Supplementary Appendix

Supplement to: Hall V, Foulkes S, Insalata F, et al. Protection against SARS-CoV-2 after Covid-19 vaccination and previous infection. N Engl J Med. DOI: 10.1056/NEJMoa2118691

This appendix has been provided by the authors to give readers additional information about the work.

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Table S1: SIREN study group

No.	Institution	First name	Surname
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4.	UK Health Security Agency	Tim	Brooks
5.	UK Health Security Agency	Colin	Brown
6.	UK Health Security Agency	Davina	Calbraith
7.	UK Health Security Agency	Meera	Chand
8.	UK Health Security Agency	Andre	Charlett
9.	UK Health Security Agency	Michelle	Cole
10.	UK Health Security Agency	Tom	Coleman
11.	UK Health Security Agency	Joanna	Conneely
12.	UK Health Security Agency	Paul	Conneely
13.	UK Health Security Agency	Eleanor	Cross
14.	UK Health Security Agency	Silvia	D'Arcangelo
15.	UK Health Security Agency	Sarah	Foulkes
16.	UK Health Security Agency	Nabila	Fowles-Gutierrez
17.	UK Health Security Agency	Eileen	Gallagher
18.	UK Health Security Agency	Natalie	Gillson
19.	UK Health Security Agency	Victoria	Hall
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21.	UK Health Security Agency	Jacqueline	Hewson
22.	UK Health Security Agency	Bethany	Hicks
23.	UK Health Security Agency	Susan	Hopkins
24.	UK Health Security Agency	Kate	Howell
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27.	UK Health Security Agency	Jameel	Khawam
28.	UK Health Security Agency	Robert	Kyffin
29.	UK Health Security Agency	Ezra	Linley
30.	UK Health Security Agency	Iain	Milligan
31.	UK Health Security Agency	Sebastian	Milward
32.	UK Health Security Agency	Edward	Monk
33.	UK Health Security Agency	Katie	Munro
34.	UK Health Security Agency	Claire	Neill
35.	UK Health Security Agency	Anne-Marie	O'Connell
36.	UK Health Security Agency	Ashley	Otter
37.	UK Health Security Agency	Mary	Ramsay
38.	UK Health Security Agency	Cathy	Rowe
39.	UK Health Security Agency	Ayoub	Saei
40.	UK Health Security Agency	Noshin	Sajedi
41.	UK Health Security Agency	Amanda	Semper
42.	UK Health Security Agency	Andrew	Taylor-Kerr
43.	UK Health Security Agency	Yrene	Themistocleous
44.	UK Health Security Agency	Jean	Timeyin
45.	UK Health Security Agency	Simon	Tonge
46.	UK Health Security Agency	Caio	Tranquillini
47.	UK Health Security Agency	Edgar	Wellington
48.	UK Health Security Agency	Maria	Zambon
49.	Public Health Agency Northern Ireland	Dianne	Corrigan
50.	Public Health Agency Northern Ireland	Lisa	Cromey
51.	Glasgow Caledonian University & Public Health Scotland	Lesley	Price
52.	Glasgow Caledonian University & Public Health Scotland	Sally	Stewart

53.	Glasgow Caledonian University & Public Health Scotland	Nicola	Sergenson
54.	Public Health Scotland	Jennifer	Bishop
55.	Public Health Scotland	Jennifer	Weir
56.	Glasgow Caledonian University	Ayo	Matuluko
57.	Glasgow Caledonian University	Annelysse	Jorgenson
58.	Public Health Scotland	Laura	Dobbie
59.	Public Health Scotland	Andrew	Telfer
60.	Public Health Scotland	David	Goldberg
61.	Public Health Wales	Ellen	De Lacy
62.	Public Health Wales	Guy	Stevens
63.	Public Health Wales	Susannah	Froude
64.	Public Health Wales	Linda	Tyson
65.	Health and Care Research Wales	Yvette	Ellis
66.	Health and Care Research Wales	Chris	Norman
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		Samuel	Rowley
4	BASILDON AND THURROCK UNIVERSITY HOSPITALS NHS FOUNDATION TRUST	Stacey	Pepper
		Georgina	Butt
5	BEDFORDSHIRE HOSPITALS NHS FOUNDATION TRUST	Simantee	Guha
		Philippa	Bakker
6	Belfast Health & Social Care Trust	Clodagh	Loughrey
		A	Watt
7	Betsi Cadwaladr University LHB	Christian	Subbe
		Alice	Thomas
8	BIRMINGHAM AND SOLIHULL MENTAL HEALTH NHS FOUNDATION TRUST	Manny	Bagary
		Di	Baines
9	BIRMINGHAM COMMUNITY HEALTHCARE NHS FOUNDATION TRUST	Rebecca	Chapman
		Lucy Booth	Booth
10	BLACK COUNTRY HEALTHCARE NHS FOUNDATION TRUST	Alison	Grant
		Rebecca	Temple-Purcell
11	BLACKPOOL TEACHING HOSPITALS NHS FOUNDATION TRUST	Joanne	Howard
		Emma	Ward
12	BOLTON NHS FOUNDATION TRUST	Chinari	Subudhi
13	BRIGHTON AND SUSSEX UNIVERSITY HOSPITALS NHS TRUST	Marion	Campbell
		Andrew	Bexley
14	BUCKINGHAMSHIRE HEALTHCARE NHS TRUST	R	Penn
		N	Wong
15	CALDERDALE AND HUDDERSFIELD NHS FOUNDATION TRUST	G	Boyd
		A	Rajgopal
16	CENTRAL AND NORTH WEST LONDON NHS FOUNDATION TRUST	Abigail	Severn
		R	Matthews

17	CHESTERFIELD ROYAL HOSPITAL NHS FOUNDATION TRUST	Edward	Harris
		Amanda	Whileman
18	CORNWALL PARTNERSHIP NHS FOUNDATION TRUST	Richard	Laugharne
		Joanna	Ledger
19	COUNTESS OF CHESTER HOSPITAL NHS FOUNDATION TRUST	T	Barnes
		C	Jones
20	CROYDON HEALTH SERVICES NHS TRUST	Banerjee	SubhroOsuji
		Anna	Rokakis
21	Cwm Taf Morgannwg University LHB	John	Geen
		Carla	Pothecary
22	DARTFORD AND GRAVESHAM NHS TRUST	Tracy	Edmunds
		Nihil	Chitalia
23	DERBYSHIRE COMMUNITY HEALTH SERVICES NHS FOUNDATION TRUST	Sarah	Creer
		Eve	Etell Kirby
24	DERBYSHIRE HEALTHCARE NHS FOUNDATION TRUST	S	Akhtar
		G	Harrison
25	DEVON PARTNERSHIP NHS TRUST	Clare	McAdam
		Natalie	Crooks
26	DONCASTER AND BASSETLAW TEACHING HOSPITALS NHS FOUNDATION TRUST	K	Agwuh
		V	Maxwell
27	DORSET COUNTY HOSPITAL NHS FOUNDATION TRUST	Jennifer	Graves
28	DORSET HEALTHCARE UNIVERSITY NHS FOUNDATION TRUST	James	Colton
29	EAST SUFFOLK AND NORTH ESSEX NHS FOUNDATION TRUST	A	O'Kelly
		P	Ridley
30	EAST SUSSEX HEALTHCARE NHS TRUST	Anna	Cowley
		Janet	Sinclair
31	EPSOM AND ST HELIER UNIVERSITY HOSPITALS NHS TRUST	Helen	Johnstone
		Neringa	Vilimiene
32	FRIMLEY HEALTH NHS FOUNDATION TRUST	Manjula	Meda
		Jane	Democratis
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		Val	Irvine
36	GREAT WESTERN HOSPITALS NHS FOUNDATION TRUST	Eva	Fraile
37	HAMPSHIRE HOSPITALS NHS FOUNDATION TRUST	Claire	Thomas
		Ina	Hoad
38	HOUNSLOW AND RICHMOND COMMUNITY HEALTHCARE NHS TRUST	Shekoo	Mackay
		Shivani	Khan
39	HULL UNIVERSITY TEACHING HOSPITALS NHS TRUST	Philippa	Burns
		Nicholas	Easom

40	Hywel Dda University LHB	Tracy	Lewis
		Zohra	Omar
41	IMPERIAL COLLEGE HEALTHCARE NHS TRUST	Graham	Pickard
		Kenisha	Lewis
42	ISLE OF WIGHT NHS TRUST	Sarah	Hinch
		Alison	Brown
43	JAMES PAGET UNIVERSITY HOSPITALS NHS FOUNDATION TRUST	Ben	Burton
		Christian	Hacon
44	KING'S COLLEGE HOSPITAL NHS FOUNDATION TRUST	Ray	Chaudhuri
		Jonnie	Aeron-Thomas
45	LANCASHIRE & SOUTH CUMBRIA NHS FOUNDATION TRUST	Robert	Shorten
		Kathryn	Williams
46	LANCASHIRE TEACHING HOSPITALS NHS FOUNDATION TRUST	Maya	Leach
		Robert	Shorten
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		J	Russell
50	LINCOLNSHIRE PARTNERSHIP NHS FOUNDATION TRUST	Kelly	Moran
		Ananta	Dave
51	LIVERPOOL UNIVERSITY HOSPITALS NHS FOUNDATION TRUST	Anu	Chawla
		Fran	Westwell
52	LONDON NORTH WEST UNIVERSITY HEALTHCARE NHS TRUST	Ekaterina	Watson
		D	Adeboyeku
53	MAIDSTONE AND TUNBRIDGE WELLS NHS TRUST	C	Pegg
		M	Williams
54	MANCHESTER UNIVERSITY NHS FOUNDATION TRUST	S	Ahmad
		A	Horsley
55	MID CHESHIRE HOSPITALS NHS FOUNDATION TRUST	Claire	Gabriel
		Katherin	Pagett
56	MID ESSEX HOSPITAL SERVICES NHS TRUST	Lauren	Sach
		Yvonne	Lester
57	MID YORKSHIRE HOSPITALS NHS TRUST	Ismaelette	Del Rosario
		John	Ashcroft
58	MOORFIELDS EYE HOSPITAL NHS FOUNDATION TRUST	Roxanne	Crosby-Nwaobi
		Chloe	Reeks
59	NHS Borders	Joy	Dawson
		Lauren	Finlayson
60	NHS Fife	Susan	Fowler
		Devesh	Dhasmana
61	NHS Forth Valley	Euan	Cameron
		Anne	Todd
62	NHS Grampian	Harriet	Carroll
		Alison	Thornton

63	NHS Greater Glasgow and Clyde	Antonia	Ho
		Michael	Murphy
64	NHS Highland	Andrew	Gibson
		Alexandra	Cochrane
65	NHS Lanarkshire	Manish	Patel
		Karen	Black
66	NHS Lothian	Kate	Templeton
		Andrea	Clarke
67	NHS Western Isles	Martin	Malcolm
		Joan	Frieslick
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		Louise	Coke
69	NORTH CUMBRIA INTEGRATED CARE NHS FOUNDATION TRUST	Beverly	Wilkinson
		John	Elliott
70	NORTH MIDDLESEX UNIVERSITY HOSPITAL NHS TRUST	Mariyam	Mirfenderesky
		Pratap	Harbham
71	NORTH WEST ANGLIA NHS FOUNDATION TRUST	Janki	Bhayani
		Stephanie	Diaz
72	NORTHERN DEVON HEALTHCARE NHS TRUST	M	Howard
		T	Lewis
73	NORTHERN HEALTH AND SOCIAL CARE TRUST	Elinor	Hanna
		Frances	Johnston
74	NORTHERN LINCOLNSHIRE AND GOOLE NHS FOUNDATION TRUST	Jonathan	Hatton
		Peter	Cowling
75	NOTTINGHAM UNIVERSITY HOSPITALS NHS TRUST	Sarah	Brand
		Imogen	Gould
76	POOLE HOSPITAL NHS FOUNDATION TRUST	Beverley	Wadams
		Elizabeth	Sheridan
77	PORTSMOUTH HOSPITALS NHS TRUST	Johanna	Mouland
		Jade	Yates
78	Powys Teaching LHB	Jayne	Goodwin
		Chris	Norman
79	QUEEN VICTORIA HOSPITAL NHS FOUNDATION TRUST	J	Giles
		G	Pottinger
80	ROYAL BERKSHIRE NHS FOUNDATION TRUST	Maya	Joseph
		Holly	Coles
81	ROYAL CORNWALL HOSPITALS NHS TRUST	H	Chenoweth
		D	Browne
82	ROYAL DEVON AND EXETER NHS FOUNDATION TRUST	Cressida	Auckland
		Stephanie	Prince
83	ROYAL FREE LONDON NHS FOUNDATION TRUST	Alison	Rodger
		Tabitha	Mahungu
84	ROYAL NATIONAL ORTHOPAEDIC HOSPITAL NHS TRUST	Esther	Hanison
		Simon	Warren
85		Sumita	Pai

	ROYAL PAPWORTH HOSPITAL NHS FOUNDATION TRUST	Helen	Baxendale
86	ROYAL SURREY COUNTY HOSPITAL NHS FOUNDATION TRUST	Charles	Piercy
		Esther	Tarr
87	ROYAL UNITED HOSPITALS BATH NHS FOUNDATION TRUST	Debbie	Delgado
		Sarah	Meisner
88	SALISBURY NHS FOUNDATION TRUST	Catherine	Thompson
		Sophia	Strong-Sheldrake
89	SANDWELL AND WEST BIRMINGHAM HOSPITALS NHS TRUST	Ash	Turner
		Anne	Hayes
90	SHEFFIELD CHILDREN'S NHS FOUNDATION TRUST	S	Gormley
		C	Kerrison
91	SHEFFIELD TEACHING HOSPITALS NHS FOUNDATION TRUST	Thushan	de Silva
		Simon	Tazzyman
92	SHERWOOD FOREST HOSPITALS NHS FOUNDATION TRUST	Lynne	Allsop
		Shrikant	Ambalkar
93	SHREWSBURY AND TELFORD HOSPITAL NHS TRUST	Mandy	Beekes
		Hannah	Gibson
94	SHROPSHIRE COMMUNITY HEALTH NHS TRUST	Johanne	Tomlinson
95	SOLENT NHS TRUST	Cathy	Price
		The Solent Research Team	
96	SOMERSET NHS FOUNDATION TRUST	Justin	Pepperell
		Kate	James
97	South Eastern Health & Social Care	Yuri	Protaschik
	South Eastern Health & Social Care	Tom	Trinick
98	SOUTHEND UNIVERSITY HOSPITAL NHS FOUNDATION TRUST	John	Day
		Swapna	Kunhunny
99	Southern Health & Social Care Trust	Angel	Boulos
		Alice	Neave
100	SOUTHERN HEALTH NHS FOUNDATION TRUST	Qi	Zheng
101	SOUTHPORT AND ORMSKIRK HOSPITAL NHS TRUST	Katherine	Gray
		Kerryanne	Brown
102	ST GEORGE'S UNIVERSITY HOSPITALS NHS FOUNDATION TRUST	Tim	Planche
		Angela	Houston
103	ST HELENS AND KNOWSLEY TEACHING HOSPITALS NHS TRUST	Rowan	Pritchard Jones
		Diane	Wycherley
104	STOCKPORT NHS FOUNDATION TRUST	Barzo	Faris
105	SURREY AND SUSSEX HEALTHCARE NHS TRUST	K	Nimako
		B	Stewart
106	Swansea Bay University LHB	Claire	Stafford
		Rebeccah	Thomas
107		Sheena	Khanduri

	THE CLATTERBRIDGE CANCER CENTRE NHS FOUNDATION TRUST	Nagesh	Kalakonda
108	THE DUDLEY GROUP NHS FOUNDATION TRUST	Helen	Ashby
109	THE HILLINGDON HOSPITALS NHS FOUNDATION TRUST	Natasha	Mahabir
110	THE NEWCASTLE UPON TYNE HOSPITALS NHS FOUNDATION TRUST	J	Harwood
		B	Payne
111	THE PRINCESS ALEXANDRA HOSPITAL NHS TRUST	Kathryn	Court
		Nikki	White
112	THE ROBERT JONES AND AGNES HUNT ORTHOPAEDIC HOSPITAL NHS FOUNDATION TRUST	Ruth	Longfellow
113	THE ROYAL BOURNEMOUTH AND CHRISTCHURCH HOSPITALS NHS FOUNDATION TRUST	Mihye	Lee
114	THE ROYAL WOLVERHAMPTON NHS TRUST	Marie	Green
		Lauren	Hughes
115	TORBAY AND SOUTH DEVON NHS FOUNDATION TRUST	Mathew	Halkes
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116	UNITED LINCOLNSHIRE HOSPITALS NHS TRUST	Alun	Roebuck
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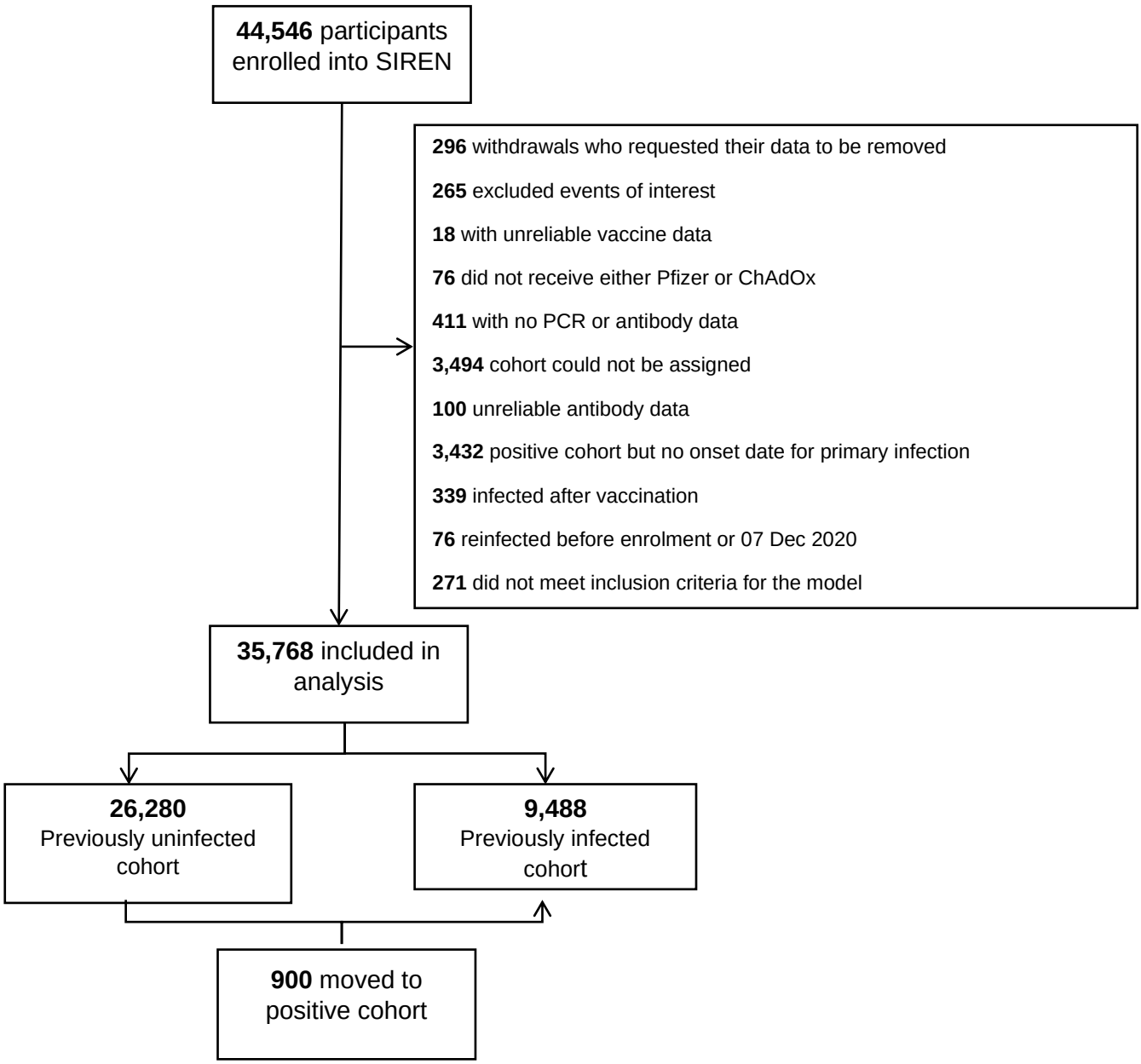
117	UNIVERSITY HOSPITAL SOUTHAMPTON NHS FOUNDATION TRUST	E	Wilson-Davies
118	UNIVERSITY HOSPITALS BRISTOL AND WESTON NHS FOUNDATION TRUST	Rajeka	Lazarus
		Aaran	Sinclair
119	UNIVERSITY HOSPITALS COVENTRY AND WARWICKSHIRE NHS TRUST	N	Aldridge
		L	Berry
120	UNIVERSITY HOSPITALS OF DERBY AND BURTON NHS FOUNDATION TRUST	F	Game
		T	Reynolds
121	UNIVERSITY HOSPITALS OF LEICESTER NHS TRUST	Christopher	Holmes
		Martin	Wiselka
122	UNIVERSITY HOSPITALS OF MORECAMBE BAY NHS FOUNDATION TRUST	Lynda	Fothergill
		Karen	Burns
123	UNIVERSITY HOSPITALS OF NORTH MIDLANDS NHS TRUST	Christopher	Duff
		Martin	Booth
124	UNIVERSITY HOSPITALS PLYMOUTH NHS TRUST	Hannah	Jory
		David	Hilton
125	Velindre NHS Trust	Charlotte	Young
		James	Powell
126	WALSALL HEALTHCARE NHS TRUST	Lisa	Richardson
		Aiden	Plant
127	WARRINGTON AND HALTON TEACHING HOSPITALS NHS FOUNDATION TRUST	Zaman	Qazzafi
		Lisa	Ditchfield
128	WEST SUFFOLK NHS FOUNDATION TRUST	A	Moody
		R	Tilley

129	Western Health & Social Care Trust	Tracy	Donaghy
		Maurice	O'Kane
130	WESTERN SUSSEX HOSPITALS NHS FOUNDATION TRUST	R	Sierra
		K	Shipman
131	WHITTINGTON HEALTH NHS TRUST	Philippa	Kemsley
		Chetan	Parmar
132	WIRRAL UNIVERSITY TEACHING HOSPITAL NHS FOUNDATION TRUST	D	Harvey
		Y	Huang
133	WYE VALLEY NHS TRUST	L	Robinson
134	YEOVIL DISTRICT HOSPITAL NHS FOUNDATION TRUST	Sarah	Board
		Andrew	Broadley
135	YORK TEACHING HOSPITAL NHS FOUNDATION TRUST	Claire	Brookes
		Mags	Szewczyk
No.	**SIREN Associated Studies**	**First name**	**Surname**
1.	Protective Immunity from T cells to Covid-19 in Health workers (PITCH)	Susie	Dunachie
2.	Protective Immunity from T cells to Covid-19 in Health workers (PITCH)	Paul	Klenerman
3.	Protective Immunity from T cells to Covid-19 in Health workers (PITCH)	Chris	Duncan
4.	Protective Immunity from T cells to Covid-19 in Health workers (PITCH)	Lance	Turtle
5.	Protective Immunity from T cells to Covid-19 in Health workers (PITCH)	Alex	Richter
6.	Protective Immunity from T cells to Covid-19 in Health workers (PITCH)	Thushan	De Silva
7.	Protective Immunity from T cells to Covid-19 in Health workers (PITCH)	Eleanor	Barnes
8.	Protective Immunity from T cells to Covid-19 in Health workers (PITCH)	Daniel	Wootton
9.	The Humoral Immune Correlates for COVID-19 (HICC) consortium	Jonathan	Heeney
10.	The Humoral Immune Correlates for COVID-19 (HICC) consortium	Helen	Baxendale
11.	The Humoral Immune Correlates for COVID-19 (HICC) consortium	Javier	Castillo-Olivares
12.	The Francis Crick Institute	Rupert	Beale
13.	The Francis Crick Institute	Edward	Carr
14.	Genotype2Phenotype (G2P)	Wendy	Barclay
15.	Genotype2Phenotype (G2P)	Massimo	Palmarini
16.	GenOMICC	John Kenneth	Baillie

Figure S1: SIREN participant flow diagram



*Events of interest excluded after initial screening include misreported results, false positive results, seroconversion between two RT-PCR positive results less than 90 days apart and seroconversion after vaccination confirmed by anti-N SARS-CoV-2 negativity.

Table S2: Comparison of SIREN cohort with national population

Demographics	SIREN cohort n (%)	UK Population n (%)	Comment on generalisability
Gender			
Male	5,699 (15.9)	33,145,709 (49.4)	The healthcare workforce is predominately female, as reflected in SIREN recruitment
Female	30,017 (83.9)	33,935,525 (50.6)	
Other	52 (0.1)	N/A	
Age group			
Under 25	1297 (3.6)	19,791,695 (29.5)	The SIREN cohort is relatively young, and therefore less suited for analysis of severe outcomes of COVID-19 which disproportionately affect individuals over 65 years old
25 to 34	7,106 (19.9)	8,998,605 (13.4)	
35 to 44	8,848 (24.7)	8,495,643 (12.7)	
45 to 54	10,874 (30.4)	8,919,984 (13.3)	
55 to 64	7,085 (19.8)	8,366,669 (12.5)	
Over 65	558 (1.6)	12,508,638 (18.6)	
Ethnicity*			
White	31,634 (88.4)	50,408,100 (84.8)	Participants from black ethnic groups are underrepresented in the SIREN cohort
Asian	2,486 (7.0)	4,737,800 (8.0)	
Black	621 (1.7)	2,095,900 (3.5)	
Mixed race	535 (1.5)	1,082,500 (1.8)	
Other ethnic group	427 (1.2)	1,115,400 (1.9)	
Prefer not to say	65 (0.2)	N/A	
Geographical area			
East Midlands	2825 (7.9)	4,865,583 (7.3)	All four UK nations and English regions are represented in the SIREN cohort, with Scotland overrepresented and Wales underrepresented
East of England	3363 (9.4)	6,269,161 (9.3)	
London	3688 (10.3)	9,002,488 (13.4)	
North East	647 (1.8)	2,680,763 (4.0)	
North West	3429 (9.6)	7,367,456 (11.0)	
South East	3548 (9.9)	9,217,265 (13.7)	
South West	5540 (15.5)	5,659,143 (8.4)	
West Midlands	2717 (7.6)	5,961,929 (8.9)	
Yorkshire and Humber	2644 (7.4)	5,526,350 (8.2)	
Scotland	5449 (15.2)	5,466,000 (8.1)	
Northern Ireland	1127 (3.2)	1,895,510 (2.8)	
Wales	791 (2.2)	3,169,586 (4.7)	
Vaccination status by 21 Sep 2021			
2-doses	33,940 (94.9)	44,560,000 (65)	The SIREN cohort is highly vaccinated relative to the general UK population
1-dose	937 (2.6)	4,060,000 (6.0)	
Total	**35,768**	**67,081,234**	

Figure S2: Description of cohort enrolment, vaccination coverage and SARS-CoV-2 variant dominance during analysis period, June 2020 to September 2021

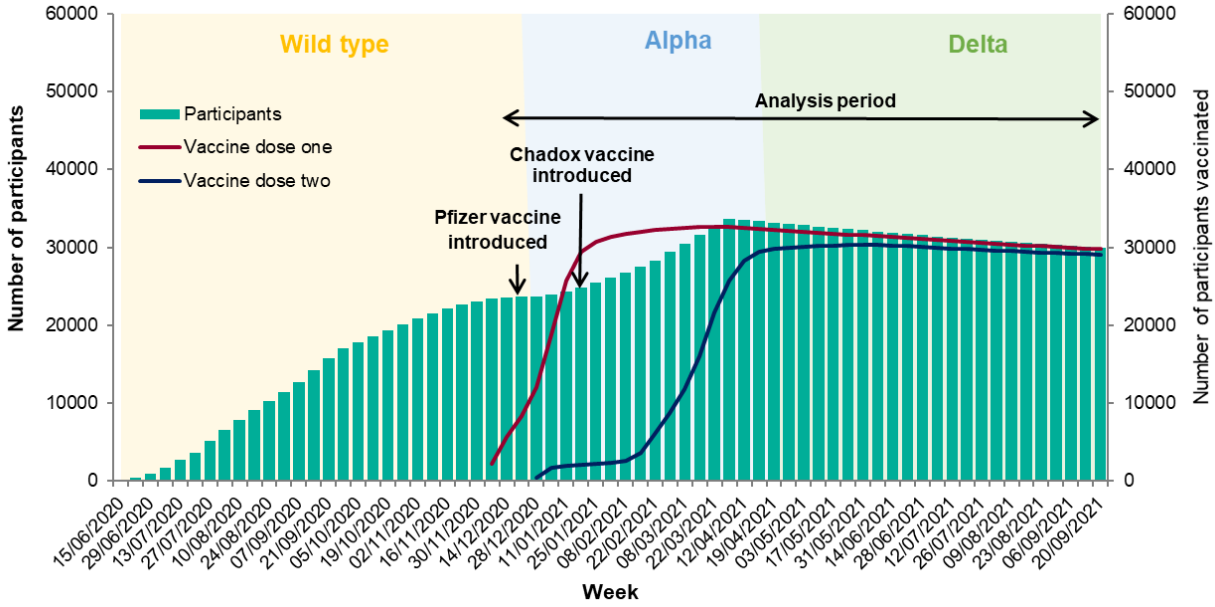
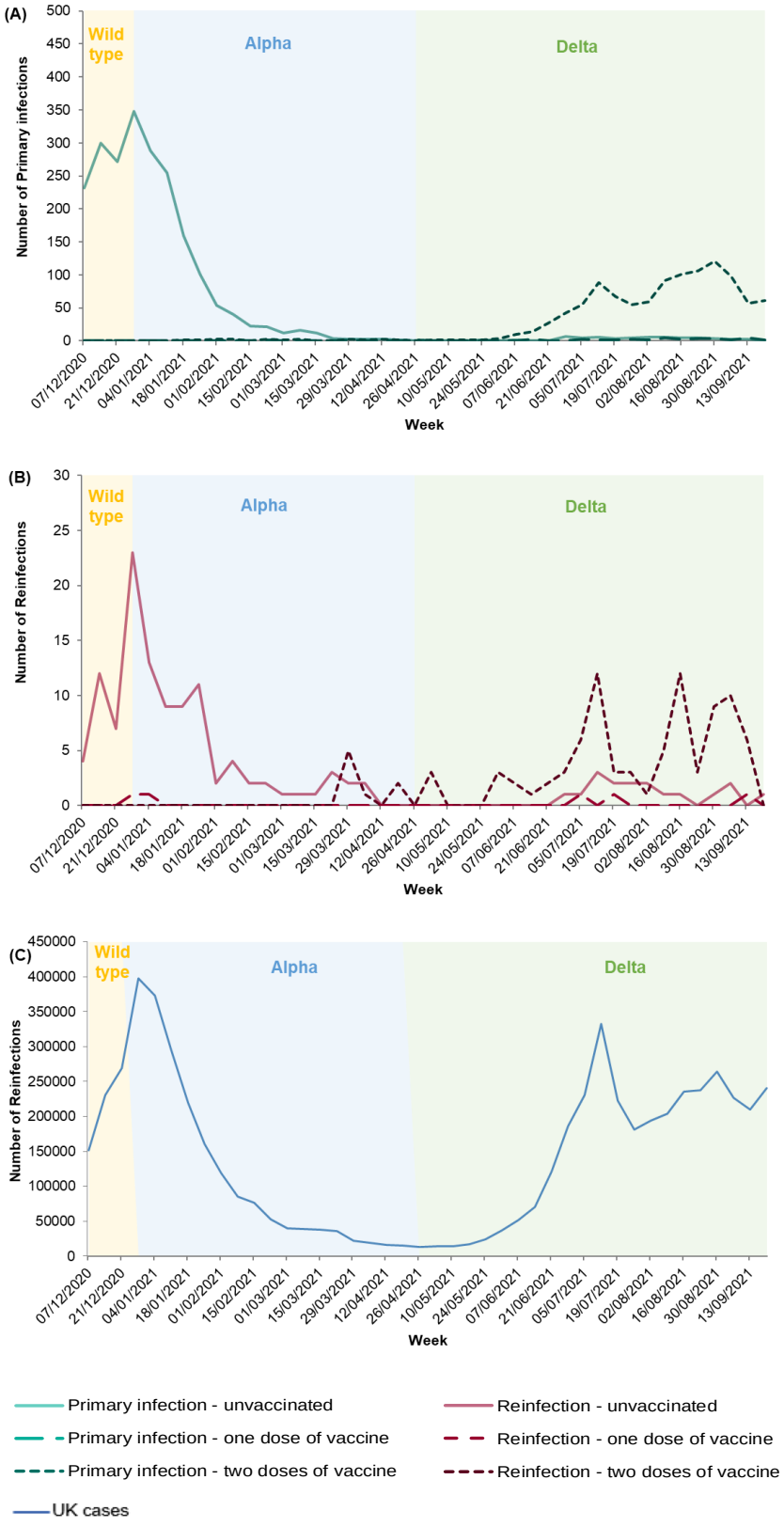


Figure S3: Number of primary infections (A) and reinfections (B) in the SIREN cohort and national UK cases (C) by vaccine status and variant-dominant period, 07 December 2020 to 21 September 2021



Data for panel C) Source: GOV.UK Coronavirus (COVID-19) in the UK

Table S3: description of participant demographics, by cohort assignment and vaccine status at the end of the analysis period, June 2020 to September 2021

Demographics	Total	SARS-CoV-2 previously uninfected cohort				SARS-CoV-2 previously infected cohort			
		Dose 2 n (%)			Unvaccinated	Dose 2 n (%)			Unvaccinated
		Pfizer short	Pfizer long	ChAdOX1		Pfizer short	Pfizer long	ChAdOX1	
Gender									
Male	5699 (15.9)	495 (20.2)	3175 (15.2)	228 (12)	50 (10.8)	156 (25.6)	1282 (17.7)	112 (12.3)	52 (12.1)
Female	30017 (83.9)	1952 (79.7)	17637 (84.6)	1666 (87.9)	410 (88.7)	453 (74.4)	5942 (82.1)	796 (87.7)	375 (87.4)
Other	52 (0.1)	3 (0.1)	31 (0.1)	1 (0.1)	2 (0.4)	-	11 (0.2)	-	2 (0.5)
Age group									
Under 25	1297 (3.6)	58 (2.4)	748 (3.6)	69 (3.6)	31 (6.7)	21 (3.4)	285 (3.9)	35 (3.9)	12 (2.8)
25 to 34	7106 (19.9)	379 (15.5)	3920 (18.8)	391 (20.6)	167 (36.1)	126 (20.7)	1531 (21.2)	184 (20.3)	144 (33.6)
35 to 44	8848 (24.7)	639 (26.1)	5158 (24.7)	485 (25.6)	119 (25.8)	153 (25.1)	1710 (23.6)	219 (24.1)	105 (24.5)
45 to 54	10874 (30.4)	781 (31.9)	6410 (30.8)	564 (29.8)	90 (19.5)	194 (31.9)	2213 (30.6)	284 (31.3)	95 (22.1)
55 to 64	7085 (19.8)	533 (21.8)	4255 (20.4)	357 (18.8)	50 (10.8)	106 (17.4)	1419 (19.6)	175 (19.3)	67 (15.6)
Over 65	558 (1.6)	60 (2.4)	352 (1.7)	29 (1.5)	5 (1.1)	9 (1.5)	77 (1.1)	11 (1.2)	6 (1.4)
Ethnicity									
White	31634 (88.4)	2104 (85.9)	18855 (90.5)	1697 (89.6)	386 (83.5)	492 (80.8)	6174 (85.3)	772 (85)	345 (80.4)
Asian	2486 (7)	228 (9.3)	1204 (5.8)	96 (5.1)	28 (6.1)	81 (13.3)	675 (9.3)	76 (8.4)	28 (6.5)
Black	621 (1.7)	31 (1.3)	262 (1.3)	50 (2.6)	27 (5.8)	11 (1.8)	152 (2.1)	34 (3.7)	34 (7.9)
Mixed race	535 (1.5)	43 (1.8)	284 (1.4)	30 (1.6)	11 (2.4)	5 (0.8)	115 (1.6)	14 (1.5)	17 (4)
Other ethnic group	427 (1.2)	40 (1.6)	202 (1)	20 (1.1)	6 (1.3)	18 (3)	110 (1.5)	10 (1.1)	4 (0.9)
Prefer not to say	65 (0.2)	4 (0.2)	36 (0.2)	2 (0.1)	4 (0.9)	2 (0.3)	9 (0.1)	2 (0.2)	1 (0.2)
Medical conditions category									
No medical condition	26670 (74.6)	1747 (71.3)	15616 (74.9)	1373 (72.5)	360 (77.9)	443 (72.7)	5409 (74.8)	664 (73.1)	348 (81.1)
Immunosuppression	803 (2.2)	88 (3.6)	450 (2.2)	52 (2.7)	11 (2.4)	14 (2.3)	135 (1.9)	16 (1.8)	12 (2.8)
Chronic respiratory conditions	4439 (12.4)	337 (13.8)	2577 (12.4)	262 (13.8)	49 (10.6)	66 (10.8)	871 (12)	116 (12.8)	36 (8.4)
Chronic non-respiratory conditions	3856 (10.8)	278 (11.3)	2200 (10.6)	208 (11)	42 (9.1)	86 (14.1)	820 (11.3)	112 (12.3)	33 (7.7)

Staff group									
Administrative/Executive (office based)	5434 (15.2)	255 (10.4)	3427 (16.4)	403 (21.3)	76 (16.5)	48 (7.9)	902 (12.5)	131 (14.4)	48 (11.2)
Nursing	12184 (34.1)	886 (36.2)	6826 (32.7)	594 (31.3)	163 (35.3)	230 (37.8)	2653 (36.7)	346 (38.1)	175 (40.8)
Healthcare Assistant	2901 (8.1)	135 (5.5)	1567 (7.5)	186 (9.8)	58 (12.6)	57 (9.4)	671 (9.3)	89 (9.8)	56 (13.1)
Doctor	4248 (11.9)	589 (24)	2287 (11)	86 (4.5)	25 (5.4)	143 (23.5)	910 (12.6)	72 (7.9)	35 (8.2)
Midwife	777 (2.2)	46 (1.9)	457 (2.2)	52 (2.7)	16 (3.5)	9 (1.5)	152 (2.1)	20 (2.2)	10 (2.3)
Physiotherapist/Occupational Therapist/SALT	1438 (4)	71 (2.9)	816 (3.9)	66 (3.5)	13 (2.8)	19 (3.1)	348 (4.8)	45 (5)	15 (3.5)
Estates/Porters/Security	530 (1.5)	27 (1.1)	304 (1.5)	30 (1.6)	14 (3)	7 (1.1)	100 (1.4)	20 (2.2)	7 (1.6)
Pharmacist	737 (2.1)	70 (2.9)	463 (2.2)	29 (1.5)	4 (0.9)	14 (2.3)	111 (1.5)	15 (1.7)	9 (2.1)
Healthcare Scientist	1390 (3.9)	42 (1.7)	978 (4.7)	74 (3.9)	20 (4.3)	6 (1)	191 (2.6)	24 (2.6)	13 (3)
Student (Medical/Nursing/Midwifery/Other)	1200 (3.4)	41 (1.7)	709 (3.4)	81 (4.3)	17 (3.7)	16 (2.6)	259 (3.6)	37 (4.1)	11 (2.6)
Other	4929 (13.8)	288 (11.8)	3009 (14.4)	294 (15.5)	56 (12.1)	60 (9.9)	938 (13)	109 (12)	50 (11.7)
Occupational setting									
Office based	7002 (19.6)	363 (14.8)	4402 (21.1)	501 (26.4)	77 (16.7)	80 (13.1)	1208 (16.7)	149 (16.4)	47 (11)
Patient facing (non-clinical)	1378 (3.9)	102 (4.2)	829 (4)	81 (4.3)	19 (4.1)	19 (3.1)	240 (3.3)	26 (2.9)	17 (4)
Outpatient	7341 (20.5)	527 (21.5)	4524 (21.7)	365 (19.3)	111 (24)	96 (15.8)	1266 (17.5)	165 (18.2)	88 (20.5)
Maternity/Labour Ward	477 (1.3)	37 (1.5)	282 (1.4)	24 (1.3)	8 (1.7)	13 (2.1)	80 (1.1)	11 (1.2)	7 (1.6)
Ambulance/Emergency Department/Inpatient Wards	6456 (18)	495 (20.2)	3309 (15.9)	225 (11.9)	85 (18.4)	154 (25.3)	1685 (23.3)	191 (21)	115 (26.8)
Intensive Care	1669 (4.7)	179 (7.3)	962 (4.6)	73 (3.9)	28 (6.1)	30 (4.9)	306 (4.2)	36 (4)	15 (3.5)
Theatres	866 (2.4)	101 (4.1)	506 (2.4)	29 (1.5)	8 (1.7)	26 (4.3)	150 (2.1)	19 (2.1)	5 (1.2)
Other	10579 (29.6)	646 (26.4)	6029 (28.9)	597 (31.5)	126 (27.3)	191 (31.4)	2300 (31.8)	311 (34.3)	135 (31.5)
Patient contact									
No	5105 (14.3)	209 (8.5)	3311 (15.9)	350 (18.5)	59 (12.8)	54 (8.9)	807 (11.2)	122 (13.4)	40 (9.3)
Yes	30663 (85.7)	2241 (91.5)	17532 (84.1)	1545 (81.5)	403 (87.2)	555 (91.1)	6428 (88.8)	786 (86.6)	389 (90.7)
Frequency of COVID-19 patient contact									
Never	12752 (35.7)	674 (27.5)	8363 (40.1)	852 (45)	145 (31.4)	118 (19.4)	1896 (26.2)	273 (30.1)	104 (24.2)
Every day	8797 (24.6)	706 (28.8)	4218 (20.2)	394 (20.8)	135 (29.2)	227 (37.3)	2435 (33.7)	282 (31.1)	158 (36.8)
Once week	6229 (17.4)	511 (20.9)	3396 (16.3)	252 (13.3)	79 (17.1)	150 (24.6)	1430 (19.8)	161 (17.7)	83 (19.3)
Once month	3257 (9.1)	234 (9.6)	1903 (9.1)	143 (7.5)	42 (9.1)	59 (9.7)	671 (9.3)	82 (9)	41 (9.6)
Less month	4733 (13.2)	325 (13.3)	2963 (14.2)	254 (13.4)	61 (13.2)	55 (9)	803 (11.1)	110 (12.1)	43 (10)

Index of Multiple Deprivation									
5 (least deprived)	8871 (24.8)	672 (27.4)	5350 (25.7)	383 (20.2)	72 (15.6)	162 (26.6)	1823 (25.2)	194 (21.4)	82 (19.1)
4	8073 (22.6)	569 (23.2)	4771 (22.9)	473 (25)	82 (17.7)	147 (24.1)	1633 (22.6)	179 (19.7)	86 (20)
3	7515 (21)	505 (20.6)	4482 (21.5)	403 (21.3)	78 (16.9)	123 (20.2)	1501 (20.7)	229 (25.2)	74 (17.2)
2	6020 (16.8)	363 (14.8)	3532 (16.9)	362 (19.1)	84 (18.2)	95 (15.6)	1225 (16.9)	165 (18.2)	74 (17.2)
1 (most deprived)	3858 (10.8)	238 (9.7)	2037 (9.8)	245 (12.9)	97 (21)	63 (10.3)	875 (12.1)	130 (14.3)	77 (17.9)
Not known	1431 (4)	103 (4.2)	671 (3.2)	29 (1.5)	49 (10.6)	19 (3.1)	178 (2.5)	11 (1.2)	36 (8.4)
Geographical area									
East Midlands	2825 (7.9)	263 (10.7)	1308 (6.3)	335 (17.7)	28 (6.1)	61 (10)	606 (8.4)	138 (15.2)	34 (7.9)
East of England	3363 (9.4)	127 (5.2)	2056 (9.9)	168 (8.9)	23 (5)	33 (5.4)	793 (11)	62 (6.8)	40 (9.3)
London	3688 (10.3)	283 (11.6)	1913 (9.2)	127 (6.7)	62 (13.4)	115 (18.9)	944 (13)	98 (10.8)	65 (15.2)
North East	647 (1.8)	84 (3.4)	333 (1.6)	26 (1.4)	3 (0.6)	20 (3.3)	146 (2)	14 (1.5)	9 (2.1)
North West	3429 (9.6)	281 (11.5)	1432 (6.9)	371 (19.6)	52 (11.3)	85 (14)	882 (12.2)	193 (21.3)	58 (13.5)
South East	3548 (9.9)	260 (10.6)	2139 (10.3)	112 (5.9)	23 (5)	83 (13.6)	782 (10.8)	63 (6.9)	28 (6.5)
South West	5540 (15.5)	285 (11.6)	3843 (18.4)	246 (13)	58 (12.6)	58 (9.5)	820 (11.3)	87 (9.6)	37 (8.6)
West Midlands	2717 (7.6)	111 (4.5)	1563 (7.5)	158 (8.3)	41 (8.9)	24 (3.9)	630 (8.7)	102 (11.2)	39 (9.1)
Yorkshire and Humber	2644 (7.4)	149 (6.1)	1420 (6.8)	144 (7.6)	31 (6.7)	42 (6.9)	703 (9.7)	80 (8.8)	43 (10)
Scotland	5449 (15.2)	428 (17.5)	3908 (18.7)	173 (9.1)	91 (19.7)	50 (8.2)	645 (8.9)	56 (6.2)	37 (8.6)
Northern Ireland	1127 (3.2)	78 (3.2)	487 (2.3)	7 (0.4)	48 (10.4)	10 (1.6)	121 (1.7)	4 (0.4)	29 (6.8)
Wales	791 (2.2)	101 (4.1)	441 (2.1)	28 (1.5)	2 (0.4)	28 (4.6)	163 (2.3)	11 (1.2)	10 (2.3)
Total	**35768**	**2450**	**20843**	**1895**	**462**	**609**	**7235**	**908**	**429**

*Index of Multiple Deprivation (IMD), which is a measure of neighbourhood relative deprivation calculated by the Office of National Statistics, was obtained through linkage with participant postcodes; For ease of presentation, we have excluded participants who only received dose-1 (n=630 in the native cohort and n=307 in the positive cohort). Please note that this table presents and compared the demographics for the small number of participants who remained unvaccinated at the end of the analysis period, however, almost all participants contributed unvaccinated follow-up time to this analysis.

Table S4: Incidence of SARS-CoV-2 reinfections and durability of protection against SARS-CoV-2 infection, adjusted for vaccine status, in the SIREN cohort between 07 December 2020 and 21 September 2021 – previously uninfected cohort only

	Hazard ratio	95% confidence interval
Vaccine status		
Unvaccinated	Ref	-
d1 0-20 PF	0.72	(0.63-0.83)
d1 21-27 PF	0.41	(0.29-0.58)
d1 28-41 PF	0.34	(0.24-0.48)
d1 42-55 PF	0.30	(0.19-0.46)
d1 56+ PF	0.37	(0.25-0.54)
d1 0-20 AZ	0.45	(0.29-0.70)
d1 21-27 AZ	0.37	(0.08-1.80)
d1 28-41 AZ	0.15	(0.03-0.84)
d1 42-55 AZ	0.68	(0.25-1.87)
d1 56+ AZ	0.91	(0.45-1.87)
d2 0-13 PF long	0.21	(0.10-0.44)
d2 14-73 PF long	0.15	(0.08-0.28)
d2 74-133 PF long	0.34	(0.25-0.47)
d2 134-193 PF long	0.32	(0.23-0.46)
d2 194+ PF long	0.49	(0.31-0.78)
d2 0-13 PF short	0.25	(0.14-0.43)
d2 14-73 PF short	0.11	(0.06-0.22)
d2 74-133 PF short	0.42	(0.21-0.82)
d2 134-193 PF short	0.50	(0.33-0.74)
d2 194+ PF short	0.47	(0.31-0.72)
d2 14-73 AZ	0.42	(0.23-0.77)
d2 74-133 AZ	0.50	(0.35-0.71)
d2 134+ AZ	0.28	(0.13-0.61)
Gender		
Male	Ref	-
Female	0.91	(0.79-1.03)
Non-binary	0.49	(0.07-3.61)
Prefer not to say	0.30	(0.03-2.67)
Ethnicity groups		
White	Ref	-
Mixed Race	0.89	(0.68-1.16)
Asian	1.26	(1.08-1.47)
Black	1.79	(1.37-2.33)
Other ethnic group	0.84	(0.59-1.21)
Prefer not to say	1.38	(0.64-3.01)

Table S5: Incidence of SARS-CoV-2 reinfections and durability of protection against SARS-CoV-2 infection, adjusted for vaccine status, in the SIREN cohort between 07 December 2020 and 21 September 2021 – both cohorts

	Hazard ratio	95% confidence interval
Vaccine status		
d1 0-20 naive	0.95	(0.83-1.09)
d1 21+ naive	0.47	(0.38-0.59)
d2 0-13 naive	0.29	(0.17-0.48)
d2 14-73 naive	0.13	(0.07-0.23)
d2 73-133 naive	0.35	(0.26-0.46)
d2 133-193 naive	0.37	(0.29-0.49)
d2 193+ naive	0.53	(0.38-0.75)
Unvaccinated infection <1yr	0.14	(0.11-0.19)
d1 0-20 infection <1yr	0.14	(0.10-0.21)
d1 21+ infection <1yr	0.08	(0.05-0.14)
d2 0-13 infection <1yr	0.12	(0.04-0.39)
d2 14-73 infection <1yr	0.16	(0.08-0.33)
d2 73-133 infection <1yr	0.08	(0.04-0.17)
d2 133-193 infection <1yr	0.08	(0.05-0.15)
d2 193+ infection <1yr	0.14	(0.03-0.73)
Unvaccinated infection >1yr	0.31	(0.16-0.62)
d1 21+ infection >1yr	0.06	(0.01-0.38)
d2 0-13 infection >1yr	0.24	(0.03-1.83)
d2 14-73 infection >1yr	0.06	(0.01-0.25)
d2 73-133 infection >1yr	0.03	(0.02-0.07)
d2 133-193 infection >1yr	0.07	(0.04-0.11)
d2 193+ infection >1yr	0.05	(0.01-0.18)
Gender		
Male	Ref	-
Female	0.90	(0.78-1.03)
Non-binary	0.41	(0.06-2.98)
Prefer not to say	0.26	(0.03-2.22)
Ethnicity groups		
White	Ref	-
Mixed Race	0.93	(0.70-1.23)
Asian	1.24	(1.04-1.48)
Black	1.68	(1.30-2.16)
Other ethnic group	0.87	(0.60-1.27)
Prefer not to say	1.30	(0.56-2.98)

SUPPLEMENTARY SENSITIVITY ANALYSES

We performed sensitivity analyses for:

1. delayed entry bias,
2. depletion-of-susceptibles bias,
3. using the date of the first positive antibody test as a proxy for primary infection date for participants excluded in the main text analysis.

As we have two (very similar) models, we have a total of 6 supplementary tables, organised in the folders named after the corresponding sensitivity analysis. We briefly explain how the analysis was performed in the corresponding sections, and we welcome request for annotated code (the code for the main model has been provided via GitHub).

All analyses gave results compatible with the models presented in the main text, but with more uncertain estimates. We reported hazard ratios (HR), protection from infection can be calculated as VE=1-HR.

Supplementary sensitivity analysis 1:

This is a sensitivity analysis to assess if having delayed entry in our cohort-study is biasing our estimates. For this sensitivity analysis we only consider participants who were enrolled at the beginning of analysis time (Dec 7th). Delayed entry is therefore removed, and we obtain comparable (but more uncertain) estimates. When hazard ratios and corresponding CI bounds are 0.00, those estimates did not converge.

The below table is relative to the naïve and positive cohort and ChAdOx1 recipients are excluded from the model.

Table S6. Output of sensitivity analysis assessing impact of delayed entry. Positive and Naïve cohort.

_t	Haz. Ratio	[95% Conf.	Interval]
x			
d1 0-20 naive	0.98	0.86	1.12
d1 21+ naive	0.45	0.35	0.59
d2 0-13 naive	0.30	0.18	0.50
d2 14-73 naive	0.17	0.08	0.34
d2 73-133 naive	0.25	0.17	0.37
d2 133-193 naive	0.35	0.25	0.49
d2 193+ naive	0.45	0.28	0.74
Unvaccinated	0.14	0.10	0.19
inf<1yr			
d1 0-20 inf<1yr	0.15	0.10	0.21
d1 21+ inf<1yr	0.08	0.05	0.15
d2 0-13 inf<1yr	0.10	0.02	0.41
d2 14-73 inf<1yr	0.00	0.00	0.00
d2 73-133 inf<1yr	0.08	0.03	0.23
d2 133-193 inf<1yr	0.10	0.04	0.25
d2 193+ inf<1yr	0.00	0.00	0.00
Unvaccinated	0.30	0.15	0.61
inf>1yr			
d1 21+ inf>1yr	0.00	0.00	0.00
d2 0-13 inf>1yr	0.22	0.03	1.72
d2 14-73 inf>1yr	0.04	0.01	0.29
d2 73-133 inf>1yr	0.03	0.01	0.06
d2 133-193 inf>1yr	0.04	0.02	0.09
d2 193+ inf>1yr	0.08	0.02	0.33
GENDER			
Female	0.94	0.80	1.10
Non-binary	0.52	0.08	3.54
Prefer not to say	0.45	0.04	4.66
ETHNIC_GR			
Mixed_Race	0.96	0.70	1.32
Asian	1.30	1.06	1.59
Black	1.78	1.34	2.35
Other_Ethnic_Group	0.96	0.67	1.38
Prefer_not	1.42	0.57	3.54

The below table is relative to the previously unifected cohort only.

Table S7. Output of sensitivity analysis assessing impact of delayed entry. Previously uninfected cohort.

_t	Haz. Ratio	[95% Conf. Interval]	
x			
d1 0-20 PF	0.74	0.64	0.85
d1 21-27 PF	0.42	0.30	0.60
d1 28-41 PF	0.33	0.22	0.47
d1 42-55 PF	0.27	0.16	0.46
d1 56+ PF	0.29	0.16	0.52
d1 0-20 AZ	0.44	0.28	0.69
d1 21-27 AZ	0.40	0.07	2.16
d1 28-41 AZ	0.16	0.03	0.90
d1 42-55 AZ	0.60	0.21	1.75
d1 56+ AZ	0.82	0.40	1.68
d2 0-13 PF_long	0.22	0.08	0.61
d2 14-73 PF_long	0.15	0.05	0.42
d2 74-133 PF_long	0.26	0.18	0.39
d2 134-193 PF_long	0.32	0.22	0.46
d2 194+ PF_long	0.61	0.33	1.11
d2 0-13 PF_short	0.25	0.14	0.45
d2 14-73 PF_short	0.11	0.06	0.23
d2 74-133 PF_short	0.18	0.04	0.81
d2 134-193 PF_short	0.46	0.25	0.86
d2 194+ PF_short	0.37	0.22	0.61
d2 14-73 AZ	0.32	0.12	0.84
d2 74-133 AZ	0.45	0.27	0.75
d2 134+ AZ	0.23	0.09	0.56
GENDER			
Female	0.94	0.81	1.10
Non-binary	0.62	0.09	4.30
Prefer not to say	0.52	0.05	5.86
ETHNIC_GR			
Mixed_Race	0.87	0.65	1.18
Asian	1.31	1.11	1.55
Black	1.88	1.42	2.49
Other_Ethnic_Group	0.89	0.62	1.27
Prefer_not	1.43	0.61	3.34

Supplementary sensitivity analysis 2.

We ran a sensitivity analysis to assess if our estimates suffer from depletion-of-susceptible bias, that can cause the observation of a spurious waning of protection. We stopped follow up time at July 31st. Results are very similar to those presented in the main text in the sense that show comparable waning. When hazard ratios and corresponding CI bounds are 0.00, those estimates did not converge.

The below table is relative to the naïve and positive cohort and ChAdOx1 recipients are excluded from the model.

Table S8. Output of sensitivity analysis assessing depletion-of- susceptibles bias. both cohorts

_t	Haz. Ratio	[95% Conf.	Interval]
x			
d1 0-20 naive	0.94	0.82	1.08
d1 21+ naive	0.44	0.35	0.56
d2 0-13 naive	0.27	0.16	0.46
d2 14-73 naive	0.12	0.06	0.21
d2 73-133 naive	0.39	0.28	0.54
d2 133-193 naive	0.45	0.31	0.64
d2 193+ naive	0.58	0.29	1.16
Unvaccinated	0.15	0.11	0.19
inf<1yr			
d1 0-20 inf<1yr	0.14	0.10	0.21
d1 21+ inf<1yr	0.09	0.05	0.15
d2 0-13 inf<1yr	0.13	0.04	0.41
d2 14-73 inf<1yr	0.19	0.09	0.37
d2 73-133 inf<1yr	0.10	0.04	0.23
d2 133-193 inf<1yr	0.14	0.03	0.57
d2 193+ inf<1yr	0.00	0.00	0.00
Unvaccinated	0.43	0.15	1.19
inf>1yr			
d1 21+ inf>1yr	0.00	0.00	0.00
d2 0-13 inf>1yr	0.31	0.04	2.44
d2 14-73 inf>1yr	0.07	0.02	0.31
d2 73-133 inf>1yr	0.05	0.02	0.09
d2 133-193 inf>1yr	0.11	0.04	0.28
d2 193+ inf>1yr	0.00	0.00	0.00
GENDER			
Female	0.90	0.77	1.05
Non-binary	0.49	0.07	3.70
Prefer not to say	0.45	0.05	3.76
ETHNIC_GR			
Mixed_Race	0.78	0.55	1.12
Asian	1.34	1.10	1.62
Black	1.76	1.34	2.32
Other_Ethnic_Group	0.89	0.58	1.37
Prefer_not	0.86	0.31	2.42

The below table is relative to the previously uninfected cohort only.

Table S9. Output of sensitivity analysis assessing depletion-of- susceptibles bias. previously uninfected cohort

_t	Haz. Ratio	[95% Conf. Interval]	
x			
d1 0-20 PF	0.72	0.62	0.82
d1 21-27 PF	0.40	0.29	0.57
d1 28-41 PF	0.32	0.22	0.45
d1 42-55 PF	0.27	0.17	0.42
d1 56+ PF	0.30	0.18	0.49
d1 0-20 AZ	0.44	0.29	0.68
d1 21-27 AZ	0.36	0.07	1.83
d1 28-41 AZ	0.14	0.03	0.79
d1 42-55 AZ	0.62	0.22	1.70
d1 56+ AZ	1.05	0.46	2.41
d2 0-13 PF_long	0.17	0.08	0.37
d2 14-73 PF_long	0.11	0.05	0.24
d2 74-133 PF_long	0.38	0.25	0.58
d2 134-193 PF_long	0.38	0.24	0.60
d2 0-13 PF_short	0.24	0.14	0.43
d2 14-73 PF_short	0.10	0.05	0.21
d2 74-133 PF_short	0.35	0.16	0.76
d2 134-193 PF_short	0.60	0.36	1.00
d2 194+ PF_short	0.48	0.23	1.01
d2 14-73 AZ	0.42	0.23	0.76
d2 74-133 AZ	0.52	0.28	0.95
d2 134+ AZ	0.86	0.05	14.41
GENDER			
Female	0.90	0.78	1.04
Non-binary	0.58	0.08	4.34
Prefer not to say	0.57	0.07	4.87
ETHNIC_GR			
Mixed_Race	0.75	0.54	1.05
Asian	1.33	1.14	1.57
Black	1.88	1.44	2.47
Other_Ethnic_Group	0.88	0.58	1.33
Prefer_not	0.97	0.42	2.27

Supplementary sensitivity analysis 3.

We ran a sensitivity analysis to assess the impact of having excluded positive cohort participants without a reliable date of primary infection, whose positivity status has been ascertained via antibody testing. In the analysis we included these participants, using the date of their first positive antibody test as a proxy for the date of primary infection. Results are comparable with those presented in the main text. The below table is relative to the naïve and positive cohort and ChAdOx1 recipients are excluded from the model.

Table S10. Output of sensitivity analysis assessing impact of excluding positive cohort participants without a reliable date of primary infection, both cohorts.

_t	Haz. Ratio	[95% Conf. Interval]	
x			
d1 0-20 naive	0.95	0.83	1.09
d1 21+ naive	0.47	0.38	0.58
d2 0-13 naive	0.28	0.17	0.48
d2 14-73 naive	0.12	0.07	0.22
d2 73-133 naive	0.35	0.27	0.45
d2 133-193 naive	0.37	0.28	0.48
d2 193+ naive	0.52	0.37	0.74
Unvaccinated inf<1yr	0.16	0.13	0.20
d1 0-20 inf<1yr	0.15	0.10	0.22
d1 21+ inf<1yr	0.11	0.07	0.17
d2 0-13 inf<1yr	0.17	0.06	0.50
d2 14-73 inf<1yr	0.21	0.12	0.37
d2 73-133 inf<1yr	0.09	0.05	0.16
d2 133-193 inf<1yr	0.07	0.04	0.12
d2 193+ inf<1yr	0.10	0.02	0.57
Unvaccinated inf>1yr	0.25	0.13	0.51
d1 21+ inf>1yr	0.05	0.01	0.29
d2 0-13 inf>1yr	0.20	0.03	1.51
d2 14-73 inf>1yr	0.05	0.01	0.21
d2 73-133 inf>1yr	0.05	0.03	0.09
d2 133-193 inf>1yr	0.06	0.04	0.10
d2 193+ inf>1yr	0.04	0.01	0.14
GENDER			
Female	0.90	0.78	1.04
Non-binary	0.38	0.05	2.73
Prefer not to say	0.25	0.03	2.15
ETHNIC_GR			
Mixed_Race	0.92	0.69	1.22
Asian	1.21	1.01	1.44
Black	1.71	1.31	2.23
Other_Ethnic_Group	0.84	0.57	1.23
Prefer_not	1.24	0.54	2.87

The below table is relative to the naïve cohort only.

Table S11. Output of sensitivity analysis assessing impact of excluding positive cohort participants without a reliable date of primary infection. Previously uninfected cohort.

_t	Haz. Ratio	[95% Conf. Interval]	
x			
d1 0-20 PF	0.72	0.63	0.83
d1 21-27 PF	0.42	0.30	0.58
d1 28-41 PF	0.35	0.25	0.49
d1 42-55 PF	0.30	0.19	0.46
d1 56+ PF	0.39	0.27	0.56
d1 0-20 AZ	0.48	0.30	0.77
d1 21-27 AZ	0.38	0.08	1.85
d1 28-41 AZ	0.15	0.03	0.85
d1 42-55 AZ	0.71	0.26	1.94
d1 56+ AZ	0.88	0.43	1.80
d2 0-13 PF_long	0.21	0.10	0.45
d2 14-73 PF_long	0.15	0.08	0.29
d2 74-133 PF_long	0.35	0.26	0.48
d2 134-193 PF_long	0.33	0.24	0.47
d2 194+ PF_long	0.51	0.31	0.82
d2 0-13 PF_short	0.24	0.14	0.43
d2 14-73 PF_short	0.11	0.06	0.22
d2 74-133 PF_short	0.43	0.22	0.85
d2 134-193 PF_short	0.51	0.34	0.74
d2 194+ PF_short	0.49	0.32	0.75
d2 14-73 AZ	0.42	0.23	0.78
d2 74-133 AZ	0.50	0.35	0.72
d2 134+ AZ	0.29	0.13	0.63
GENDER			
Female	0.91	0.80	1.04
Non-binary	0.44	0.06	3.26
Prefer not to say	0.30	0.03	2.61
ETHNIC_GR			
Mixed_Race	0.88	0.67	1.15
Asian	1.26	1.08	1.47
Black	1.78	1.37	2.31
Other_Ethnic_Group	0.87	0.62	1.24
Prefer_not	1.39	0.63	3.06