

Supplementary Data

Table 1 Demographic characteristics of solid organ and islet transplant recipients receiving two vaccine doses, by vaccine type.

Variable	Vaccine type				p-value
	Two doses – AZ		Two doses – PF		
	N	%	N	%	
Total	22788	58	16472	42	
Transplant type					<0.0001
Kidney ^a	15916	56.8	12100	43.2	
SPK ^b	904	59.6	614	40.4	
Liver	4105	60.8	2642	39.2	
Heart	1041	61.6	649	38.4	
Lung ^c	687	64.7	375	35.3	
Intestinal and multi-organ ^d	135	59.5	92	40.5	
Ethnicity					0.003
Asian	2514	58.2	1804	41.8	
Black	1100	58.9	768	41.1	
Other	547	53.4	478	46.6	
Unknown	1110	55.4	892	44.6	
White	17517	58.3	12530	41.7	
Age					0.39
16-49	7532	58.4	5376	41.6	
50+	15256	57.9	11096	42.1	
Sex					0.70
Male	13861	58.1	9987	41.9	
Female	8927	57.9	6485	42.1	
Time from transplant					0.43
<90 days	338	57	255	43.0	
90 days - 1 year	993	56.7	759	43.3	
>1 year	21457	58.1	15458	41.9	
Region					<0.0001
East of England	2935	60.9	1882	39.1	
London	3319	50.8	3214	49.2	
Midlands	4283	59.9	2868	40.1	
North East and Yorkshire	3933	62.6	2354	37.4	
North West	2365	50.9	2283	49.1	
South East	3493	58.7	2453	41.3	
South West	2460	63.4	1418	36.6	

^a Includes single kidney, en-bloc kidney and double kidney transplants

^b Simultaneous pancreas-kidney transplants, including pancreas only, islet only and simultaneous islet-kidney transplants

^c Includes single lung, double lung, partial lung and heart-lung transplants

^d Includes if any other organ was transplanted with the intestine as well as liver-kidney, heart-lung-liver, liver-pancreas, heart-kidney, heart-liver, and lung-liver transplants

Table 2 Demographic characteristics of solid organ and islet transplant recipients with laboratory-confirmed SARS-CoV-2 infection and death within 28 days, by vaccination status and vaccine type.

Variable	Unvaccinated			Two vaccine doses (AZ)			Two vaccine doses (PF)			p-value
	Cases	Deaths		Cases	Deaths		Cases	Deaths		
	N	N	%	N	N	%	N	N	%	
Total	2575	269	10.4	809	58	7.2	505	50	9.9	
Transplant type										0.05
Kidney ^a	1985	209	10.5	574	41	7.1	386	37	9.6	
SPK ^b	84	7	8.3	36	0	0	25	2	8	
Liver	370	29	7.8	116	5	4.3	58	7	12.1	
Heart	72	9	12.5	50	2	4	24	3	12.5	
Lung ^c	58	15	25.9	31	10	32.3	10	1	10	
Intestinal and multi-organ ^d	6	0	0	2	0	0	2	0	0	
Ethnicity										0.37
Asian	567	57	10.1	117	10	8.5	50	5	10	
Black	214	30	14	48	5	10.4	31	5	16.1	
Other	82	7	8.5	15	0	0	9	0	0	
Unknown	114	14	12.3	28	2	7.1	22	2	9.1	
White	1598	161	10.1	601	41	6.8	393	38	9.7	
Age group										0.12
16-49 years	1019	30	2.9	377	12	3.2	216	5	2.3	
50+ years	1556	239	15.4	432	46	10.6	289	45	15.6	
Sex										0.85
Male	1540	175	11.4	492	39	7.9	307	31	10.1	
Female	1035	94	9.1	317	19	6	198	19	9.6	
Time from transplant										0.11
<90 days	76	14	18.4	7	0	0	5	0	0	
90 days - 1 year	144	12	8.3	30	1	3.3	32	1	3.1	
>1 year	2355	243	10.3	772	57	7.4	468	49	10.5	
Region										0.08
East of England	220	38	17.3	83	7	8.4	45	3	6.7	
London	608	50	8.2	103	5	4.9	89	8	9	
Midlands	533	50	9.4	165	17	10.3	81	9	11.1	
North East and Yorkshire	378	37	9.8	202	16	7.9	96	7	7.3	
North West	383	43	11.2	107	6	5.6	99	10	10.1	
South East	322	34	10.6	77	3	3.9	54	9	16.7	
South West	131	17	13	72	4	5.6	41	4	9.8	

AZ – Oxford University-AstraZeneca ChAdOx1-S

PF – Pfizer-BioNTech BNT162b2

^a Includes single kidney, en-bloc kidney and double kidney transplants

^b Simultaneous pancreas-kidney transplants, including pancreas only, islet only and simultaneous islet-kidney transplants

^c Includes single lung, double lung, partial lung and heart-lung transplants

^d Includes if any other organ was transplanted with the intestine as well as liver-kidney, heart-lung-liver, liver-pancreas, heart-kidney, heart-liver, and lung-liver transplants

Table 3 SARS-CoV-2 infection incidence rates and risk-adjusted incidence rate ratios in solid organ and islet transplant recipients by demographic variables, 1st June 2021 to 31st August 2021.

Variable	Unvaccinated		Two vaccine doses		Risk-adjusted incidence rate ratio (95% CI)	p-value
	Cases	Incidence rate per 100,000 person-days	Cases	Incidence rate per 100,000 person-days		
Transplant type						
Kidney ^a	66	39.3	933	40.1	1.00 (reference)	
SPK ^b	1	10.8	60	47.2	1.10 (0.85-1.42)	0.48
Liver	14	27.9	173	30.6	0.83 (0.71-0.96)	0.01
Heart	2	18.2	72	50.3	1.20 (0.95-1.51)	0.13
Lung ^c	1	16.4	41	45.7	1.10 (0.81-1.50)	0.53
Intestinal and multi-organ ^d	1	40.2	4	20.4	0.54 (0.22-1.30)	0.17
Ethnicity						
White	42	28.0	973	38.2	1.00 (reference)	
Asian	21	57.5	160	48.5	1.29 (1.10-1.51)	0.002
Black	17	42.5	77	53.5	1.58 (1.26-1.96)	<0.0001
Other	4	36.8	24	29.1	0.88 (0.61-1.27)	0.49
Unknown	1	10.3	49	28.9	0.81 (0.61-1.07)	0.14
Age group						
16-49 years	56	47.5	585	56.1	1.00 (reference)	
50+ years	29	22.5	698	31.3	0.57 (0.52-0.64)	<0.0001
Sex						
Male	46	29.9	783	39.3	1.00 (reference)	
Female	39	41.8	500	39.1	1.01 (0.91-1.13)	0.82
Time from transplant						
<90 days	1	242.1	12	25.6	0.57 (0.32-1.01)	0.05
90 days - 1 year	8	76.6	60	44.3	1.12 (0.87-1.40)	0.40
>1 year	76	32.2	1211	39.2	1.00 (reference)	
Region						
East of England	7	30.1	125	30.3	0.98 (0.79-1.23)	0.88
London	20	27.9	189	35.9	1.00 (reference)	
Midlands	18	45.4	242	40.9	1.32 (1.09-1.58)	0.004
North East and Yorkshire	15	43.1	290	55.7	1.73 (1.46-2.10)	<0.0001
North West	19	63.5	196	52.0	1.68 (1.39-2.06)	<0.0001
South East	4	13.4	128	25.3	0.78 (0.63-0.99)	0.04
South West	2	11.2	113	33.6	1.07 (0.86-1.38)	0.46
Month						
June	14	16.4	85	7.9	0.16 (0.13-0.20)	<0.0001
July	33	39.4	555	49.5	0.82 (0.74-0.92)	0.0004
August	38	49.0	643	59.7	1.00 (reference)	

^a Includes single kidney, en-bloc kidney and double kidney transplants

^b Simultaneous pancreas-kidney transplants, including pancreas only, islet only and simultaneous islet-kidney transplants

^c Includes single lung, double lung, partial lung and heart-lung transplants

^d Includes if any other organ was transplanted with the intestine as well as liver-kidney, heart-lung-liver, liver-pancreas, heart-kidney, heart-liver, and lung-liver transplants

Table 4 Risk-adjusted survival model for death within 28 days of a laboratory-confirmed SARS-CoV-2 infection in solid organ and islet transplant recipients.

Variable	Cases	Deaths		Hazard ratio	95% hazard ratio confidence limits	p-value
		N	%			
Vaccination status						
No vaccine	2575	269	10.4	1	-	-
Two vaccine doses	1314	108	8.2	0.8	0.63 - 1	0.05
Age (years)						
16-49	1661	46	2.8	1	-	-
50+	2486	361	14.5	5.4	3.94 - 7.41	<0.0001
Sex						
Male	2496	265	10.6	1	-	-
Female	1651	142	8.6	0.87	0.7 - 1.07	0.2
Time from transplant (p=0.16)						
More than 1 year	3827	378	9.9	1	-	-
Up to 90 days	96	15	15.6	1.55	0.91 - 2.66	0.1
90 days to 1 year	224	14	6.3	0.75	0.44 - 1.28	0.3
Ethnicity (p=0.02)						
White	2753	258	9.4	1	-	-
Asian	795	81	10.2	1.27	0.96 - 1.67	0.09
Black	309	42	13.6	1.86	1.28 - 2.7	0.001
Other	117	8	6.8	0.73	0.32 - 1.66	0.5
Unknown	173	18	10.4	1.07	0.66 - 1.73	0.8
Transplant type (p<.0001)						
Kidney ^a	3136	309	9.9	1	-	-
SPK ^b	155	9	5.8	0.65	0.34 - 1.27	0.21
Liver	577	45	7.8	0.77	0.55 - 1.07	0.12
Heart	158	16	10.1	1.19	0.69 - 2.04	0.53
Lung ^c	107	27	25.2	3.21	2.14 - 4.83	<0.0001
Intestinal + multi-organ ^d	14	1	7.1	-	-	*
Region (p=0.004)						
London	841	69	8.2	1	-	-
North East and Yorkshire	732	65	8.9	1.42	0.97 - 2.09	0.07
North West	632	64	10.1	1.67	1.14 - 2.45	0.008
Midlands	841	86	10.2	1.55	1.09 - 2.2	0.02
East of England	370	50	13.5	2.38	1.59 - 3.55	<0.0001
South East	474	48	10.1	1.59	1.06 - 2.38	0.02
South West	257	25	9.7	1.81	1.11 - 2.98	0.02

^a Includes single kidney, en-bloc kidney and double kidney transplants

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^d Includes if any other organ was transplanted with the intestine as well as liver-kidney, heart-lung-liver, liver-pancreas, heart-kidney, heart-liver, and lung-liver transplants

*Unable to estimate due to insufficient events

Table 5 Risk-adjusted survival model for death within 28 days of a laboratory-confirmed SARS-CoV-2 infection in solid organ and islet transplant recipients, including vaccine type.

Variable	Cases	Deaths		Hazard ratio	95% hazard ratio confidence limits	p-value
		N	%			
Vaccination status (p=0.003)						
No vaccine	2575	269	10.4	1	-	-
Two vaccine doses - AZ	809	58	7.2	0.69	0.52 - 0.92	0.01
Two vaccine doses - PF	505	50	9.9	0.97	0.71 - 1.31	0.8
Age (years)						
16-49	1661	46	2.8	1	-	-
50+	2486	361	14.5	5.38	3.92 - 7.38	<0.0001
Sex						
Male	2496	265	10.6	1	-	-
Female	1651	142	8.6	0.87	0.7 - 1.07	0.2
Time from transplant (p=0.16)						
More than 1 year	3827	378	9.9	1	-	-
Up to 90 days	96	15	15.6	1.54	0.9 - 2.63	0.1
90 days to 1 year	224	14	6.3	0.74	0.43 - 1.27	0.3
Ethnicity (p=0.016)						
White	2753	258	9.4	1	-	-
Asian	795	81	10.2	1.28	0.97 - 1.68	0.08
Black	309	42	13.6	1.87	1.29 - 2.71	0.001
Other	117	8	6.8	0.74	0.33 - 1.67	0.5
Unknown	173	18	10.4	1.06	0.65 - 1.72	0.8
Transplant type (p<.0001)						
Kidney ^a	3136	309	9.9	1	-	-
SPK ^b	155	9	5.8	0.66	0.34 - 1.28	0.2
Liver	577	45	7.8	0.77	0.56 - 1.08	0.1
Heart	158	16	10.1	1.18	0.69 - 2.02	0.6
Lung ^c	107	27	25.2	3.27	2.18 - 4.91	<0.0001
Intestinal + multi-organ ^d	14	1	7.1	-	-	*
Region (p=0.004)						
London	841	69	8.2	1	-	-
North East and Yorkshire	732	65	8.9	1.45	0.99 - 2.13	0.06
North West	632	64	10.1	1.66	1.14 - 2.44	0.009
Midlands	841	86	10.2	1.56	1.1 - 2.23	0.01
East of England	370	50	13.5	2.39	1.6 - 3.57	<0.0001
South East	474	48	10.1	1.6	1.07 - 2.39	0.02
South West	257	25	9.7	1.84	1.12 - 3.01	0.02

AZ – Oxford University-AstraZeneca ChAdOx1-S

PF – Pfizer-BioNTech BNT162b2

^a Includes single kidney, en-bloc kidney and double kidney transplants

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^c Includes single lung, double lung, partial lung and heart-lung transplants

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*Unable to estimate due to insufficient events

Figure 1 Time from effective date of second vaccination to laboratory-confirmed SARS-CoV-2 infection.

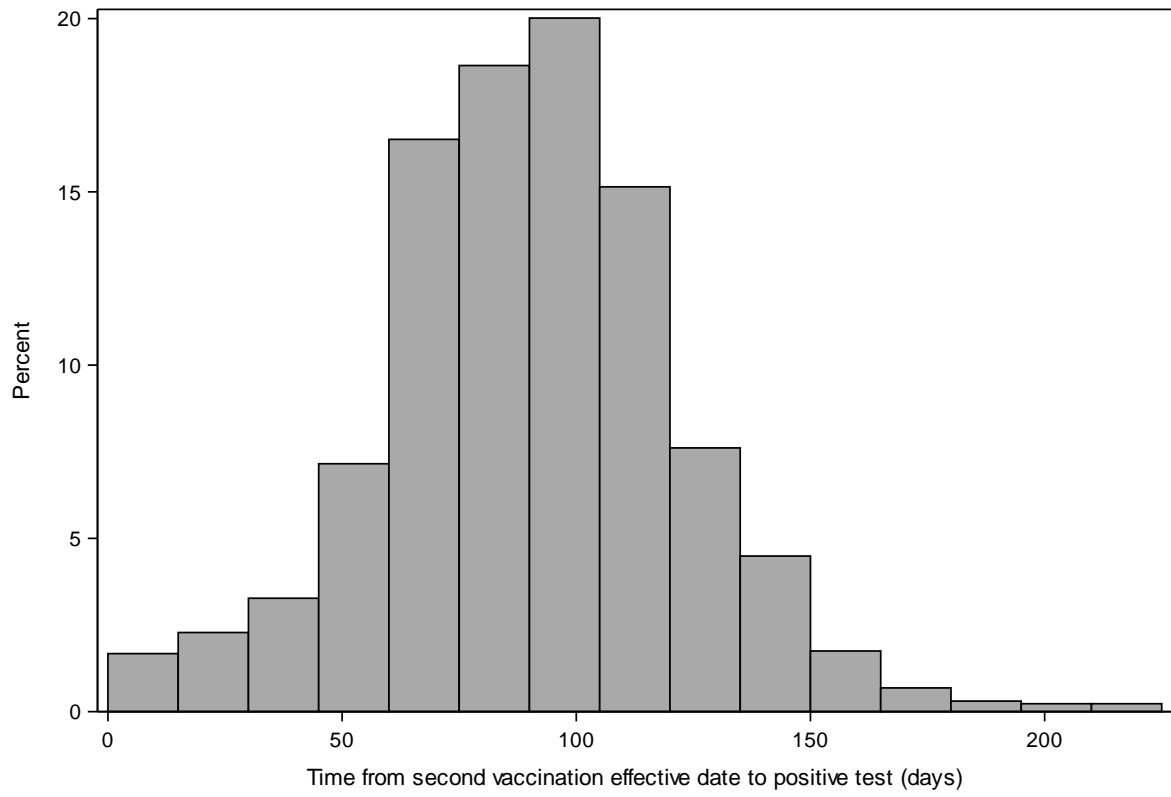


Figure 2 SARS-CoV-2 infections and deaths within 28 days in unvaccinated and vaccinated solid organ and islet transplant recipients, by demographic characteristics. Total number of cases and number of deaths are shown on each bar.

