx1-S, BNT162b2 or mRNA1273 primary course and other than a BNT162b2 or mRNA1273 booster dose were excluded. Infants were also excluded if the mother was given a vaccine other

than ChAdOx1-S, BNT162b2 or mRNA1273, if the infant had received a vaccine prior to onset date and if the week of birth was prior to 2 May 2021 as there was minimal maternal vaccination prior to this date, and only women at high risk of exposure or severe disease were vaccinated before mid-April 2021.

Hospital Admission Data

Hospital inpatient admissions for a range of acute respiratory illnesses were identified from the Secondary Uses Service (SUS) (2) (Supplementary Table 1) and were linked to the testing data in November 2022 using NHS number and date of birth. Admissions with an ICD-10 coded acute respiratory illness (ARI) discharge diagnosis (Supplementary Table 2) in any diagnosis field were identified where the sample was taken 1 day before and up to 2 days after the admission. Data were restricted to those with ARI in the first diagnosis field and where the length of stay was at least two days.

Identification of Delta and Omicron Variants and assignment to cases

Cases were defined as Delta or Omicron (BA.1 and BA.2) based on whole genome sequencing, genotyping, S-gene target failure (SGTF) status or period, with sequencing taking priority, followed by genotyping, SGTF status and period (Supplementary Table 1). Where subsequent positive tests within 14 days included sequencing, genotyping or S-gene target failure information, this information was used to classify the variant. The Delta analysis was restricted from 26 April 2021 to 9 January 2022. The Omicron analysis was restricted from 29 November 2021 onwards. Previously we have not found a difference in VE between BA.1 and BA.2 (24) so these were both included in the Omicron analyses.

Supplementary Table 1. Description of data sources used to estimate vaccine effectiveness. Women who were delivered in 2021 were identified from HES and infants born in 2021 were identified from MSDS. Cases (those testing positive) and controls (those testing negative) were identified in the testing data. Data were linked to the NIMS to ascertain vaccination status, to the genomics line list to ascertain variant information, and to the SUS hospitalisation records.

Data Source	Description	Variables
HES	Data on all women who delivered in 2021 in England were extracted from the HES.	Delivery date, gestational age of the infant, information on whether the infant was term or pre-term, the earliest and latest possible pregnancy start dates, last menstrual period date (LMPD).
MSDS	Data on infants born in 2021, and their mothers, were extracted from the MSDS.	NHS number of the infant and mother, LPMD, delivery date, gestational age of the infant, information on whether the infant was term or pre-term and the pregnancy start date.

Pillar 1 and 2 testing data	SARS-CoV-2 PCR testing in England is undertaken by hospital and public health laboratories (Pillar 1), as well as by community testing (Pillar 2). Pillar 1 testing data is available from UKHSA labs and NHS hospitals for those with a clinical need, and health and care workers. Pillar 2 community testing is available to anyone with symptoms consistent with COVID-19 (high temperature, new continuous cough, or loss or change in sense of smell or taste), anyone who is a contact of a confirmed case, care home staff and residents, and to those who have self-tested as positive using a lateral flow test (LFT). SGTF information to classify variant is available from some Pillar 2 tests.	Date of birth (age), period (week of test), S gene target failure (SGTF) status, previous positivity
NIMS vaccination record	The National Immunization Management System (NIMS) contains demographic information on the whole population of England who are registered with a general practice physician in England and is used to record all COVID-19 vaccinations.	Infant and maternal vaccination dates by manufacturer, index of multiple deprivation, ethnicity, geographic region, date of birth, health and social care worker status, clinical risk group status, clinically extremely vulnerable, severely immunosuppressed. Clinical risk groups included a range of chronic conditions as described in the Green Book (3), whereas the CEV group included persons who were considered to be at the highest risk for severe COVID-19, including those with immunosuppressed conditions and those with severe respiratory disease. The CEV flag is a record of vulnerable patients thought to be at high risk of complications from COVID-19. The severely immunosuppressed flag is also provided by NHS Digital and includes those with specific immunosuppression conditions. The severely immunosuppressed were offered additional doses as part of the primary vaccination schedule which the CEV were not.
Genomics data	Sequencing and genotyping is undertaken through a network of laboratories, including the Wellcome Sanger Institute. Whole-genome sequences are assigned to UKHSA definitions of variants based on mutations. Data were provided by the Genomics Cell at UKHSA.	Whole genome sequencing and genotyping data associated with Pillar 1 and 2 testing data.
Secondary Care Hospital Admission Data (SUS)	SUS is the national electronic database of hospital admissions that provides timely updates of ICD-10 codes for completed hospital stays for all NHS hospitals in England. Up to 24 ICD-10 diagnoses fields can be completed in SUS for each admission with the first diagnosis field indicating the primary reason for admission. Length of stay was calculated as date of discharge – date of admission. Where multiple admissions linked to the same sample date the first admission after the sample date was retained and episode length calculated by summing the stay length for each admission. Data were restricted to those with ARI in the first	Primary diagnosis code, length of stay, treatment with oxygen, mechanical ventilation or treatment on intensive care unit (ICU).

diagnosis field and where the length of stay was at least two days.

Supplementary Table 2. SUS Acute respiratory illness ICD10 code list.

SUS Acute respiratory illness ICD10 code list	
J04*	Acute laryngitis and tracheitis
J09*	Influenza due to identified avian influenza virus
J10*	Influenza with pneumonia, other influenza virus identified
J11*	Influenza with pneumonia, virus not identified
J12*	Viral pneumonia, not elsewhere classified
J13*	Pneumonia due to Streptococcus pneumoniae
J14*	Pneumonia due to Haemophilus influenzae
J15*	Bacterial pneumonia, not elsewhere classified
J16*	Pneumonia due to other infectious organisms, not elsewhere classified
J17*	Pneumonia in diseases classified elsewhere
J18*	Pneumonia, organism unspecified
J20*	Acute bronchitis
J21*	Acute bronchiolitis
J22*	Unspecified acute lower respiratory infection
J80*	ARDS (related to respiratory infection)
U071, U072	COVID-19, virus identified and not identified
U04*	Severe acute respiratory syndrome (SARS)

Supplementary Table 3. Descriptive characteristics of tests from symptomatic women who delivered in 2021 and for whom VE was estimated in Figure 1 and Supplementary Table 4.

			Delta period				Omicron period			
			Control		Case		Control		Case	
			n	%	n	%	n	%	n	%
	Test Result	**Interval**	**35,206**	**67.8%**	**16,693**	**32.2%**	**5,974**	**55.9%**	**4,715**	**44.1%**
Vaccination Status	Unvaccinated		17,010	**48.3%**	11,442	**68.5%**	1,290	**21.6%**	1,773	**37.6%**
	Dose 1	0-2 days	233	**0.7%**	140	**0.8%**	23	**0.4%**	22	**0.5%**
		3-8 days	637	**1.8%**	296	**1.8%**	60	**1.0%**	70	**1.5%**
		9-13 days	597	**1.7%**	212	**1.3%**	77	**1.3%**	46	**1.0%**
		2-4 weeks	2,538	**7.2%**	761	**4.6%**	256	**4.3%**	259	**5.5%**
		5-9 weeks	2,742	**7.8%**	1,162	**7.0%**	303	**5.1%**	271	**5.7%**
		10-14 weeks	319	**0.9%**	103	**0.6%**	34	**0.6%**	27	**0.6%**
		15-19 weeks	325	**0.9%**	92	**0.6%**	33	**0.6%**	17	**0.4%**
		20-24 weeks	277	**0.8%**	168	**1.0%**	17	**0.3%**	12	**0.3%**
		25+ weeks	770	**2.2%**	494	**3.0%**	190	**3.2%**	202	**4.3%**
	Dose 2	0-2 days	241	**0.7%**	103	**0.6%**	36	**0.6%**	21	**0.4%**
		3-8 days	388	**1.1%**	117	**0.7%**	50	**0.8%**	39	**0.8%**
		9-13 days	469	**1.3%**	52	**0.3%**	66	**1.1%**	32	**0.7%**
		2-4 weeks	1,332	**3.8%**	149	**0.9%**	165	**2.8%**	99	**2.1%**
		5-9 weeks	1,989	**5.6%**	305	**1.8%**	340	**5.7%**	150	**3.2%**
		10-14 weeks	1,724	**4.9%**	363	**2.2%**	421	**7.0%**	244	**5.2%**
		15-19 weeks	1,335	**3.8%**	334	**2.0%**	567	**9.5%**	217	**4.6%**
		20-24 weeks	737	**2.1%**	211	**1.3%**	323	**5.4%**	151	**3.2%**
		25+ weeks	544	**1.5%**	160	**1.0%**	245	**4.1%**	214	**4.5%**
	Dose 3	0-2 days	145	**0.4%**	9	**0.1%**	139	**2.3%**	65	**1.4%**
		3-8 days	211	**0.6%**	10	**0.1%**	201	**3.4%**	138	**2.9%**
		9-13 days	219	**0.6%**	1	**0.0%**	217	**3.6%**	94	**2.0%**
		2-4 weeks	243	**0.7%**	7	**0.0%**	410	**6.9%**	236	**5.0%**
		5-9 weeks	131	**0.4%**	2	**0.0%**	346	**5.8%**	189	**4.0%**
		10-14 weeks	50	**0.1%**	0	**0.0%**	113	**1.9%**	89	**1.9%**
		15+ weeks	0	**0.0%**	0	**0.0%**	52	**0.9%**	38	**0.8%**
Age	16-19		540	**1.5%**	408	**2.4%**	109	**1.8%**	107	**2.3%**
	20-24		3,347	**9.5%**	2,325	**13.9%**	530	**8.9%**	632	**13.4%**
	25-29		8,744	**24.8%**	4,822	**28.9%**	1,403	**23.5%**	1,423	**30.2%**
	30-34		13,495	**38.3%**	5,617	**33.6%**	2,349	**39.3%**	1,592	**33.8%**
	35-39		7,620	**21.6%**	2,851	**17.1%**	1,325	**22.2%**	775	**16.4%**
	40-44		1,413	**4.0%**	648	**3.9%**	249	**4.2%**	177	**3.8%**
	45-49		47	**0.1%**	21	**0.1%**	9	**0.2%**	9	**0.2%**
	50-54		0	**0.0%**	1	**0.0%**	0	**0.0%**	0	**0.0%**
Ethnicity	African		367	**1.0%**	199	**1.2%**	50	**0.8%**	68	**1.4%**
	Any other Asian background		655	**1.9%**	240	**1.4%**	114	**1.9%**	90	**1.9%**
	Any other Black background		139	**0.4%**	119	**0.7%**	17	**0.3%**	27	**0.6%**
	Any other White background		2,952	**8.4%**	1,549	**9.3%**	496	**8.3%**	590	**12.5%**

	Any other ethnic group	731	**2.1%**	354	**2.1%**	99	**1.7%**	113	**2.4%**
	Any other mixed background	239	**0.7%**	122	**0.7%**	52	**0.9%**	44	**0.9%**
	Bangladeshi or British Bangladeshi	371	**1.1%**	195	**1.2%**	41	**0.7%**	52	**1.1%**
	British, Mixed British	25,015	**71.1%**	11,887	**71.2%**	4,393	**73.5%**	3,143	**66.7%**
	Caribbean	114	**0.3%**	103	**0.6%**	17	**0.3%**	29	**0.6%**
	Chinese	203	**0.6%**	46	**0.3%**	38	**0.6%**	21	**0.4%**
	Indian or British Indian	1,280	**3.6%**	379	**2.3%**	196	**3.3%**	115	**2.4%**
	Irish	254	**0.7%**	71	**0.4%**	45	**0.8%**	28	**0.6%**
	Pakistani or British Pakistani	1,090	**3.1%**	603	**3.6%**	133	**2.2%**	128	**2.7%**
	White and Asian	128	**0.4%**	49	**0.3%**	19	**0.3%**	22	**0.5%**
	White and Black African	83	**0.2%**	35	**0.2%**	15	**0.3%**	20	**0.4%**
	White and Black Caribbean	188	**0.5%**	122	**0.7%**	28	**0.5%**	26	**0.6%**
	Missing	1,397	**4.0%**	620	**3.7%**	221	**3.7%**	199	**4.2%**
NHS Region	East of England	4,217	**12.0%**	1,672	**10.0%**	848	**14.2%**	515	**10.9%**
	London	4,755	**13.5%**	1,763	**10.6%**	864	**14.5%**	687	**14.6%**
	Midlands	6,270	**17.8%**	3,477	**20.8%**	970	**16.2%**	885	**18.8%**
	North East	5,515	**15.7%**	3,359	**20.1%**	821	**13.7%**	870	**18.5%**
	North West	4,632	**13.2%**	2,834	**17.0%**	692	**11.6%**	732	**15.5%**
	South East	5,781	**16.4%**	2,096	**12.6%**	1,078	**18.0%**	683	**14.5%**
	South West	4,036	**11.5%**	1,492	**8.9%**	701	**11.7%**	343	**7.3%**
	Missing	0	**0.0%**	0	**0.0%**	0	**0.0%**	0	**0.0%**
IMD Quintiles	1	6,481	**18.4%**	4,438	**26.6%**	895	**15.0%**	1,130	**24.0%**
	2	6,527	**18.5%**	3,583	**21.5%**	1,099	**18.4%**	972	**20.6%**
	3	7,048	**20.0%**	3,226	**19.3%**	1,266	**21.2%**	925	**19.6%**
	4	7,282	**20.7%**	2,894	**17.3%**	1,282	**21.5%**	881	**18.7%**
	5	7,630	**21.7%**	2,432	**14.6%**	1,389	**23.3%**	770	**16.3%**
	Missing	238	**0.7%**	120	**0.7%**	43	**0.7%**	37	**0.8%**
Vaccine priority groups	HSCW	3,685	**10.5%**	975	**5.8%**	5,310	**88.9%**	4,336	**92.0%**
	At risk	6,347	**18.0%**	2,932	**17.6%**	1,086	**18.2%**	838	**17.8%**
	Severely Immunosuppressed	90	**0.3%**	45	**0.3%**	19	**0.3%**	8	**0.2%**
	CEV	1,776	**5.0%**	713	**4.3%**	264	**4.4%**	186	**3.9%**
Variant of most recent previous infection	None	31,591	**89.7%**	16,371	**98.1%**	5,038	**84.3%**	4,204	**89.2%**
	Wild-type	1,332	**3.8%**	170	**1.0%**	242	**4.1%**	146	**3.1%**
	Alpha	1,876	**5.3%**	140	**0.8%**	356	**6.0%**	189	**4.0%**
	Delta	407	**1.2%**	12	**0.1%**	334	**5.6%**	176	**3.7%**
	Omicron	0	**0.0%**	0	**0.0%**	4	**0.1%**	0	**0.0%**

Supplementary Table 4. Vaccine effectiveness against symptomatic disease with Delta and Omicron in pregnant women. *Primary course manufacturer ChAdOx1-S, BNT162b2 or mRNA1273. **Booster manufacturer BNT162b2 or mRNA1273. These are the data behind the estimates shown in Figure 1.

Vaccination Status	Interval	Controls	Cases	OR*** (95% CI)	VE*** (95% CI)
			Delta		
Unvaccinated		17,010	11,442	Baseline	Baseline
Dose 1*	0-2 days	233	140	0.91 (0.73-1.15)	8.6 (-15.2 to 27.5)
	3-8 days	637	296	0.68 (0.58-0.79)	32.1 (21 to 41.7)
	9-13 days	597	212	0.50 (0.42-0.60)	49.8 (40.5 to 57.7)
	2-4 weeks	2,538	761	0.39 (0.36-0.43)	60.7 (57 to 64.1)
	5-9 weeks	2,742	1162	0.48 (0.45-0.52)	51.7 (47.8 to 55.3)
	10-14 weeks	319	103	0.49 (0.39-0.63)	50.6 (36.9 to 61.3)
	15-19 weeks	325	92	0.42 (0.32-0.54)	58.4 (46.5 to 67.7)
	20-24 weeks	277	168	0.69 (0.56-0.85)	30.7 (14.8 to 43.7)
	25+ weeks	770	494	0.79 (0.69-0.89)	21.2 (10.6 to 30.6)
Dose 2*	0-2 days	241	103	0.49 (0.39-0.63)	50.7 (37 to 61.4)
	3-8 days	388	117	0.34 (0.27-0.42)	66.4 (58.2 to 73)
	9-13 days	469	52	0.13 (0.09-0.17)	87.5 (83.2 to 90.7)
	2-4 weeks	1332	149	0.12 (0.10-0.14)	87.9 (85.5 to 89.8)
	5-9 weeks	1,989	305	0.19 (0.17-0.21)	81.2 (78.6 to 83.5)
	10-14 weeks	1724	363	0.25 (0.22-0.28)	75.0 (71.7 to 77.9)
	15-19 weeks	1335	334	0.31 (0.27-0.35)	69.4 (65 to 73.2)
	20-24 weeks	737	211	0.38 (0.32-0.45)	62.3 (55.5 to 68.1)
	25+ weeks	544	160	0.42 (0.35-0.51)	57.6 (48.6 to 65)
Dose 3**	0-2 days	145	9	0.17 (0.08-0.34)	83.1 (66.3 to 91.5)
	3-8 days	211	10	0.14 (0.07-0.27)	85.9 (73 to 92.7)
	9-13 days	219	1	0.02 (0-0.12)	98.4 (88.4 to 99.8)
	2-4 weeks	243	7	0.08 (0.04-0.17)	92.3 (83.3 to 96.4)
	5-9 weeks	131	2	0.03 (0.01-0.13)	96.7 (86.5 to 99.2)
	10-14 weeks	50	0	n too small	n too small
	15+ weeks	0	0	n too small	n too small
			Omicron		
Unvaccinated		1,290	1,773	Baseline	Baseline
Dose 1*	0-2 days	23	22	0.99 (0.49-2.01)	1.1 (-101.5 to 51.4)
	3-8 days	60	70	0.80 (0.53-1.20)	20.0 (-19.6 to 46.5)
	9-13 days	77	46	0.43 (0.28-0.66)	56.8 (34.1 to 71.7)
	2-4 weeks	256	259	0.65 (0.52-0.81)	35.0 (19.2 to 47.6)
	5-9 weeks	303	271	0.69 (0.55-0.85)	31.5 (15.2 to 44.6)
	10-14 weeks	34	27	0.59 (0.32-1.08)	41.0 (-8.1 to 67.8)
	15-19 weeks	33	17	0.56 (0.28-1.11)	43.8 (-10.9 to 71.5)
	20-24 weeks	17	12	0.44 (0.19-1.0)	56.3 (-0.2 to 80.9)
	25+ weeks	190	202	0.72 (0.56-0.93)	27.8 (7.4 to 43.6)
Dose 2*	0-2 days	36	21	0.45 (0.25-0.84)	54.6 (16.3 to 75.4)
	3-8 days	50	39	0.53 (0.33-0.85)	46.8 (14.7 to 66.9)
	9-13 days	66	32	0.34 (0.21-0.55)	65.8 (44.5 to 78.9)

	2-4 weeks	165	99	0.47 (0.35-0.63)	53.2 (36.9 to 65.3)
	5-9 weeks	340	150	0.40 (0.31-0.5)	60.3 (49.5 to 68.8)
	10-14 weeks	421	244	0.54 (0.44-0.67)	46.0 (33.3 to 56.2)
	15-19 weeks	567	217	0.58 (0.47-0.71)	42.4 (28.7 to 53.5)
	20-24 weeks	323	151	0.54 (0.42-0.69)	46.1 (30.9 to 58)
	25+ weeks	245	214	0.78 (0.61-0.99)	22.3 (0.9 to 39)
Dose 3**	0-2 days	139	65	0.44 (0.31-0.61)	56.4 (39 to 68.9)
	3-8 days	201	138	0.50 (0.39-0.65)	49.7 (34.9 to 61.2)
	9-13 days	217	94	0.20 (0.15-0.26)	80.1 (73.8 to 84.9)
	2-4 weeks	410	236	0.25 (0.21-0.31)	74.6 (69 to 79.2)
	5-9 weeks	346	189	0.30 (0.24-0.37)	70.2 (62.6 to 76.3)
	10-14 weeks	113	89	0.35 (0.25-0.48)	65.5 (52.1 to 75.1)
	15+ weeks	52	38	0.29 (0.18-0.47)	70.6 (52.7 to 81.8)

*Primary course manufacturer ChAdOx1-S, BNT162b2 or mRNA1273

**Booster manufacturer BNT162b2 or mRNA1273

*** Confounding variables were week of symptom onset, age (5-year bands), risk group status, region, IMD quintile, ethnicity and likely variant of most recent past infection.

Supplementary Table 5. Sensitivity analyses to investigate vaccine effectiveness against symptomatic disease for pregnant individuals; 1) only including tests from pregnancy start date up to the delivery date (Delta study period), 2) without adjusting for past infection (Delta study period) 3) without adjusting for past infection (Omicron study period) 4) excluding overlapping period with Alpha and Omicron (Delta study period), 5) excluding the overlapping period with Delta (Omicron study period). A sensitivity analysis was also conducted to investigate VE against symptomatic disease with Omicron amongst non-pregnant women aged 20 to 44 years.

Vaccination Status	Interval	Controls	Cases	OR (95% CI)	VE (95% CI)
Delta variant; including tests from trimester 1 to 3 only					
Unvaccinated		12,002	7,492	Baseline	Baseline
Dose 1*	0-2 days	96	43	0.78 (0.53-1.16)	21.9 (-15.9 to 47.4)
	3-8 days	273	105	0.61 (0.48-0.79)	38.6 (21.5 to 52.0)
	9-13 days	255	62	0.38 (0.29-0.52)	61.6 (48.2 to 71.5)
	2-4 weeks	1,056	288	0.39 (0.34-0.45)	60.6 (54.6 to 65.7)
	5-9 weeks	1,143	470	0.49 (0.43-0.55)	51.1 (45.0 to 56.6)
	10-14 weeks	222	50	0.41 (0.29-0.57)	59.4 (43.0 to 71.1)
	15-19 weeks	274	80	0.46 (0.35-0.60)	54.2 (39.8 to 65.2)
	20-24 weeks	256	157	0.72 (0.58-0.89)	28.5 (11.3 to 42.3)
	25+ weeks	597	416	0.81 (0.70-0.93)	19.5 (7.3 to 30.1)
Dose 2*	0-2 days	125	52	0.46 (0.33-0.64)	54.1 (35.6 to 67.2)
	3-8 days	190	66	0.39 (0.29-0.53)	60.7 (47.1 to 70.8)
	9-13 days	241	37	0.17 (0.12-0.24)	83.4 (76.3 to 88.4)
	2-4 weeks	796	108	0.15 (0.12-0.18)	85.1 (81.6 to 88.0)
	5-9 weeks	1,190	207	0.22 (0.19-0.26)	78.0 (74.2 to 81.2)
	10-14 weeks	851	223	0.30 (0.26-0.35)	70.0 (64.8 to 74.5)
	15-19 weeks	532	193	0.41 (0.34-0.49)	58.8 (50.6 to 65.6)
	20-24 weeks	366	138	0.45 (0.36-0.55)	55.4 (44.8 to 63.9)
	25+ weeks	320	103	0.43 (0.33-0.54)	57.4 (45.6 to 66.6)
Dose 3**	0-2 days	20	1	0.08 (0.01-0.59)	92.3 (40.5 to 99.0)
	3-8 days	21	4	0.29 (0.09-0.87)	71.5 (13.0 to 90.7)
	9-13 days	36	0	n too small	n too small
	2-4 weeks	62	3	0.06 (0.02-0.19)	94.0 (80.8 to 98.2)
	5-9 weeks	47	1	0.03 (0-0.21)	97.1 (78.8 to 99.6)
	10-14 weeks	1	0	n too small	n too small
	15+ weeks	0	0	n too small	n too small
Delta variant; without adjusting for past infection					
Unvaccinated		17,010	11,442	Baseline	Baseline
Dose 1*	0-2 days	233	140	0.92 (0.73-1.15)	8.4 (-14.9 to 27.0)
	3-8 days	637	296	0.70 (0.61-0.82)	29.6 (18.2 to 39.4)
	9-13 days	597	212	0.51 (0.43-0.60)	49.2 (39.9 to 57.1)
	2-4 weeks	2,538	761	0.40 (0.37-0.44)	59.6 (55.8 to 63.0)
	5-9 weeks	2,742	1162	0.50 (0.47-0.54)	49.6 (45.5 to 53.3)
	10-14 weeks	319	103	0.51 (0.40-0.66)	48.5 (34.4 to 59.6)
	15-19 weeks	325	92	0.44 (0.34-0.56)	56.2 (43.8 to 65.8)
	20-24 weeks	277	168	0.70 (0.57-0.86)	30.1 (14.4 to 43.0)

	25+ weeks	770	494	0.77 (0.68-0.87)	23.2 (13.1 to 32.1)
Dose 2*	0-2 days	241	103	0.52 (0.41-0.66)	47.8 (33.5 to 59.0)
	3-8 days	388	117	0.35 (0.28-0.43)	65.2 (56.8 to 72.0)
	9-13 days	469	52	0.13 (0.10-0.18)	86.9 (82.5 to 90.3)
	2-4 weeks	1332	149	0.13 (0.11-0.15)	87.3 (84.9 to 89.4)
	5-9 weeks	1,989	305	0.20 (0.17-0.22)	80.4 (77.7 to 82.8)
	10-14 weeks	1724	363	0.27 (0.24-0.30)	73.2 (69.7 to 76.3)
	15-19 weeks	1335	334	0.33 (0.29-0.37)	67.5 (62.9 to 71.5)
	20-24 weeks	737	211	0.41 (0.34-0.48)	59.4 (52.2 to 65.6)
	25+ weeks	544	160	0.45 (0.37-0.55)	54.6 (45.1 to 62.5)
Dose 3**	0-2 days	145	9	0.18 (0.09-0.36)	82.2 (64.5 to 91.1)
	3-8 days	211	10	0.15 (0.08-0.3)	84.5 (70.3 to 91.9)
	9-13 days	219	1	0.02 (0-0.13)	98.2 (87.2 to 99.8)
	2-4 weeks	243	7	0.08 (0.04-0.18)	91.7 (82.1 to 96.1)
	5-9 weeks	131	2	0.04 (0.01-0.15)	96.3 (84.9 to 99.1)
	10-14 weeks	50	0	n too small	n too small
	15+ weeks	0	0	n too small	n too small
Omicron variant; without adjusting for past infection					
Unvaccinated		1,290	1,773	Baseline	Baseline
Dose 1*	0-2 days	23	22	0.94 (0.46-1.91)	6.0 (-90.9 to 53.7)
	3-8 days	60	70	0.83 (0.56-1.24)	17.0 (-24.1 to 44.5)
	9-13 days	77	46	0.44 (0.29-0.66)	56.3 (33.6 to 71.3)
	2-4 weeks	256	259	0.69 (0.56-0.85)	31.0 (14.5 to 44.3)
	5-9 weeks	303	271	0.73 (0.59-0.90)	27.4 (10.3 to 41.2)
	10-14 weeks	34	27	0.65 (0.36-1.19)	34.9 (-18.8 to 64.3)
	15-19 weeks	33	17	0.56 (0.28-1.09)	44.4 (-8.9 to 71.6)
	20-24 weeks	17	12	0.42 (0.19-0.96)	57.5 (3.6 to 81.3)
	25+ weeks	190	202	0.72 (0.56-0.92)	27.9 (7.8 to 43.5)
Dose 2*	0-2 days	36	21	0.49 (0.26-0.90)	51.3 (10.4 to 73.5)
	3-8 days	50	39	0.55 (0.35-0.88)	44.7 (11.5 to 65.4)
	9-13 days	66	32	0.38 (0.23-0.61)	62.4 (39.1 to 76.8)
	2-4 weeks	165	99	0.50 (0.37-0.67)	50.4 (33.3 to 63.2)
	5-9 weeks	340	150	0.42 (0.33-0.54)	57.5 (46.1 to 66.5)
	10-14 weeks	421	244	0.58 (0.47-0.72)	41.7 (28.2 to 52.6)
	15-19 weeks	567	217	0.61 (0.50-0.76)	38.6 (24.1 to 50.3)
	20-24 weeks	323	151	0.58 (0.45-0.74)	42.0 (25.8 to 54.7)
	25+ weeks	245	214	0.81 (0.64-1.03)	18.9 (-3.2 to 36.2)
Dose 3**	0-2 days	139	65	0.47 (0.33-0.65)	53.4 (34.8 to 66.6)
	3-8 days	201	138	0.54 (0.42-0.70)	45.6 (29.7 to 57.9)
	9-13 days	217	94	0.22 (0.16-0.28)	78.4 (71.6 to 83.6)
	2-4 weeks	410	236	0.28 (0.23-0.34)	72.1 (66.0 to 77.1)
	5-9 weeks	346	189	0.32 (0.26-0.40)	68.0 (59.9 to 74.5)
	10-14 weeks	113	89	0.38 (0.27-0.52)	62.2 (47.8 to 72.7)
	15+ weeks	52	38	0.33 (0.21-0.53)	67.0 (47.0 to 79.4)
Delta variant; excluding periods where Alpha and Omicron were co-circulating					
Unvaccinated		9,786	10,056	Baseline	Baseline

Dose 1*	0-2 days	139	118	0.87 (0.67-1.12)	13.4 (-12.2 to 33.2)
	3-8 days	371	255	0.67 (0.57-0.80)	32.7 (20.3 to 43.1)
	9-13 days	351	195	0.55 (0.46-0.67)	44.6 (33.4 to 54.0)
	2-4 weeks	1,807	679	0.39 (0.35-0.43)	61.0 (57.1 to 64.6)
	5-9 weeks	2,250	1077	0.47 (0.43-0.51)	53.3 (49.3 to 57.0)
	10-14 weeks	168	80	0.44 (0.33-0.58)	56.0 (41.8 to 66.7)
	15-19 weeks	176	74	0.40 (0.30-0.53)	60.2 (47.2 to 70.1)
	20-24 weeks	215	156	0.69 (0.56-0.86)	30.9 (14.1 to 44.4)
	25+ weeks	619	442	0.76 (0.66-0.87)	24.0 (13.1 to 33.5)
Dose 2*	0-2 days	194	93	0.47 (0.36-0.60)	53.4 (39.7 to 63.9)
	3-8 days	321	113	0.34 (0.27-0.42)	66.3 (57.8 to 73.1)
	9-13 days	384	50	0.13 (0.09-0.17)	87.4 (83.0 to 90.7)
	2-4 weeks	1099	135	0.11 (0.09-0.14)	88.6 (86.2 to 90.5)
	5-9 weeks	1,579	280	0.19 (0.16-0.21)	81.2 (78.5 to 83.6)
	10-14 weeks	1293	327	0.25 (0.22-0.29)	74.9 (71.3 to 78.0)
	15-19 weeks	790	270	0.33 (0.28-0.38)	67.1 (61.7 to 71.7)
	20-24 weeks	430	159	0.38 (0.31-0.46)	62.0 (53.8 to 68.6)
	25+ weeks	343	115	0.39 (0.31-0.48)	61.4 (51.5 to 69.2)
Dose 3**	0-2 days	14	1	0.09 (0.01-0.7)	91.1 (30.1 to 98.9)
	3-8 days	20	4	0.24 (0.08-0.72)	76.3 (28.4 to 92.2)
	9-13 days	33	0	n too small	n too small
	2-4 weeks	55	3	0.06 (0.02-0.19)	94.2 (81.4 to 98.2)
	5-9 weeks	30	0	n too small	n too small
	10-14 weeks	0	0	n too small	n too small
	15+ weeks	0	0	n too small	n too small
Omicron variant; excluding period where Delta was co-circulating					
Unvaccinated		249	669	Baseline	Baseline
Dose 1*	0-2 days	1	4	n too small	n too small
	3-8 days	9	20	0.67 (0.29-1.55)	32.7 (-54.9 to 70.7)
	9-13 days	16	15	0.32 (0.15-0.69)	68.3 (31.3 to 85.4)
	2-4 weeks	42	73	0.61 (0.40-0.93)	39.3 (6.9 to 60.4)
	5-9 weeks	62	103	0.63 (0.44-0.91)	36.8 (8.7 to 56.3)
	10-14 weeks	8	8	0.34 (0.12-0.96)	65.9 (4.2 to 87.9)
	15-19 weeks	2	4	n too small	n too small
	20-24 weeks	3	4	n too small	n too small
	25+ weeks	40	87	0.81 (0.53-1.23)	19.5 (-23.1 to 47.3)
Dose 2*	0-2 days	2	5	n too small	n too small
	3-8 days	11	13	0.40 (0.17-0.94)	59.9 (5.7 to 82.9)
	9-13 days	12	9	0.2 (0.08-0.51)	79.7 (48.7 to 91.9)
	2-4 weeks	28	24	0.35 (0.19-0.63)	65.0 (37.2 to 80.5)
	5-9 weeks	54	47	0.31 (0.20-0.48)	68.8 (51.6 to 79.8)
	10-14 weeks	47	53	0.39 (0.25-0.61)	60.5 (38.6 to 74.6)
	15-19 weeks	36	51	0.50 (0.31-0.80)	50.3 (20.4 to 69.0)
	20-24 weeks	27	40	0.55 (0.32-0.95)	44.7 (5.2 to 67.7)
	25+ weeks	44	97	0.83 (0.55-1.25)	17.0 (-25.1 to 44.9)
Dose 3**	0-2 days	8	11	0.5 (0.2-1.3)	49.6 (-30.2 to 80.5)

	3-8 days	10	22	0.77 (0.34-1.75)	22.8 (-74.5 to 65.9)
	9-13 days	31	18	0.20 (0.11-0.38)	79.8 (62.1 to 89.3)
	2-4 weeks	222	136	0.21 (0.16-0.28)	79.0 (72.0 to 84.3)
	5-9 weeks	245	154	0.23 (0.17-0.31)	77.0 (69.4 to 82.6)
	10-14 weeks	63	59	0.29 (0.19-0.44)	71.4 (55.7 to 81.5)
	15+ weeks	52	38	0.25 (0.15-0.42)	74.9 (58.2 to 84.9)
Omicron variant; VE for non-pregnant women aged 20-44					
Unvaccinated		55,801	86,284	Baseline	Baseline
Dose 1*	0-2 days	409	526	0.89 (0.77-1.03)	10.5 (-3.5 to 22.7)
	3-8 days	947	1107	0.69 (0.63-0.76)	30.7 (23.7 to 37.1)
	9-13 days	837	757	0.53 (0.47-0.59)	47.1 (41.0 to 52.6)
	2-4 weeks	3,368	2994	0.49 (0.47-0.52)	50.6 (47.7 to 53.2)
	5-9 weeks	4,424	4184	0.58 (0.55-0.61)	42.4 (39.5 to 45.1)
	10-14 weeks	2028	1754	0.61 (0.56-0.66)	39.1 (34.4 to 43.5)
	15-19 weeks	1922	1786	0.77 (0.71-0.83)	22.8 (16.6 to 28.5)
	20-24 weeks	3009	2527	0.76 (0.71-0.81)	24.2 (19.2 to 28.9)
	25+ weeks	8146	9499	0.73 (0.70-0.76)	27.1 (24.4 to 29.6)
Dose 2*	0-2 days	655	500	0.56 (0.49-0.64)	44.2 (36.5 to 51.1)
	3-8 days	1115	802	0.49 (0.45-0.55)	50.6 (45.3 to 55.4)
	9-13 days	1559	750	0.32 (0.29-0.35)	68.4 (65.2 to 71.3)
	2-4 weeks	5986	3481	0.37 (0.35-0.39)	62.8 (61.0 to 64.6)
	5-9 weeks	12,789	8996	0.52 (0.51-0.54)	47.8 (46.0 to 49.5)
	10-14 weeks	34413	19481	0.66 (0.64-0.67)	34.3 (32.7 to 35.9)
	15-19 weeks	85914	58671	0.78 (0.76-0.79)	22.5 (21.1 to 23.9)
	20-24 weeks	63707	55804	0.82 (0.81-0.84)	17.7 (16.1 to 19.2)
	25+ weeks	82889	91793	0.93 (0.92-0.95)	6.9 (5.3 to 8.4)
Dose 3**	0-2 days	16638	13704	0.68 (0.66-0.70)	32.3 (30.3 to 34.1)
	3-8 days	25600	22181	0.56 (0.55-0.58)	43.8 (42.5 to 45.1)
	9-13 days	30885	19407	0.31 (0.31-0.32)	68.6 (67.9 to 69.3)
	2-4 weeks	80402	59200	0.33 (0.32-0.33)	67.2 (66.7 to 67.8)
	5-9 weeks	83580	61120	0.40 (0.40-0.41)	59.6 (58.9 to 60.3)
	10-14 weeks	33171	38032	0.52 (0.51-0.54)	47.6 (46.4 to 48.7)
	15+ weeks	8511	12813	0.66 (0.64-0.68)	33.8 (31.5 to 36.0)

*Primary course manufacturer ChAdOx1-S, BNT162b2 or mRNA1273

**Booster manufacturer BNT162b2 or mRNA1273

Supplementary Table 6. Descriptive characteristics of tests from hospitalised women who delivered in 2021 and for whom VE was estimated.

			Delta			
			Control		Case	
			n	%	n	%
	Test Result	**Interval (weeks)**	**86**	**6.4%**	**1,249**	**93.6%**
Vaccination Status	Unvaccinated		55	**64.0%**	1,109	**88.8%**
	Dose 1	0-4	4	**4.7%**	32	**2.6%**
		5-19	8	**9.3%**	26	**2.1%**
		20+	2	**2.3%**	30	**2.4%**
	Dose 2	0-4	4	**4.7%**	4	**0.3%**
		5-19	12	**14.0%**	34	**2.7%**
		20+	1	**1.2%**	14	**1.1%**
Age	16-19		2	**2.3%**	23	**1.8%**
	20-24		12	**14.0%**	139	**11.1%**
	25-29		16	**18.6%**	351	**28.1%**
	30-34		41	**47.7%**	386	**30.9%**
	35-39		13	**15.1%**	275	**22.0%**
	40-44		2	**2.3%**	67	**5.4%**
	45-49		0	**0.0%**	4	**0.3%**
	50-54		0	**0.0%**	4	**0.3%**
Ethnicity	African		2	**2.3%**	51	**4.1%**
	Any other Asian background		1	**1.2%**	35	**2.8%**
	Any other Black background		0	**0.0%**	22	**1.8%**
	Any other White background		7	**8.1%**	154	**12.3%**
	Any other ethnic group		2	**2.3%**	63	**5.0%**
	Any other mixed background		0	**0.0%**	9	**0.7%**
	Bangladeshi or British Bangladeshi		2	**2.3%**	32	**2.6%**
	British, Mixed British		56	**65.1%**	650	**52.0%**
	Caribbean		0	**0.0%**	26	**2.1%**
	Chinese		0	**0.0%**	11	**0.9%**
	Indian or British Indian		6	**7.0%**	27	**2.2%**
	Irish		0	**0.0%**	6	**0.5%**
	Pakistani or British Pakistani		7	**8.1%**	95	**7.6%**
	White and Asian		0	**0.0%**	11	**0.9%**
	White and Black African		0	**0.0%**	4	**0.3%**
	White and Black Caribbean		1	**1.2%**	12	**1.0%**
	Missing		2	**2.3%**	41	**3.3%**
NHS Region	East of England		11	**12.8%**	138	**11.0%**
	London		9	**10.5%**	233	**18.7%**
	Midlands		18	**20.9%**	355	**28.4%**
	North East		18	**20.9%**	177	**14.2%**
	North West		13	**15.1%**	176	**14.1%**
	South East		12	**14.0%**	107	**8.6%**

	South West	5	**5.8%**	63	**5.0%**
	Missing	0	**0.0%**	0	**0.0%**
IMD Quintiles	1	17	**19.8%**	422	**33.8%**
	2	23	**26.7%**	284	**22.7%**
	3	17	**19.8%**	221	**17.7%**
	4	19	**22.1%**	168	**13.5%**
	5	10	**11.6%**	149	**11.9%**
	Missing	0	**0.0%**	5	**0.4%**
Vaccine priority groups	HSCW	10	**11.6%**	56	**4.5%**
	At risk	32	**37.2%**	299	**23.9%**
	Severely Immunosuppressed	0	**0.0%**	2	**0.2%**
	CEV	6	**7.0%**	65	**5.2%**
Variant of most recent previous infection	None	78	**90.7%**	1,238	**99.1%**
	Wild-type	1	**1.2%**	4	**0.3%**
	Alpha	5	**5.8%**	5	**0.4%**
	Delta	2	**2.3%**	2	**0.2%**
	Omicron	0	**0.0%**	0	**0.0%**

Supplementary Table 7. Descriptive characteristics of tests from symptomatic infants for whom VE was estimated in Figures 2-3.

		Delta period				Omicron period			
	Test Result	Control (Negative)		Case (Positive)		Control (Negative)		Case (Positive)	
		n	%	n	%	n	%	n	%
		23,053	**88.7%**	**2,924**	**11.3%**	**13,908**	**71.0%**	**5,669**	**29.0%**
Pillar	1	15,525	**67.3%**	1,060	**36.3%**	7,007	**50.4%**	1,672	**29.5%**
	2	7,528	**32.7%**	1,864	**63.7%**	6,901	**49.6%**	3,997	**70.5%**
Gender of infant	Female	10,108	**43.8%**	1,344	**46.0%**	6,062	**43.6%**	2,614	**46.1%**
	Male	12,847	**55.7%**	1,578	**54.0%**	7,815	**56.2%**	3,052	**53.8%**
	Unknown	98	**0.4%**	2	**0.1%**	31	**0.2%**	3	**0.1%**
Premature	No	21,121	**91.6%**	2,740	**93.7%**	12,810	**92.1%**	5,280	**93.1%**
	Gestational age <37 weeks	1,518	**6.6%**	163	**5.6%**	782	**5.6%**	306	**5.4%**
	Gestational age <33 weeks	414	**1.8%**	21	**0.7%**	316	**2.3%**	83	**1.5%**
Age of infant (months)	0	4,481	**19.4%**	402	**13.7%**	914	**6.6%**	156	**2.8%**
	1	5,881	**25.5%**	784	**26.8%**	1,823	**13.1%**	577	**10.2%**
	2	3,749	**16.3%**	577	**19.7%**	1,648	**11.8%**	691	**12.2%**
	3	2,857	**12.4%**	414	**14.2%**	1,666	**12.0%**	684	**12.1%**
	4	2,314	**10.0%**	347	**11.9%**	1,670	**12.0%**	757	**13.4%**
	5	1,840	**8.0%**	237	**8.1%**	1,840	**13.2%**	856	**15.1%**
	6	1,357	**5.9%**	137	**4.7%**	1,949	**14.0%**	810	**14.3%**
	7	564	**2.4%**	26	**0.9%**	1,468	**10.6%**	731	**12.9%**
	8	10	**0.0%**	0	**0.0%**	930	**6.7%**	407	**7.2%**
Ethnicity	African	406	**1.8%**	42	**1.4%**	202	**1.5%**	93	**1.6%**
	Any other Asian background	412	**1.8%**	51	**1.7%**	274	**2.0%**	113	**2.0%**
	Any other Black background	151	**0.7%**	18	**0.6%**	86	**0.6%**	32	**0.6%**
	Any other White background	1,441	**6.3%**	219	**7.5%**	909	**6.5%**	608	**10.7%**
	Any other ethnic group	490	**2.1%**	71	**2.4%**	296	**2.1%**	129	**2.3%**
	Any other mixed background	461	**2.0%**	47	**1.6%**	268	**1.9%**	125	**2.2%**

	Bangladeshi or British Bangladeshi			231	**1.0%**	37	**1.3%**	116	**0.8%**	40	**0.7%**
	British, Mixed British			12,643	**54.8%**	1,500	**51.3%**	8,218	**59.1%**	2,966	**52.3%**
	Caribbean			62	**0.3%**	13	**0.4%**	35	**0.3%**	24	**0.4%**
	Chinese			64	**0.3%**	1	**0.0%**	32	**0.2%**	19	**0.3%**
	Indian or British Indian			537	**2.3%**	51	**1.7%**	323	**2.3%**	180	**3.2%**
	Irish			75	**0.3%**	11	**0.4%**	51	**0.4%**	15	**0.3%**
	Pakistani or British Pakistani			664	**2.9%**	71	**2.4%**	399	**2.9%**	186	**3.3%**
	White and Asian			213	**0.9%**	26	**0.9%**	161	**1.2%**	63	**1.1%**
	White and Black African			144	**0.6%**	11	**0.4%**	98	**0.7%**	46	**0.8%**
	White and Black Caribbean			215	**0.9%**	37	**1.3%**	133	**1.0%**	63	**1.1%**
	Missing			4,844	**21.0%**	718	**24.6%**	2,307	**16.6%**	967	**17.1%**
IMD Quintiles	1			5,562	**24.1%**	818	**28.0%**	3,112	**22.4%**	1,388	**24.5%**
	2			4,437	**19.2%**	585	**20.0%**	2,670	**19.2%**	1,127	**19.9%**
	3			4,319	**18.7%**	575	**19.7%**	2,647	**19.0%**	1,087	**19.2%**
	4			4,258	**18.5%**	497	**17.0%**	2,672	**19.2%**	1,068	**18.8%**
	5			4,247	**18.4%**	413	**14.1%**	2,671	**19.2%**	945	**16.7%**
	Missing			230	**1.0%**	36	**1.2%**	136	**1.0%**	54	**1.0%**
Age of mother (years)	15-24			3,510	**15.2%**	509	**17.4%**	1,933	**13.9%**	898	**15.8%**
	25-29			6,308	**27.4%**	758	**25.9%**	3,579	**25.7%**	1,488	**26.2%**
	30-34			7,965	**34.6%**	963	**32.9%**	4,953	**35.6%**	1,934	**34.1%**
	35+			5,270	**22.9%**	694	**23.7%**	3,443	**24.8%**	1,349	**23.8%**
Mother's vaccination status; no. of doses in pregnancy and no. of doses post pregnancy	Unvaccinated	0	0	10,452	**45.3%**	1,648	**56.4%**	3,898	**28.0%**	1,780	**31.4%**
	Unvaccinated	0	1	3,772	**16.4%**	572	**19.6%**	1,367	**9.8%**	652	**11.5%**
	Unvaccinated	0	2	3,842	**16.7%**	444	**15.2%**	4,028	**29.0%**	1,736	**30.6%**
	Pre-pregnancy	1	0	62	**0.3%**	3	**0.1%**	95	**0.7%**	39	**0.7%**
	Pre-pregnancy	1	1	12	**0.1%**	0	**0.0%**	48	**0.3%**	21	**0.4%**
	Pre-pregnancy	2	0	10	**0.0%**	0	**0.0%**	21	**0.2%**	6	**0.1%**
	Trimester 1	1	0	144	**0.6%**	15	**0.5%**	122	**0.9%**	48	**0.8%**
	Trimester 1	1	1	38	**0.2%**	2	**0.1%**	85	**0.6%**	39	**0.7%**

	Trimester 1	2	0	70	**0.3%**	3	**0.1%**	105	**0.8%**	40	**0.7%**
	Trimester 1	2	1	19	**0.1%**	2	**0.1%**	99	**0.7%**	37	**0.7%**
	Trimester 2	1	0	69	**0.3%**	9	**0.3%**	53	**0.4%**	13	**0.2%**
	Trimester 2	1	1	81	**0.4%**	4	**0.1%**	58	**0.4%**	21	**0.4%**
	Trimester 2	2	0	617	**2.7%**	31	**1.1%**	499	**3.6%**	81	**1.4%**
	Trimester 2	2	1	108	**0.5%**	0	**0.0%**	538	**3.9%**	219	**3.9%**
	Trimester 3	1	0	525	**2.3%**	42	**1.4%**	123	**0.9%**	29	**0.5%**
	Trimester 3	1	1	1,272	**5.5%**	92	**3.1%**	713	**5.1%**	234	**4.1%**
	Trimester 3	1	2	42	**0.2%**	0	**0.0%**	398	**2.9%**	179	**3.2%**
	Trimester 3	2	0	1,750	**7.6%**	52	**1.8%**	878	**6.3%**	169	**3.0%**
	Trimester 3	2	1	113	**0.5%**	5	**0.2%**	640	**4.6%**	309	**5.5%**
	Trimester 3	3	0	55	**0.2%**	0	**0.0%**	140	**1.0%**	17	**0.3%**
Risk Status of mother	None			17,879	**77.6%**	2,276	**77.8%**	10,818	**77.8%**	4,428	**78.1%**
	At risk/CEV/Severely immunosuppressed			5,174	**22.4%**	648	**22.2%**	3,090	**22.2%**	1,241	**21.9%**
Variant of most recent previous infection pre-birth in mother	None			20,236	**87.8%**	2,833	**96.9%**	11,951	**85.9%**	5,064	**89.3%**
	Wild-type			753	**3.3%**	39	**1.3%**	470	**3.4%**	169	**3.0%**
	Alpha			1,457	**6.3%**	44	**1.5%**	812	**5.8%**	254	**4.5%**
	Delta			607	**2.6%**	8	**0.3%**	672	**4.8%**	182	**3.2%**
	Omicron			0	**0.0%**	0	**0.0%**	3	**0.0%**	0	**0.0%**
Infection in the mother prior to infant infection	None			21,870	**94.9%**	1,999	**68.4%**	12,562	**90.3%**	4,610	**81.3%**
	More than 4 weeks prior			678	**2.9%**	22	**0.8%**	953	**6.9%**	175	**3.1%**
	Less than 4 weeks prior			505	**2.2%**	903	**30.9%**	393	**2.8%**	884	**15.6%**

Supplementary Table 8. Maternal vaccine effectiveness against symptomatic disease with Delta and Omicron in infants in England. These are the data behind the estimates shown in Figure 2 and Figure 3.

Infant age (months)	Maternal Vaccination Status	Doses in pregnancy	Doses post pregnancy	Delta			Omicron		
				Cases	Controls	VE (95% CI)	Cases	Controls	VE (95% CI)
0-5	None	0	0	1,609	10,065	Baseline	1,383	3,058	Baseline
	None	0	1	554	3,633	34.5 (26.2 to 41.9)	506	1,047	4.2 (-10.8 to 17.2)
	None	0	2	343	2,569	51.2 (42.6 to 58.4)	604	1,446	25.8 (13.6 to 36.2)
	Pre-pregnancy	1	0	3	62	n too imprecise	39	93	-4.4 (-58.6 to 31.3)
	Pre-pregnancy	1	1	0	12	n too small	21	48	30.1 (-20.9 to 59.6)
	Pre-pregnancy	2	0	0	10	n too small	6	21	43.1 (-55.3 to 79.1)
	Trimester 1	1	0	15	144	9.0 (-61.9 to 48.9)	48	121	-5.0 (-53.8 to 28.3)
	Trimester 1	1	1	2	37	n too imprecise	39	83	37.6 (5.7 to 58.6)
	Trimester 1	2	0	3	70	65.3 (-15.7 to 89.6)	40	105	3.9 (-44.4 to 36.0)
	Trimester 1	2	1	2	19	n too imprecise	37	98	44.0 (15.1 to 63.1)
	Trimester 2	1	0	9	68	-8.0 (-128.8 to 49.0)	13	52	42.5 (-11.2 to 70.3)
	Trimester 2	1	1	3	80	74.7 (16.6 to 92.3)	18	53	29.6 (-28.3 to 61.4)
	Trimester 2	2	0	31	617	66.7 (50.9 to 77.4)	81	499	56.8 (43.4 to 67.0)
	Trimester 2	2	1	0	105	n too small	203	511	58.0 (48.6 to 65.7)
	Trimester 3	1	0	42	525	51.5 (31.9 to 65.4)	28	119	35.8 (-2.0 to 59.6)
	Trimester 3	1	1	90	1,203	70.7 (62.8 to 76.9)	193	611	30.5 (14.6 to 43.5)
	Trimester 3	1	2	0	23	n too small	58	108	52.9 (32.5 to 67.1)
	Trimester 3	2	0	51	1,743	86.5 (81.9 to 90.0)	163	867	56.6 (46.7 to 64.6)
	Trimester 3	2	1	4	82	65.4 (0.6 to 87.9)	224	481	56.2 (46.4 to 64.2)
	Trimester 3	3	0	0	55	n too small	17	140	84.0 (72.7 to 90.6)
0-2	None	0	0	1,220	7,858	Baseline	708	1,693	Baseline
	None	0	1	357	2,408	37.7 (27.7 to 46.4)	183	402	13.6 (-9.1 to 31.6)

	None	0	2	19	140	53.9 (22.1 to 72.7)	17	29	25.9 (-52.4 to 64.0)
	Pre-pregnancy	1	0	3	61	n too imprecise	34	84	1.8 (-56.2 to 38.2)
	Pre-pregnancy	1	1	0	12	n too small	14	35	41.1 (-15.2 to 69.9)
	Pre-pregnancy	2	0	0	10	n too small	5	18	n too imprecise
	Trimester 1	1	0	15	132	4.1 (-72.3 to 46.6)	40	100	-12.2 (-73.1 to 27.2)
	Trimester 1	1	1	0	32	n too small	18	44	56.4 (20.6 to 76.0)
	Trimester 1	2	0	3	69	63.7 (-22.4 to 89.2)	35	96	9.3 (-41.6 to 41.9)
	Trimester 1	2	1	2	19	n too imprecise	25	68	47.6 (12.4 to 68.6)
	Trimester 2	1	0	8	58	-18.3 (-169.3 to 48.0)	10	37	26.8 (-59.3 to 66.4)
	Trimester 2	1	1	1	47	83.4 (-27.1 to 97.8)	8	22	14.3 (-115.5 to 65.9)
	Trimester 2	2	0	27	589	70.1 (54.5 to 80.4)	65	448	63.0 (49.5 to 72.9)
	Trimester 2	2	1	0	67	n too small	76	288	72.3 (62.3 to 79.6)
	Trimester 3	1	0	42	511	51.5 (31.7 to 65.5)	18	96	46.7 (5.8 to 69.8)
	Trimester 3	1	1	32	593	75.4 (64.0 to 83.2)	43	149	43.6 (15.7 to 62.3)
	Trimester 3	1	2	0	0	n too small	0	0	n too small
	Trimester 3	2	0	34	1,430	89.0 (84.3 to 92.4)	89	573	63.5 (51.8 to 72.4)
	Trimester 3	2	1	0	20	n too small	24	81	74.9 (58.4 to 84.8)
	Trimester 3	3	0	0	55	n too small	12	122	87.4 (76.3 to 93.3)
3-5	None	0	0	389	2,207	Baseline	675	1,365	Baseline
	None	0	1	197	1,225	26.5 (9.9 to 40.1)	323	645	-3.7 (-25.2 to 14.1)
	None	0	2	324	2,429	48.4 (37.7 to 57.2)	587	1,417	17.6 (2.8 to 30.2)
	Pre-pregnancy	1	0	0	1	n too small	5	9	-18.3 (-262.4 to 61.4)
	Pre-pregnancy	1	1	0	0	n too small	7	13	8.6 (-143.7 to 65.7)
	Pre-pregnancy	2	0	0	0	n too small	1	3	n too imprecise
	Trimester 1	1	0	0	12	n too small	8	21	37.8 (-50.0 to 74.2)
	Trimester 1	1	1	2	5	n too imprecise	21	39	16.4 (-49.0 to 53.1)
	Trimester 1	2	0	0	1	n too small	5	9	7.1 (-200.7 to 71.3)
	Trimester 1	2	1	0	0	n too small	12	30	45.4 (-13.2 to 73.7)
	Trimester 2	1	0	1	10	n too imprecise	3	15	68.0 (-17.1 to 91.3)

	Trimester 2	1	1	2	33	71.9 (-25.5 to 93.7)	10	31	35.6 (-42.1 to 70.8)
	Trimester 2	2	0	4	28	27.9 (-122.4 to 76.6)	16	51	34.8 (-21.4 to 64.9)
	Trimester 2	2	1	0	38	n too small	127	223	42.7 (24.3 to 56.6)
	Trimester 3	1	0	0	14	n too small	10	23	7.7 (-114.3 to 60.3)
	Trimester 3	1	1	58	610	65.5 (52.6 to 74.9)	150	462	20.9 (-1.1 to 38.1)
	Trimester 3	1	2	0	23	n too small	58	108	44.1 (19.3 to 61.3)
	Trimester 3	2	0	17	313	77.6 (62.0 to 86.8)	74	294	47.7 (28.7 to 61.6)
	Trimester 3	2	1	4	62	60.1 (-16.9 to 86.4)	200	400	44.9 (30.7 to 56.3)
	Trimester 3	3	0	0	0	n too small	5	18	75.5 (30.2 to 91.4)
6-8	None	0	0	-	-	-	397	840	Baseline
	None	0	1	-	-	-	146	320	6.6 (-20.6 to 27.7)
	None	0	2	-	-	-	1,132	2,582	9.9 (-6.0 to 23.5)
	Pre-pregnancy	1	0	-	-	-	0	2	n too small
	Pre-pregnancy	1	1	-	-	-	0	0	n too small
	Pre-pregnancy	2	0	-	-	-	0	0	n too small
	Trimester 1	1	0	-	-	-	0	1	n too small
	Trimester 1	1	1	-	-	-	0	2	n too small
	Trimester 1	2	0	-	-	-	0	0	n too small
	Trimester 1	2	1	-	-	-	0	1	n too small
	Trimester 2	1	0	-	-	-	0	1	n too small
	Trimester 2	1	1	-	-	-	3	5	n too imprecise
	Trimester 2	2	0	-	-	-	0	0	n too small
	Trimester 2	2	1	-	-	-	16	27	22.5 (-52.7 to 60.7)
	Trimester 3	1	0	-	-	-	1	4	n too imprecise
	Trimester 3	1	1	-	-	-	41	102	19.3 (-24.2 to 47.6)
	Trimester 3	1	2	-	-	-	121	290	45.1 (27.7 to 58.3)
	Trimester 3	2	0	-	-	-	6	11	14.5 (-153.8 to 71.2)
	Trimester 3	2	1	-	-	-	85	159	30.1 (2.8 to 49.7)
	Trimester 3	3	0	-	-	-	0	0	n too small

Supplementary Table 9. Descriptive characteristics of hospitalised infants for whom vaccine effectiveness was estimated.

		Delta period				Omicron period			
	Test Result	Control (Negative)		Case (Positive)		Control (Negative)		Case (Positive)	
		n	%	n	%	n	%	n	%
Pillar	1	4,588	**91.3%**	436	**8.7%**	1,413	**75.6%**	457	**24.4%**
Gender of infant	Female	2,009	**43.8%**	184	**42.2%**	529	**37.4%**	196	**42.9%**
	Male	2,547	**55.5%**	252	**57.8%**	873	**61.8%**	261	**57.1%**
	Unknown	32	**0.7%**	0	**0.0%**	11	**0.8%**	0	**0.0%**
Premature	No	3,963	**86.4%**	405	**92.9%**	1,192	**84.4%**	406	**88.8%**
	Gestational age <37 weeks	450	**9.8%**	26	**6.0%**	135	**9.6%**	33	**7.2%**
	Gestational age <33 weeks	175	**3.8%**	5	**1.1%**	86	**6.1%**	18	**3.9%**
Age of infant (months)	0	652	**14.2%**	148	**33.9%**	77	**5.4%**	45	**9.8%**
	1	1,878	**40.9%**	188	**43.1%**	350	**24.8%**	138	**30.2%**
	2	945	**20.6%**	74	**17.0%**	229	**16.2%**	111	**24.3%**
	3	530	**11.6%**	13	**3.0%**	226	**16.0%**	64	**14.0%**
	4	340	**7.4%**	12	**2.8%**	237	**16.8%**	46	**10.1%**
	5	243	**5.3%**	1	**0.2%**	294	**20.8%**	53	**11.6%**
Ethnicity	African	86	**1.9%**	7	**1.6%**	28	**2.0%**	10	**2.2%**
	Any other Asian background	79	**1.7%**	11	**2.5%**	42	**3.0%**	13	**2.8%**
	Any other Black background	33	**0.7%**	3	**0.7%**	15	**1.1%**	3	**0.7%**
	Any other White background	243	**5.3%**	57	**13.1%**	71	**5.0%**	85	**18.6%**
	Any other ethnic group	84	**1.8%**	15	**3.4%**	31	**2.2%**	14	**3.1%**
	Any other mixed background	70	**1.5%**	6	**1.4%**	24	**1.7%**	10	**2.2%**
	Bangladeshi or British Bangladeshi	67	**1.5%**	12	**2.8%**	18	**1.3%**	3	**0.7%**
	British, Mixed British	2,637	**57.5%**	183	**42.0%**	915	**64.8%**	219	**47.9%**
	Caribbean	12	**0.3%**	6	**1.4%**	1	**0.1%**	1	**0.2%**
	Chinese	7	**0.2%**	0	**0.0%**	2	**0.1%**	0	**0.0%**
	Indian or British Indian	77	**1.7%**	13	**3.0%**	28	**2.0%**	22	**4.8%**

	Irish			14	**0.3%**	2	**0.5%**	6	**0.4%**	0	**0.0%**
	Pakistani or British Pakistani			186	**4.1%**	20	**4.6%**	87	**6.2%**	27	**5.9%**
	White and Asian			33	**0.7%**	5	**1.1%**	11	**0.8%**	7	**1.5%**
	White and Black African			24	**0.5%**	4	**0.9%**	6	**0.4%**	2	**0.4%**
	White and Black Caribbean			43	**0.9%**	7	**1.6%**	19	**1.3%**	8	**1.8%**
	Missing			893	**19.5%**	85	**19.5%**	109	**7.7%**	33	**7.2%**
IMD Quintiles	1			1,347	**29.4%**	136	**31.2%**	452	**32.0%**	123	**26.9%**
	2			887	**19.3%**	84	**19.3%**	317	**22.4%**	109	**23.9%**
	3			767	**16.7%**	91	**20.9%**	219	**15.5%**	96	**21.0%**
	4			784	**17.1%**	77	**17.7%**	231	**16.3%**	82	**17.9%**
	5			761	**16.6%**	44	**10.1%**	185	**13.1%**	45	**9.8%**
	Missing			42	**0.9%**	4	**0.9%**	9	**0.6%**	2	**0.4%**
Age of mother (years)	15-24			724	**15.8%**	78	**17.9%**	210	**14.9%**	95	**20.8%**
	25-29			1,358	**29.6%**	126	**28.9%**	420	**29.7%**	125	**27.4%**
	30-34			1,514	**33.0%**	136	**31.2%**	471	**33.3%**	139	**30.4%**
	35+			992	**21.6%**	96	**22.0%**	312	**22.1%**	98	**21.4%**
Mother's vaccination status; no. of doses in pregnancy and no. of doses post pregnancy	Unvaccinated	0	0	2,489	**54.3%**	341	**78.2%**	560	**39.6%**	270	**59.1%**
	Unvaccinated	0	1	926	**20.2%**	64	**14.7%**	159	**11.3%**	59	**12.9%**
	Unvaccinated	0	2	318	**6.9%**	7	**1.6%**	147	**10.4%**	19	**4.2%**
	Trimester 1	1	0	34	**0.7%**	4	**0.9%**	26	**1.8%**	6	**1.3%**
	Trimester 1	1	1	8	**0.2%**	0	**0.0%**	17	**1.2%**	3	**0.7%**
	Trimester 1	2	0	9	**0.2%**	0	**0.0%**	17	**1.2%**	10	**2.2%**
	Trimester 1	2	1	5	**0.1%**	0	**0.0%**	25	**1.8%**	3	**0.7%**
	Trimester 2	1	0	25	**0.5%**	1	**0.2%**	21	**1.5%**	2	**0.4%**
	Trimester 2	1	1	25	**0.5%**	0	**0.0%**	10	**0.7%**	1	**0.2%**
	Trimester 2	2	0	108	**2.4%**	2	**0.5%**	87	**6.2%**	13	**2.8%**
	Trimester 2	2	1	14	**0.3%**	0	**0.0%**	76	**5.4%**	24	**5.3%**
	Trimester 3	1	0	149	**3.2%**	10	**2.3%**	28	**2.0%**	3	**0.7%**
	Trimester 3	1	1	187	**4.1%**	5	**1.1%**	54	**3.8%**	12	**2.6%**

	Trimester 3	1	2	1	**0.0%**	0	**0.0%**	8	**0.6%**	3	**0.7%**
	Trimester 3	2	0	273	**6.0%**	2	**0.5%**	114	**8.1%**	14	**3.1%**
	Trimester 3	2	1	9	**0.2%**	0	**0.0%**	41	**2.9%**	12	**2.6%**
	Trimester 3	3	0	8	**0.2%**	0	**0.0%**	23	**1.6%**	3	**0.7%**
Risk Status of mother	None			3,453	**75.3%**	352	**80.7%**	1,075	**76.1%**	369	**80.7%**
	At risk/CEV/Severely immunosuppressed			1,135	**24.7%**	84	**19.3%**	338	**23.9%**	88	**19.3%**
Variant of most recent previous infection pre-birth in mother	None			4,021	**87.6%**	420	**96.3%**	1,173	**83.0%**	390	**85.3%**
	Wild-type			141	**3.1%**	1	**0.2%**	52	**3.7%**	15	**3.3%**
	Alpha			299	**6.5%**	13	**3.0%**	87	**6.2%**	24	**5.3%**
	Delta			127	**2.8%**	2	**0.5%**	100	**7.1%**	28	**6.1%**
	Omicron			0	**0.0%**	0	**0.0%**	1	**0.1%**	0	**0.0%**

Supplementary Table 10. Maternal vaccine effectiveness against hospitalisation with Delta and Omicron in infants in England. These are the estimates behind the data presented in Figure 4.

Infant age (months)	Maternal Vaccination Status	Doses in pregnancy	Doses post pregnancy	Delta			Omicron		
				Cases	Controls	VE (95% CI)	Cases	Controls	VE (95% CI)
0-6	None	0	0	341	2,489	Baseline	270	560	Baseline
	None	0	1	64	926	34.0 (9.9 to 51.7)	59	159	6.5 (-45.1 to 39.7)
	None	0	2	7	318	26.3 (-74.5 to 68.8)	19	147	52.0 (10.2 to 74.3)
	Trimester 1	1	0	4	34	-17.9 (-263.1 to 61.7)	6	26	62.8 (-4.7 to 86.8)
	Trimester 1	1	1	0	8	n too small	3	17	70.5 (-12.3 to 92.2)
	Trimester 1	2	0	0	9	n too small	10	17	22.5 (-114.0 to 72.0)
	Trimester 1	2	1	0	5	n too small	3	25	86.4 (47.0 to 96.5)
	Trimester 2	1	0	1	25	n too imprecise	2	21	84.6 (17.8 to 97.1)
	Trimester 2	1	1	0	25	n too small	1	10	83.4 (-59.3 to 98.3)
	Trimester 2	2	0	2	108	87.4 (47.2 to 97.0)	13	87	73.9 (43.9 to 87.9)
	Trimester 2	2	1	0	14	n too small	24	76	67.8 (41.5 to 82.3)
	Trimester 3	1	0	10	149	54.8 (10.6 to 77.1)	3	28	84.1 (30.5 to 96.4)
	Trimester 3	1	1	5	187	76.5 (40.7 to 90.7)	12	54	55.5 (5.2 to 79.2)
	Trimester 3	1	2	0	1	n too small	3	8	n too imprecise
	Trimester 3	2	0	2	273	94.7 (78.2 to 98.7)	14	114	78.7 (58.2 to 89.1)
	Trimester 3	2	1	0	9	n too small	12	41	56.0 (6.3 to 79.4)
	Trimester 3	3	0	0	8	n too small	3	23	90.5 (62.4 to 97.6)

References

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