



Blood and Transplant

**ANNUAL REPORT ON LIVING DONOR KIDNEY
TRANSPLANTATION**

**REPORT FOR 2023/2024
(1 APRIL 2009 – 31 MARCH 2024)**

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Executive Summary

This report presents key figures about living donor kidney transplantation in the UK. The period reported covers 15 years of transplant data, from 1 April 2009. The report presents information on the number of transplants, follow-up data and survival analysis on a national and centre-specific basis.

Key findings

- There were 832 adult living donor kidney transplants performed in the UK in 2023/24, a decrease of 3 transplants compared to 2022/23. Of these, 410 (392 in 2022/23) were genetically related, 199 (176 in 2022/23) were unrelated, 2 (3 in 2022/23) were HLAi, 26 (17 in 2022/23) were ABOi, 149 (167 in 2022/23) were paired/pooled and 46 (80 in 2022/23) were non-directed altruistic donor transplants. The equivalent number of paediatric transplants was 76, one transplant less than the previous year.
- The proportion of living donors across the UK being prescribed anti-hypertensive drugs is 6% at five years and 11% at ten years post donation.
- Serum creatinine for living donors in the UK is 97 (84-112) at five years and 92 (79-107) at ten years post donation.
- The UK rate of graft survival five years after adult living donor kidney transplant by type is; unrelated 94%, genetically related 94%, non-directed altruistic 89%, paired exchange 92%, ABOi 93% and HLAi 83%.
- 48% of registered recipients in the UK Living Kidney Sharing Scheme have been transplanted and 70% of identified transplants proceed.

Use of the contents of this report should be acknowledged as follows:
Annual Report on Living Donor Kidney Transplantation 2023/24. NHS Blood and Transplant

Introduction

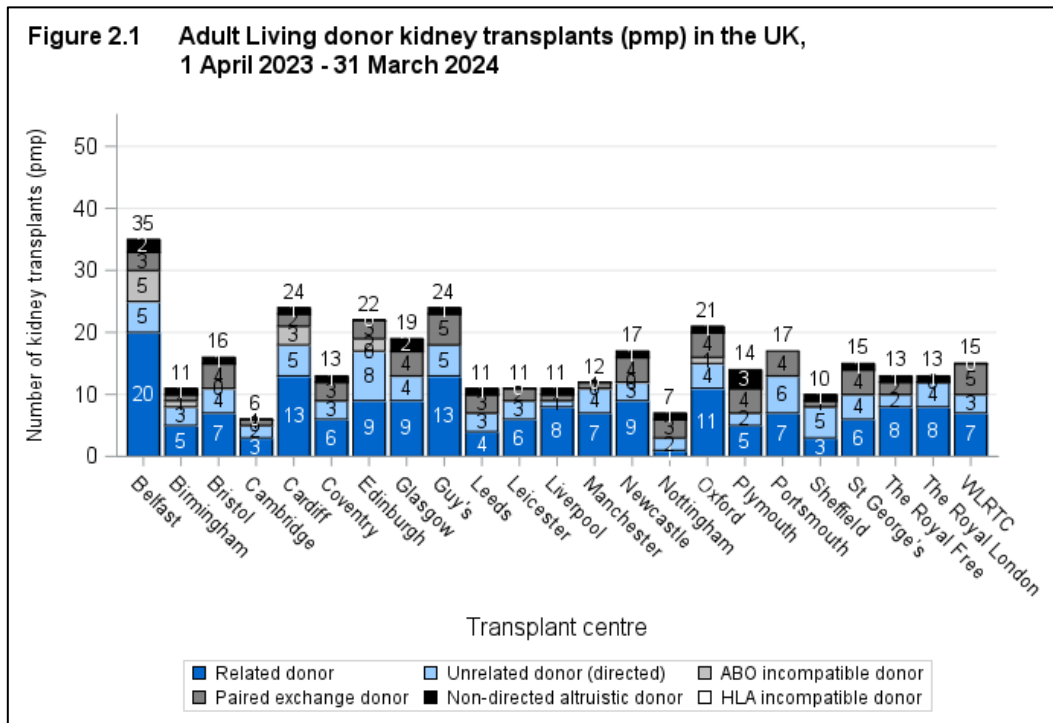
This report presents information on transplant activity between 1 April 2009 and 31 March 2024, for all 24 centres performing living donor kidney transplantation in the UK. Data were obtained from the UK Transplant Registry, at NHS Blood & Transplant, that holds information relating to donors, recipients and outcomes for all kidney transplants performed in the UK.

Graft and patient survival estimates are reported at one-year post transplant for the period 1 April 2019 to 31 March 2023 and five-year post-transplant for the period 1 April 2015 to 31 March 2019. Results are described separately according to the type of donor.

Throughout this report West London Renal and Transplant Centre is labeled as WLRTC and Great Ormond Street Hospital is labelled as GOSH.

The COVID-19 pandemic has led to unprecedented challenges for UK transplantation. Concerns about the ability to care for transplant recipients, lack of access to resource, and the risk versus benefit for immunosuppressed transplant recipients, have resulted in a major reduction in the number of organ transplants undertaken.

Figure 2.1 shows the number of adult living donor kidney transplants per million population (pmp) that were performed in 2023/24 in each transplant centre.



ADULT

Figure 2.2 shows the number of adult living donor kidney transplants performed in the UK between 1 April 2009 and 31 March 2024.

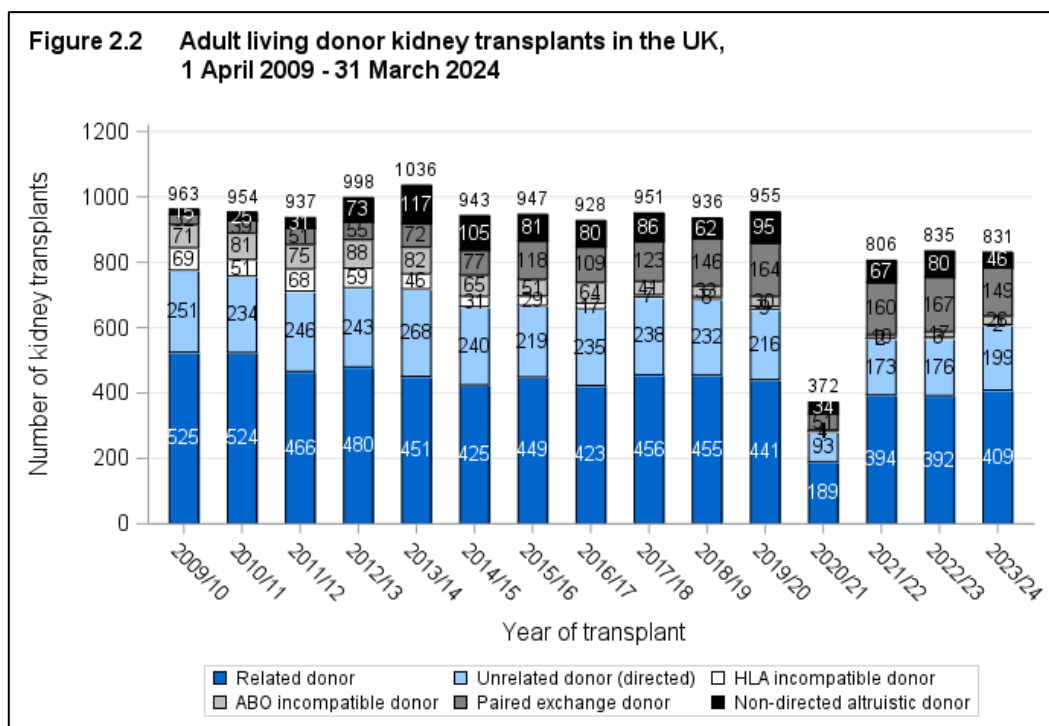


Figure 2.3 and Table 2.1 show the number of adult living donor kidney transplants performed in 2023/24 in each transplant centre.

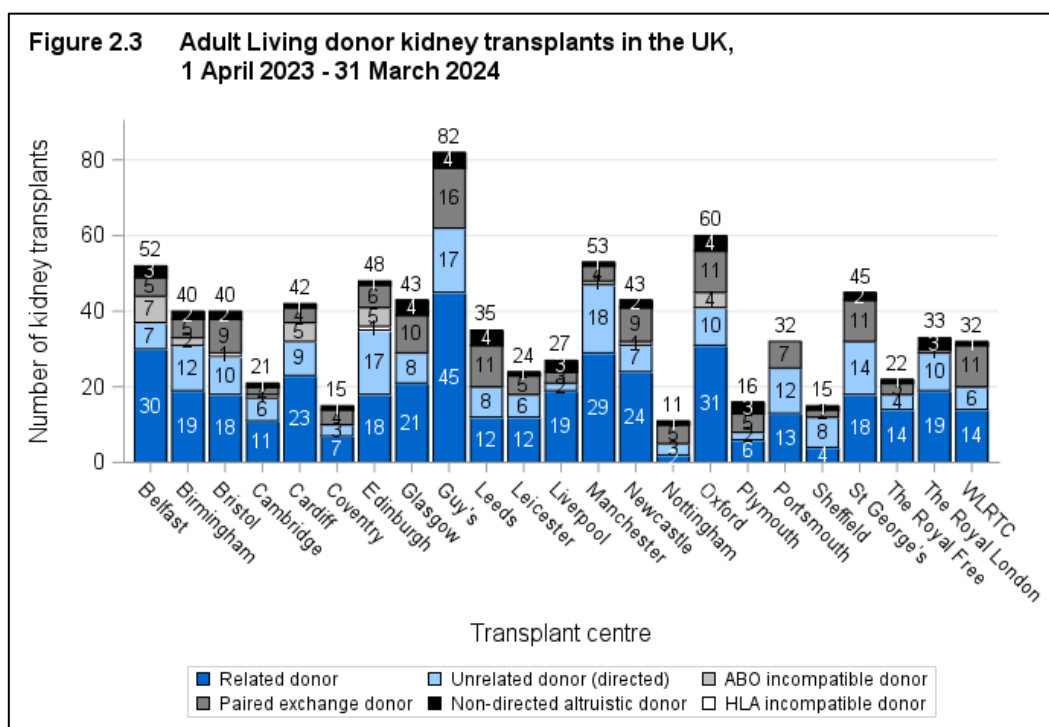


Table 2.1 Adult living donor kidney transplants in the UK, 1 April 2023 - 31 March 2024

Transplant Centre	Donor type					
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	Non-directed altruistic donor
Belfast	30	7	0	7	5	3
Birmingham	19	12	0	2	5	2
Bristol	18	10	1	0	9	2
Cambridge	11	6	0	1	2	1
Cardiff	23	9	0	5	4	1
Coventry	7	3	0	0	4	1
Edinburgh	18	17	1	5	6	1
Glasgow	21	8	0	0	10	4
Guy's	45	17	0	0	16	4
Leeds	12	8	0	0	11	4
Leicester	12	6	0	0	5	1
Liverpool	19	2	0	0	3	3
Manchester	29	18	0	1	4	1
Newcastle	24	7	0	1	9	2
Nottingham	2	3	0	0	5	1
Oxford	31	10	0	4	11	4
Plymouth	6	2	0	0	5	3
Portsmouth	13	12	0	0	7	0
Sheffield	4	8	0	0	2	1
St George's	18	14	0	0	11	2
The Royal Free	14	4	0	0	3	1
The Royal London	19	10	0	0	1	3
WLRTC	14	6	0	0	11	1

Figure 2.4 shows the proportion of adult living donor kidney transplants by donor type and centre in 2023/2024.

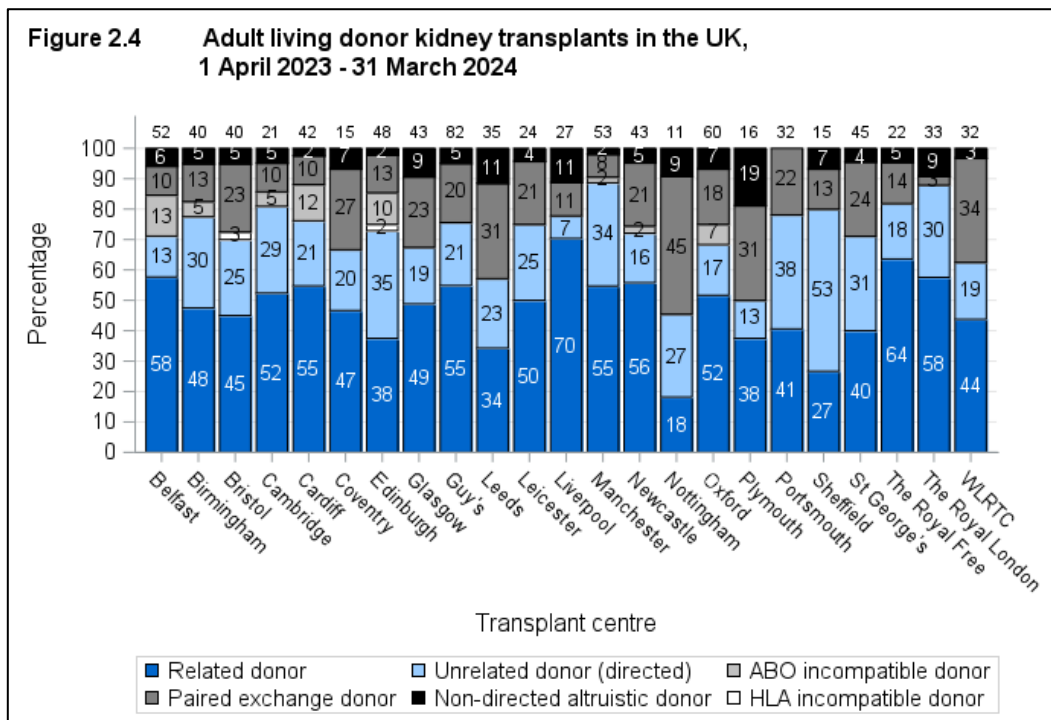
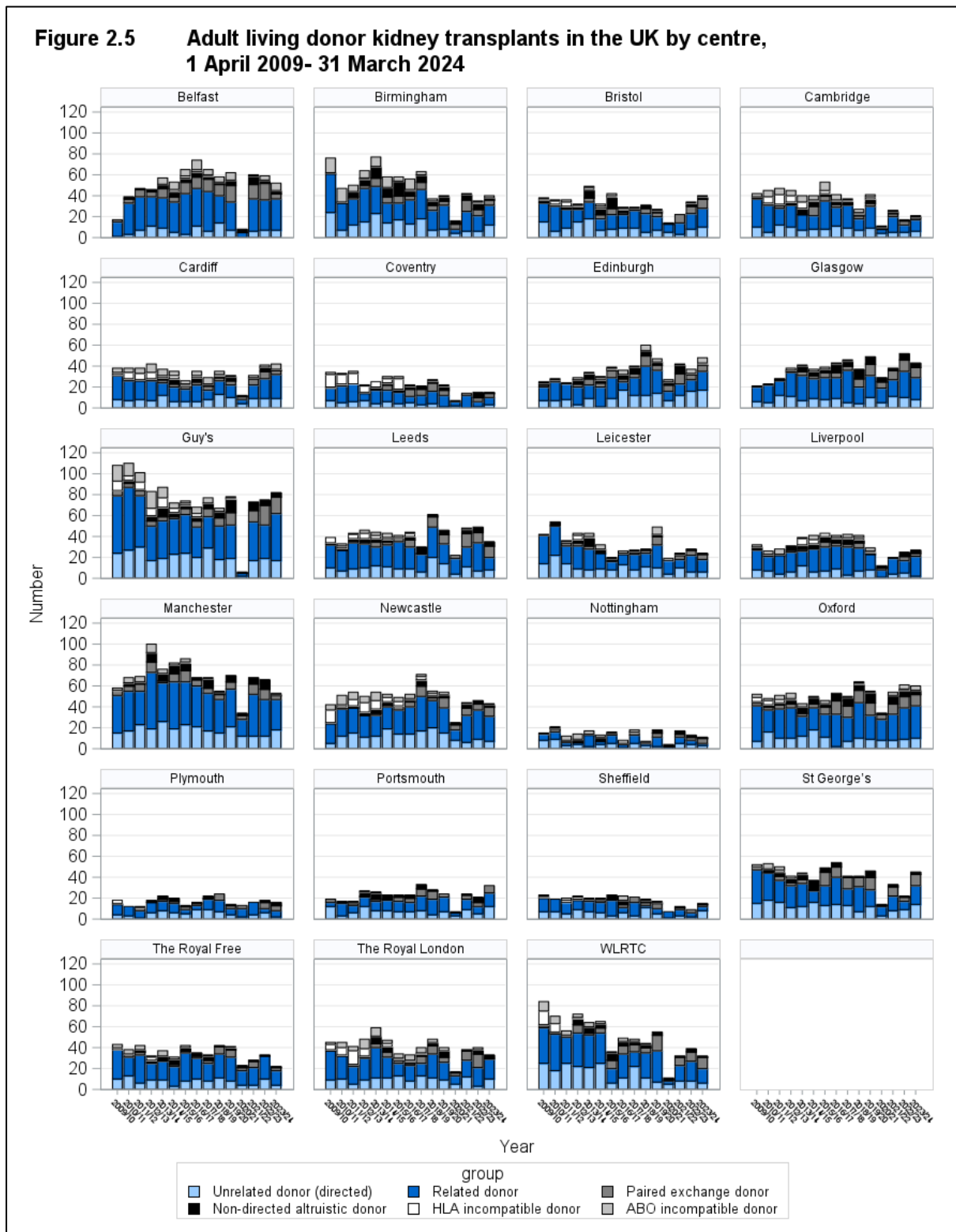


Figure 2.5 shows the number of adult living donor kidney transplants by donor type and centre between 1 April 2009 and 31 March 2024.



PAEDIATRIC

Figure 2.6 shows the number of paediatric living donor kidney transplants performed in the UK between 1 April 2009 and 31 March 2024.

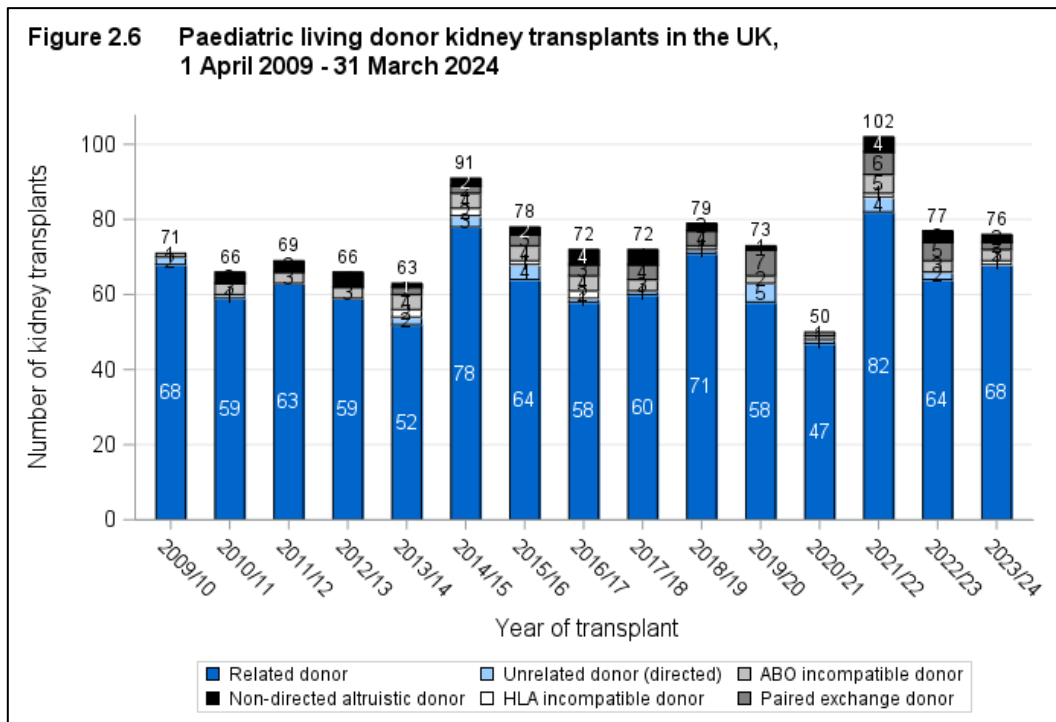


Figure 2.7 and Table 2.2 show the number of paediatric living donor kidney transplants performed in 2023/24 in each transplant centre.

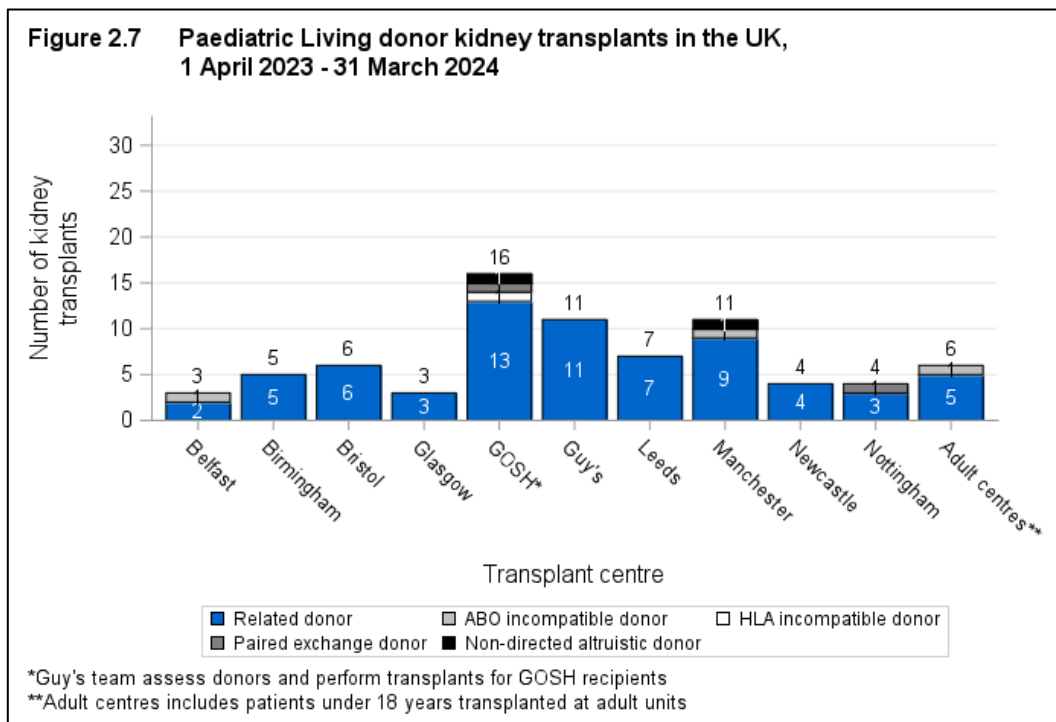


Table 2.2 Paediatric living donor kidney transplants in the UK, 1 April 2023 - 31 March 2024

Transplant Centre	Donor type					
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	Non-directed altruistic donor
Belfast	2	0	0	1	0	0
Birmingham	5	0	0	0	0	0
Bristol	6	0	0	0	0	0
GOSH*	13	0	1	0	1	1
Glasgow	3	0	0	0	0	0
Guy's	11	0	0	0	0	0
Leeds	7	0	0	0	0	0
Manchester	9	0	0	1	0	1
Newcastle	4	0	0	0	0	0
Nottingham	3	0	0	0	1	0
Adult centres**	5	0	0	1	0	0

*Guy's team assess donors and perform transplants for GOSH recipients.

**Adult centres includes recipients under 18 years transplanted at adult units

Figure 2.8 shows the proportion of paediatric living donor kidney transplants by donor type and centre in 2023/24.

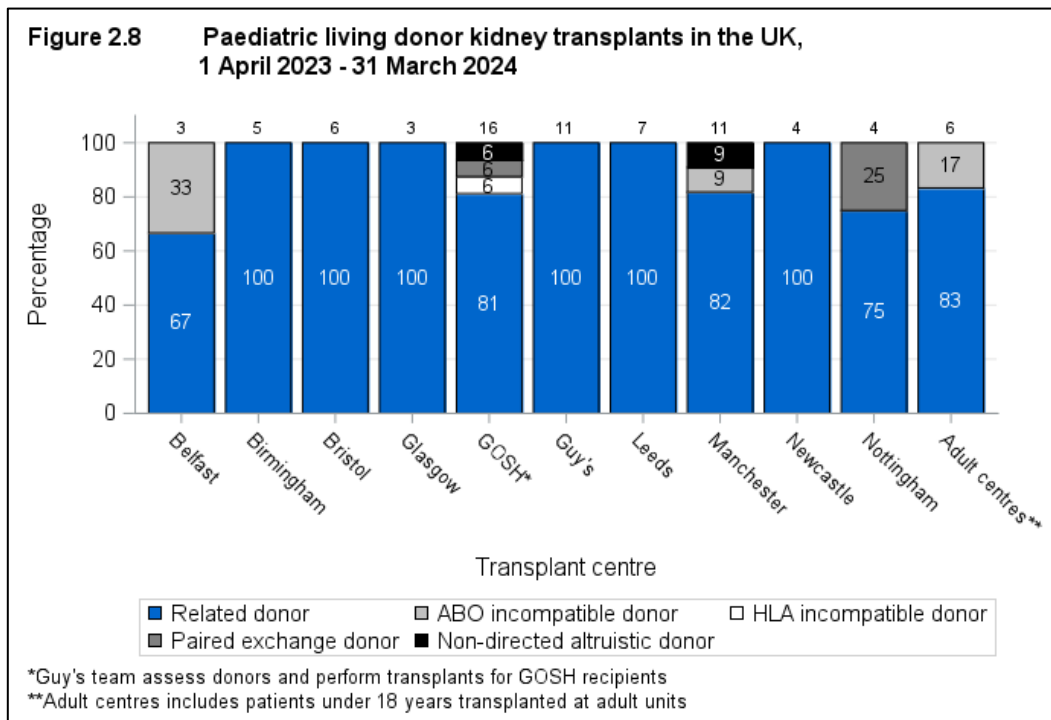
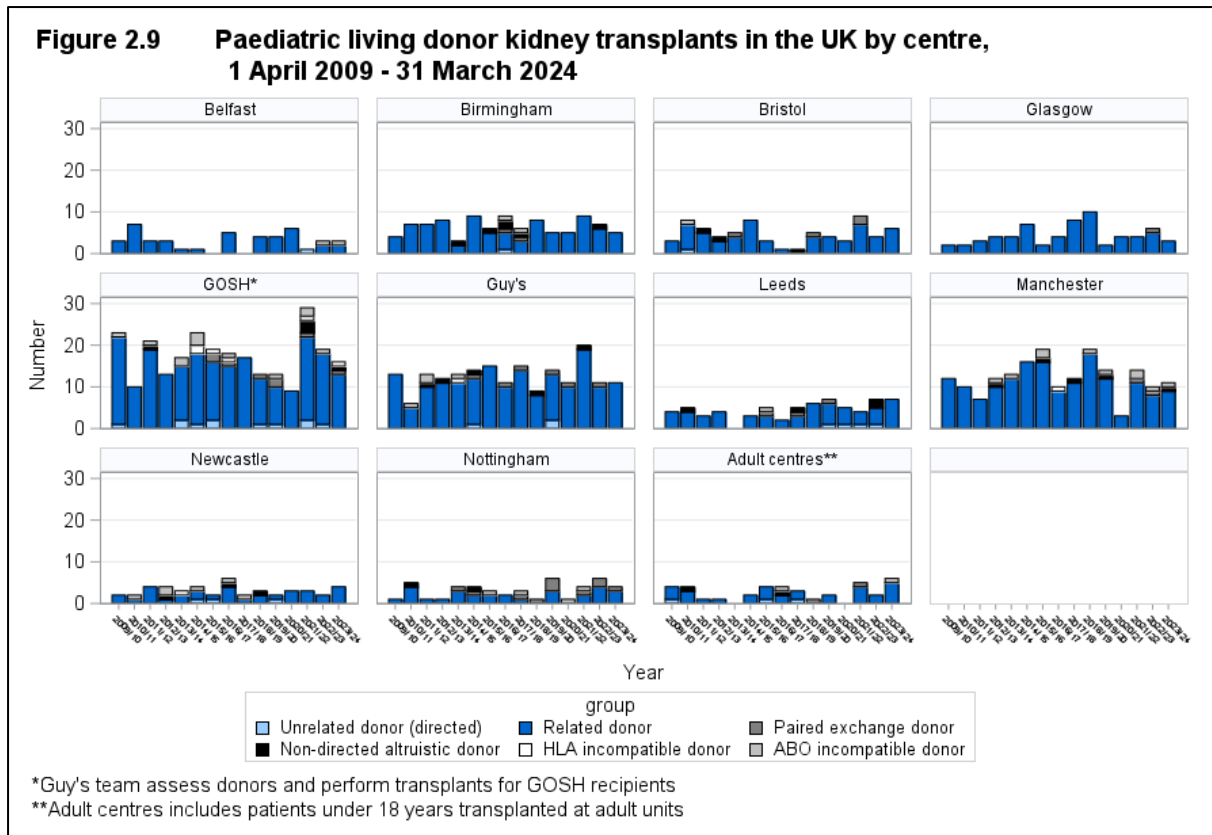


Figure 2.9 shows the number of paediatric living donor kidney transplants by donor type and centre between 1 April 2009 and 31 March 2024.



Demographic Characteristics

ADULT

The sex, ethnicity, age group, sensitisation (cRF), cRF by transplant type for HSP, blood group, dialysis status of donors and recipients of adult living donor kidney transplants and pre-emptive transplant rates are shown by centre in **Figure 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7** and **3.8** respectively. Note that all percentages quoted are based only on data where relevant information was available.

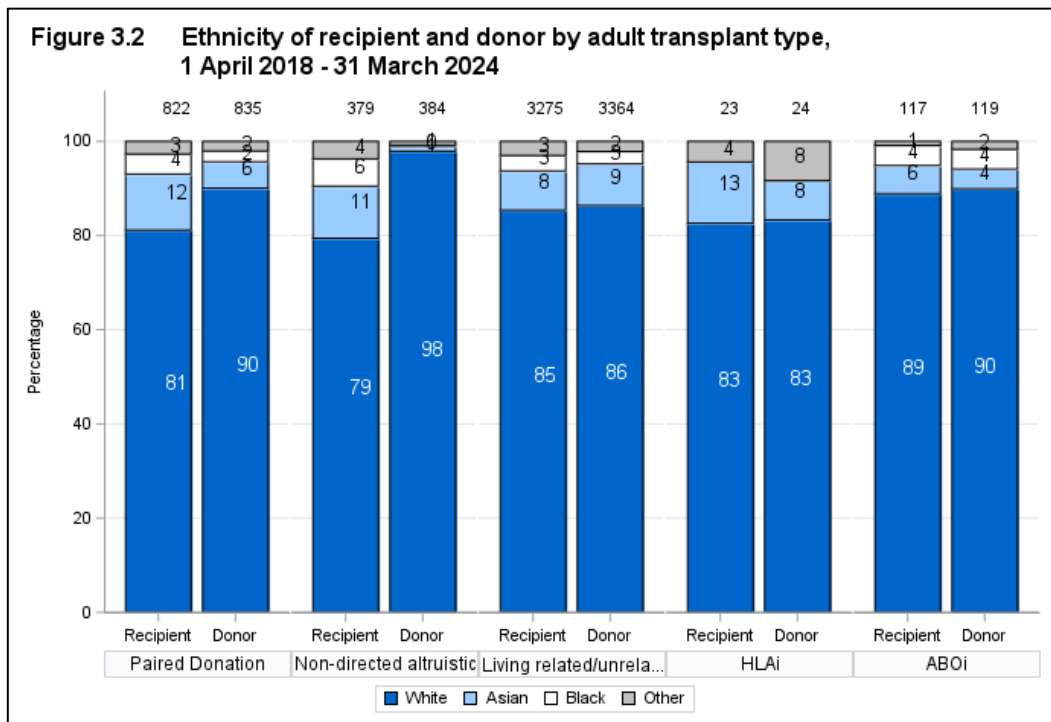
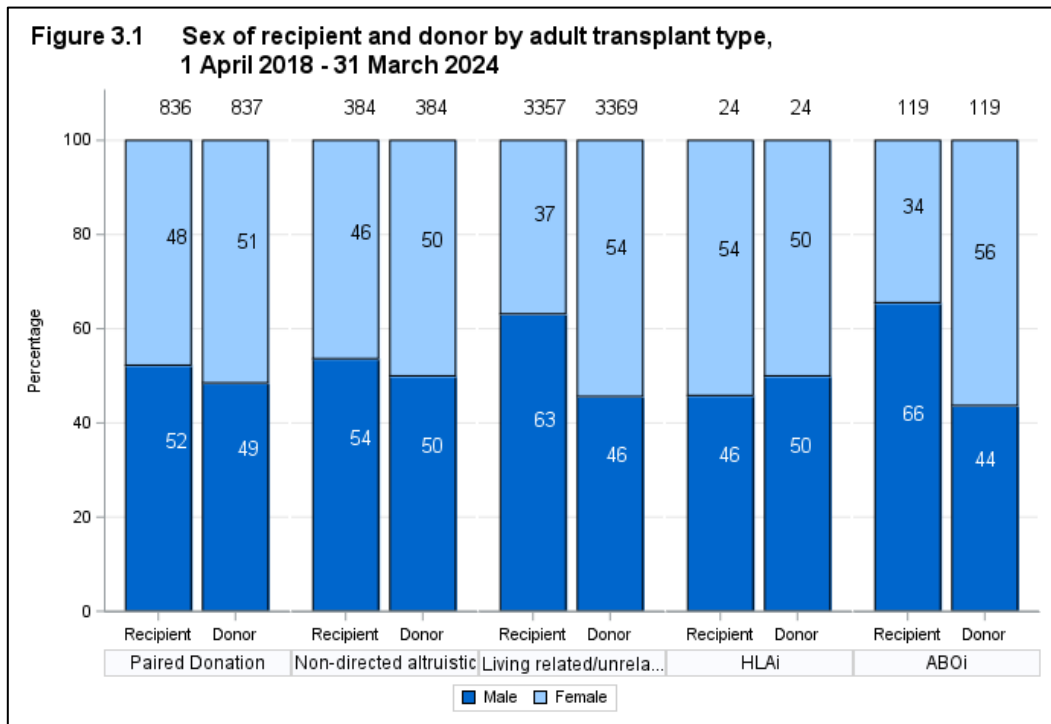


Figure 3.3 Age of recipient and donor by adult transplant type, 1 April 2018 - 31 March 2024

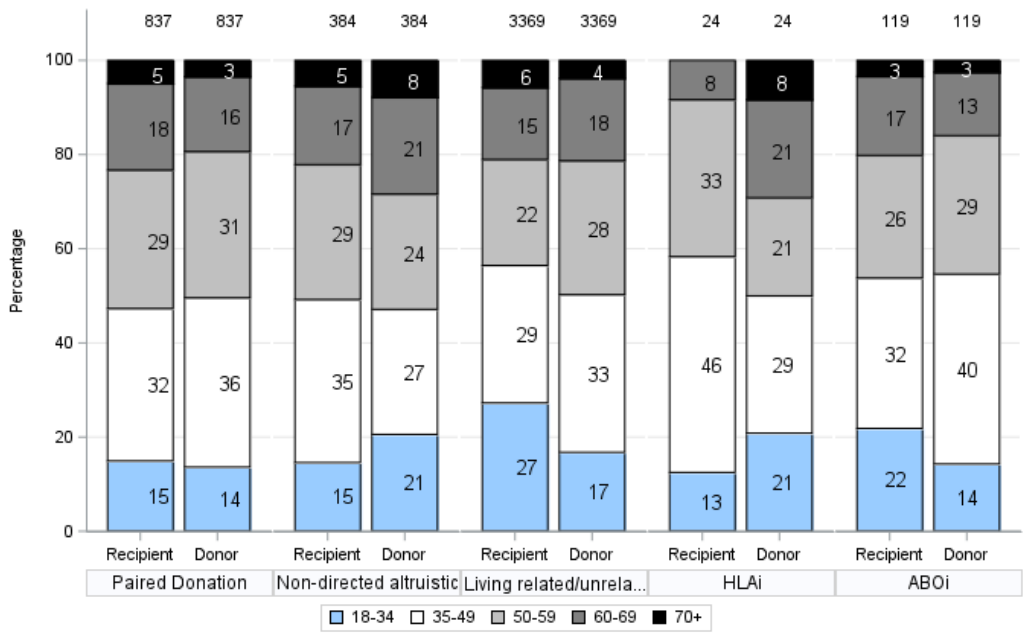


Figure 3.4 Recipient Calculated Reaction Frequency by adult transplant type 1 April 2018 - 31 March 2024

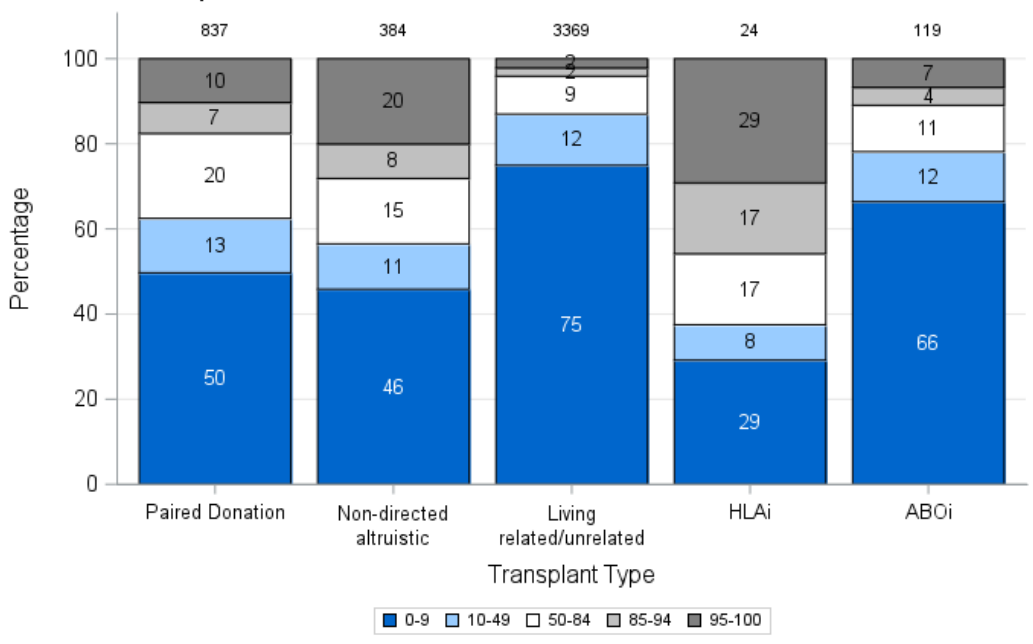


Figure 3.5 Adult HSP by transplant type and year of transplant, 1 April 2018 - 31 March 2024

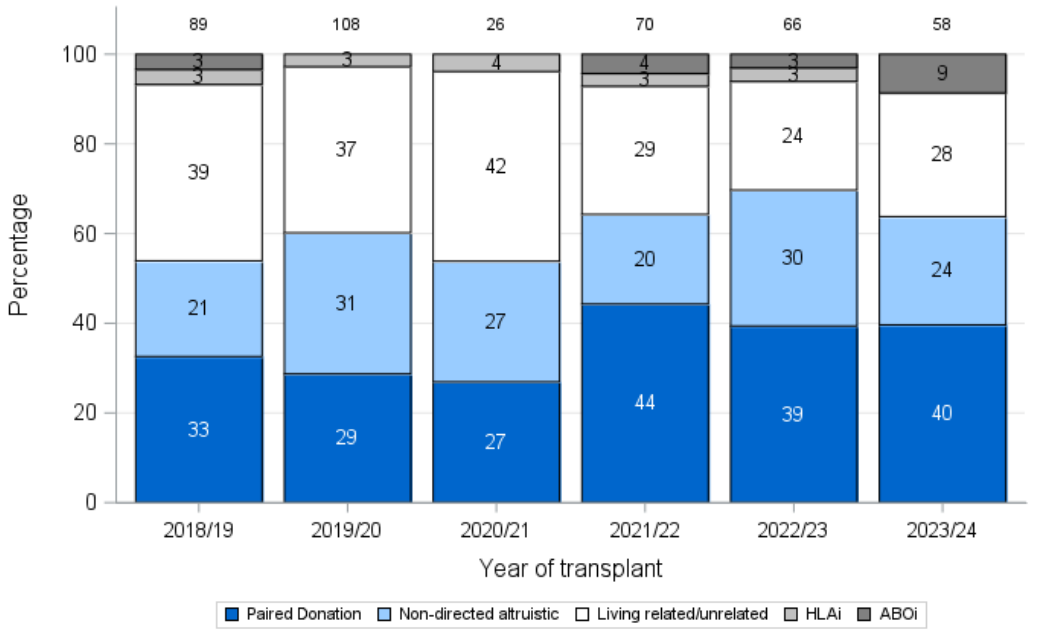
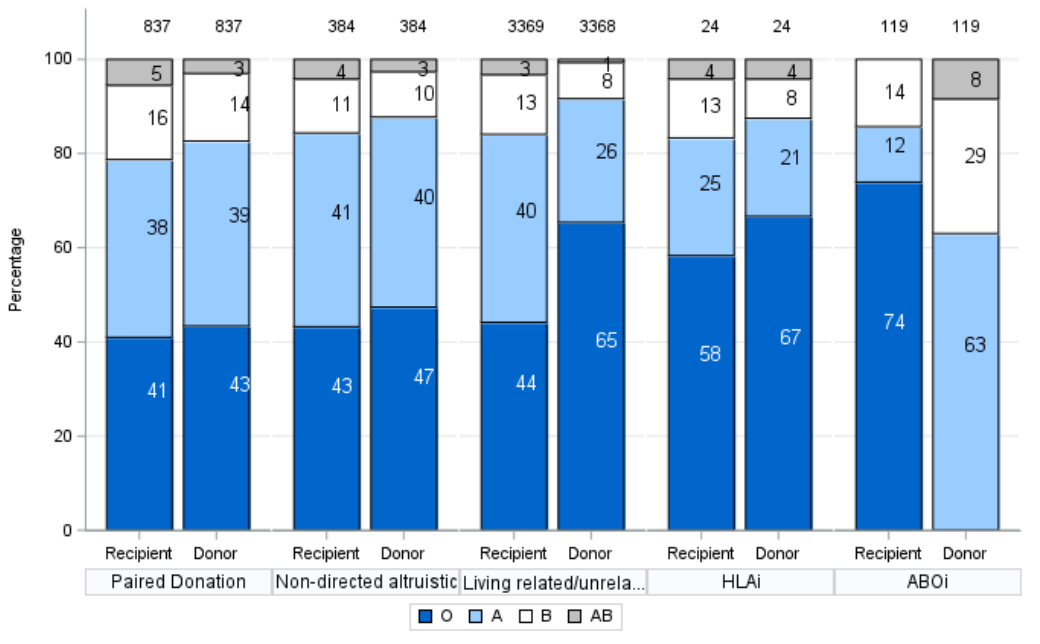
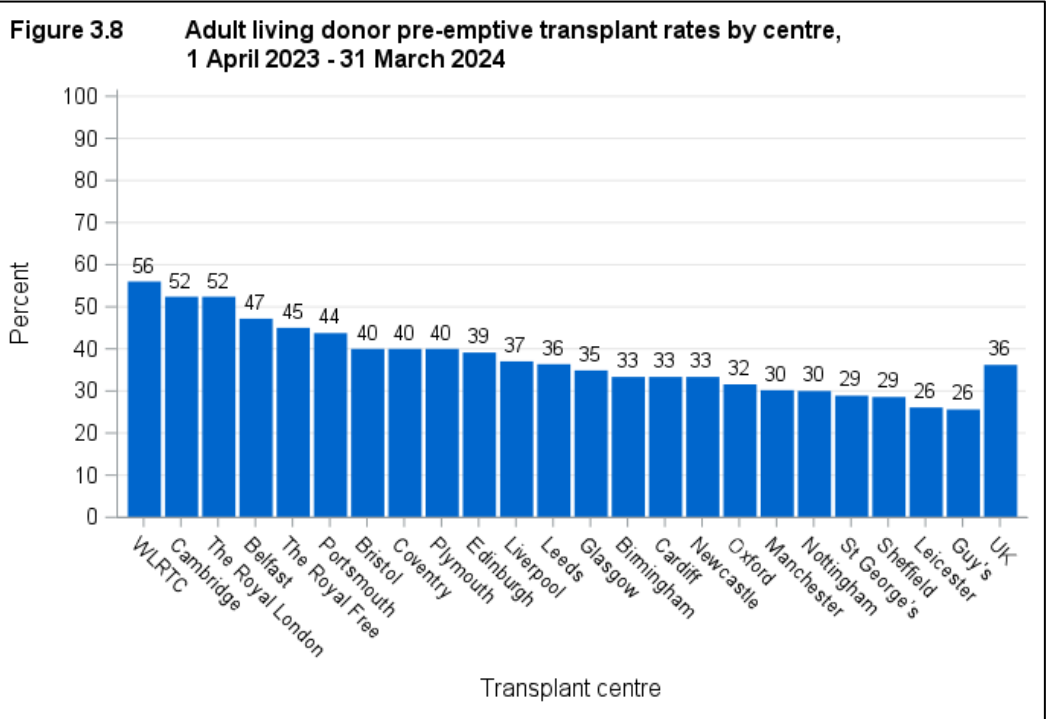
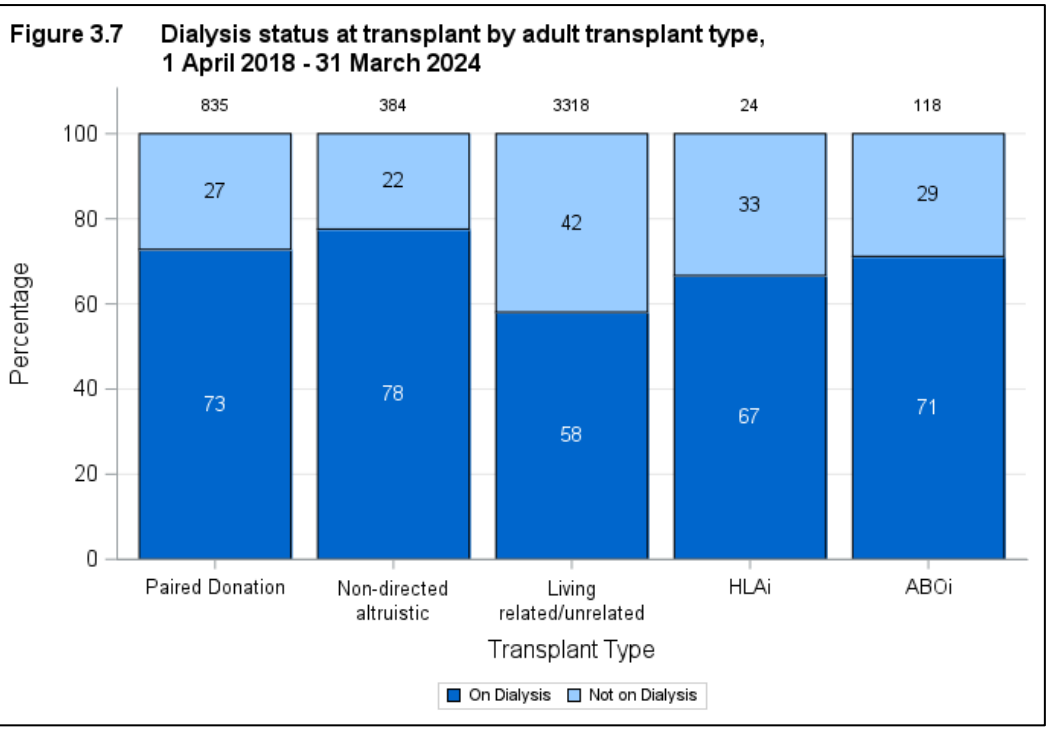


Figure 3.6 Recipient and donor blood group by adult transplant type, 1 April 2018 - 31 March 2024





PAEDIATRIC

The sex, ethnicity, age group, sensitisation (cRF), cRF by transplant type for HSP, blood group and dialysis status of donors and recipients of paediatric living donor kidney transplants and pre-emptive transplant rates are shown by centre in **Figure 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15** and **3.16** respectively. Note that all percentages quoted are based only on data where relevant information was available. Percentages are omitted where there is a low number of recipients and donors.

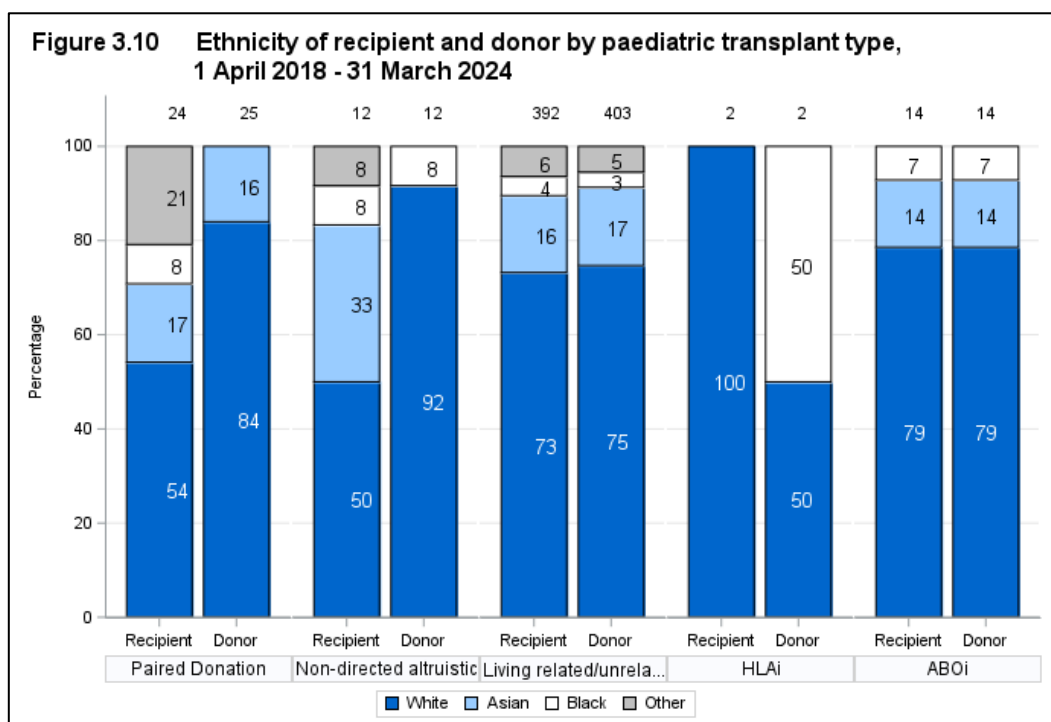
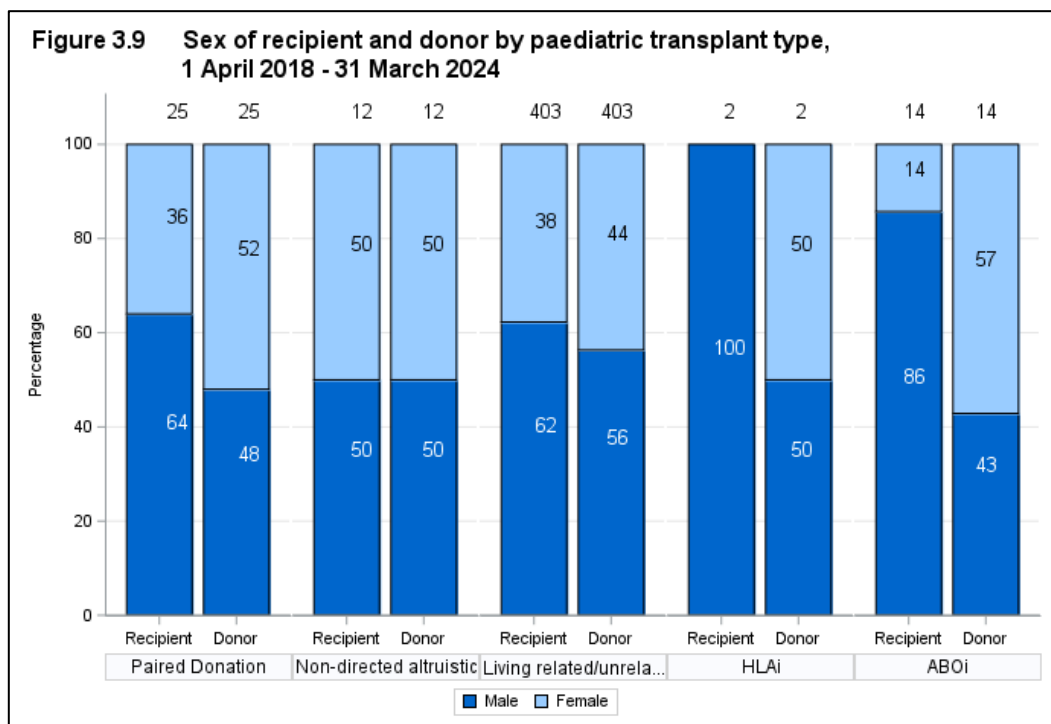


Figure 3.11 Age of recipient and donor by paediatric transplant type, 1 April 2018 - 31 March 2024

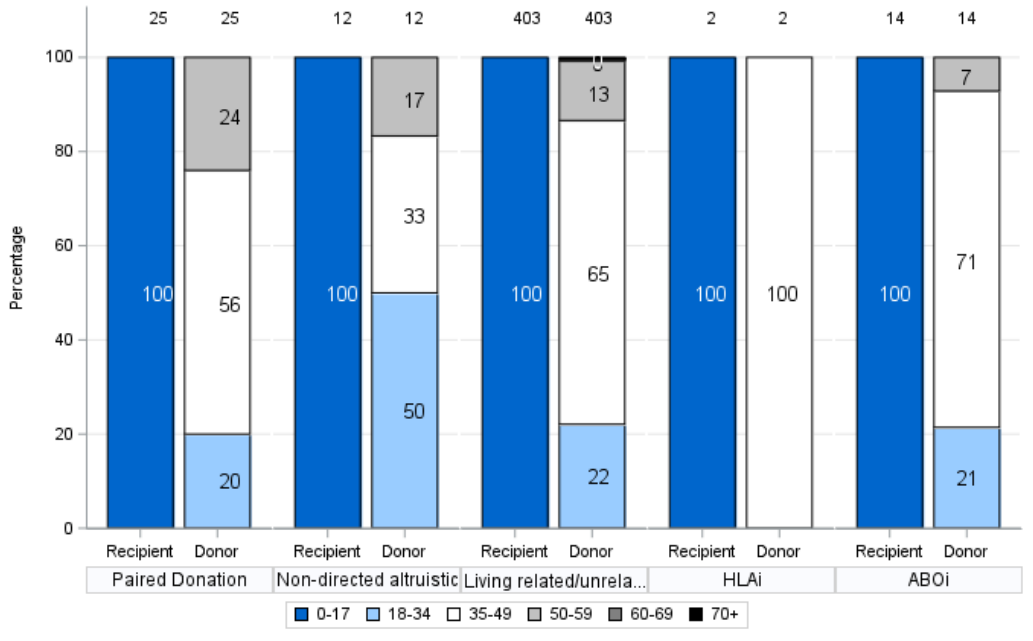


Figure 3.12 Recipient Calculated Reaction Frequency by paediatric transplant type 1 April 2018 - 31 March 2024

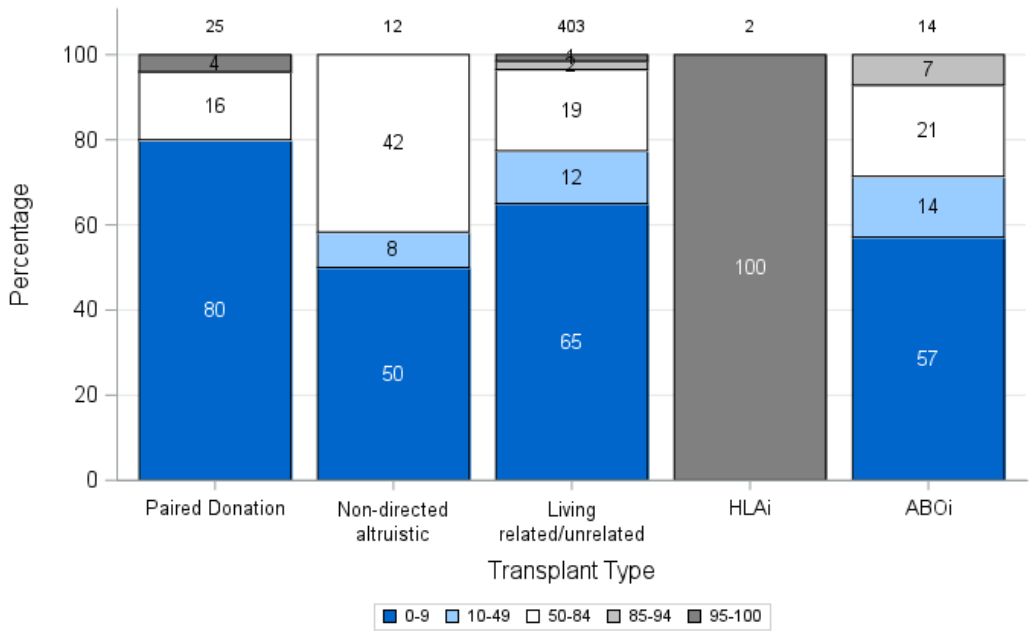


Figure 3.13 Paediatric HSP by transplant type and year of transplant, 1 April 2018 - 31 March 2024

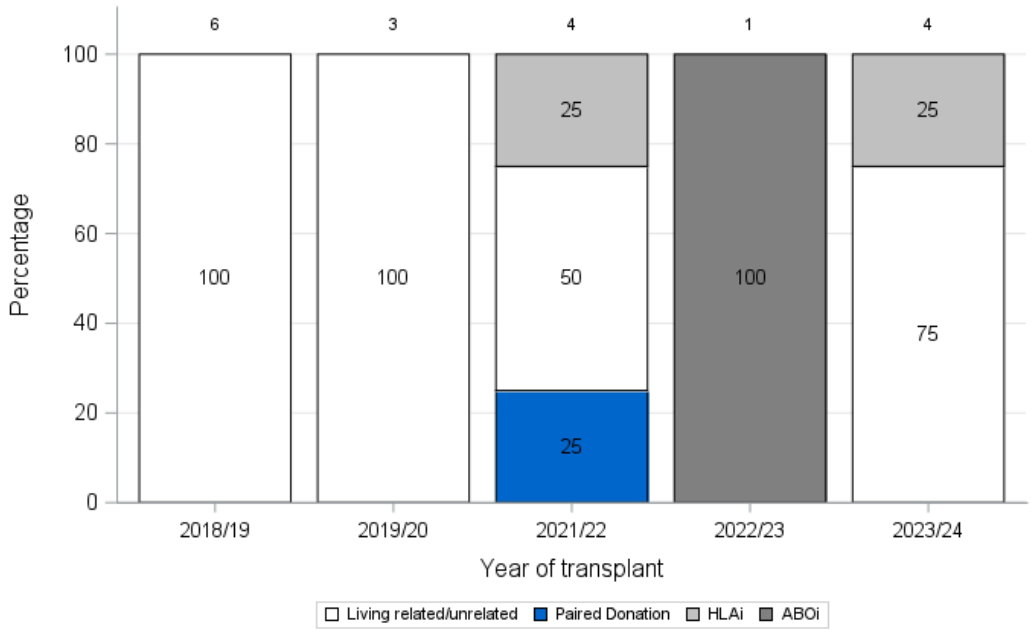
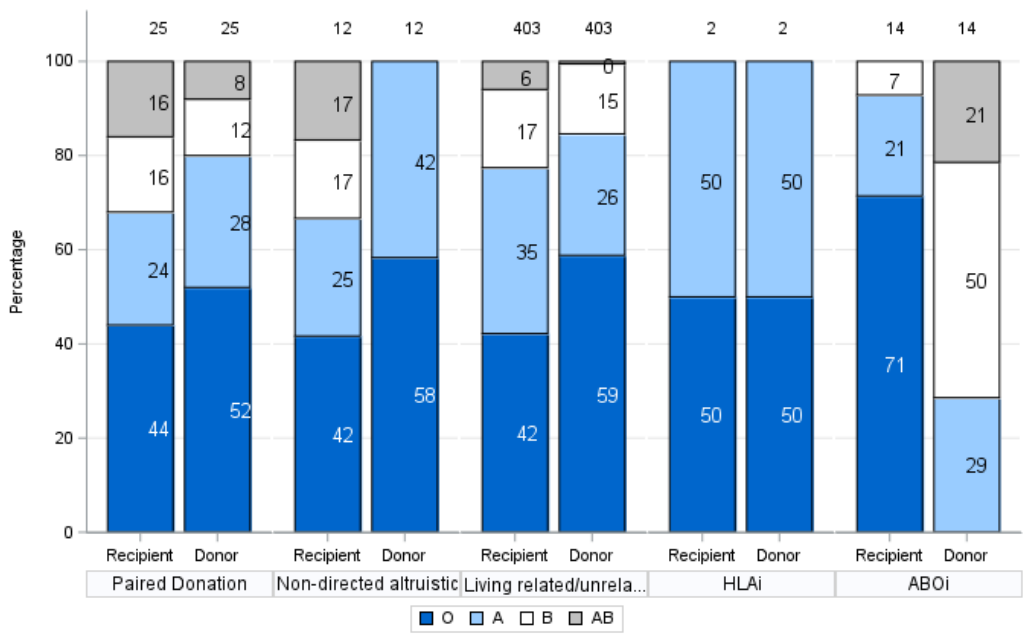
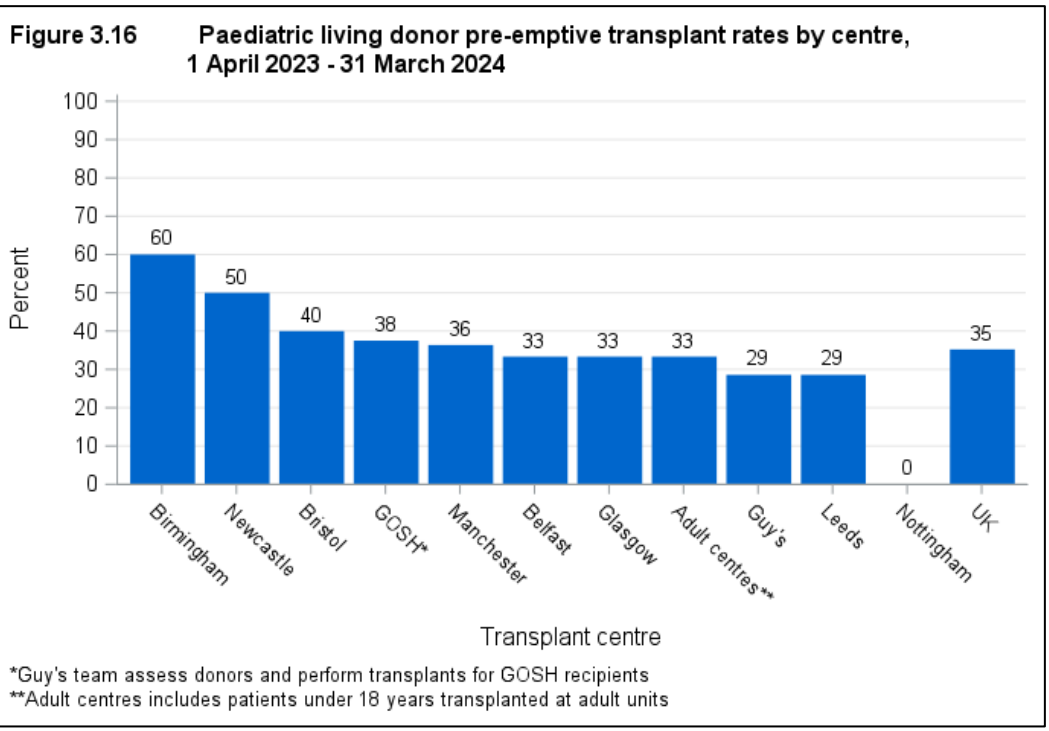
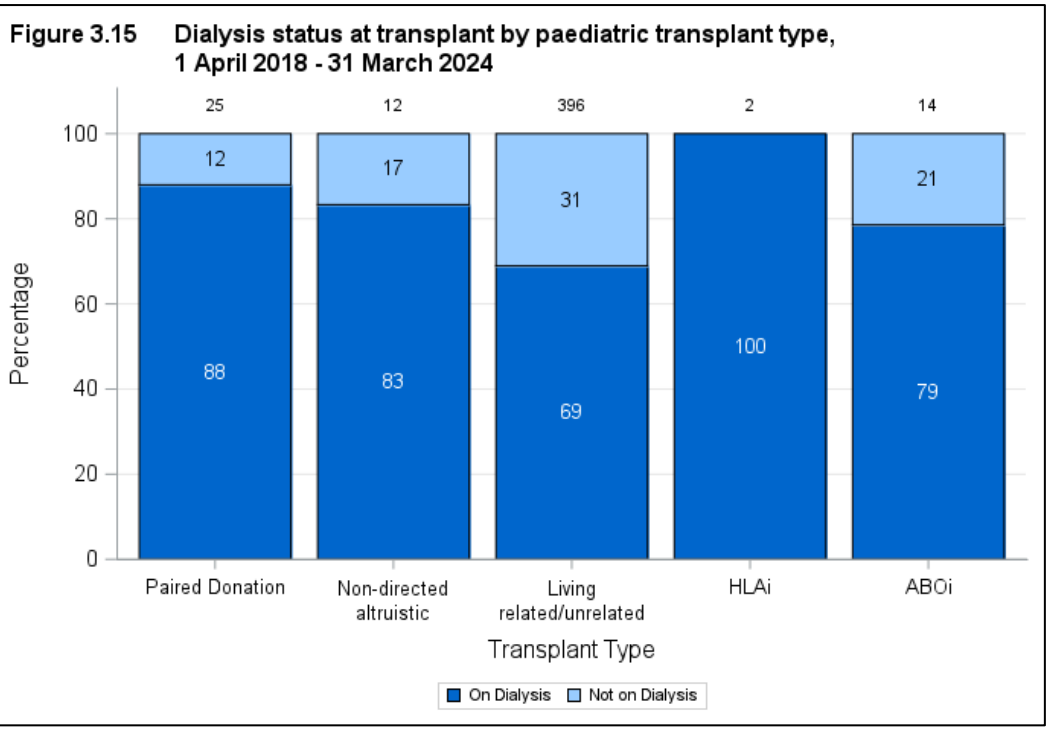


Figure 3.14 Recipient and donor blood group by paediatric transplant type, 1 April 2018 - 31 March 2024





UK Living Kidney Sharing Scheme

4.1 Paired Donation Scheme

4.1.1 Registrations: Matching Runs, 1 April 2018 – 31 March 2024

Figure 4.1 shows the number of recipients included in matching runs from 1 April 2018 to 31 March 2024. Overall, there were 1,760 recipients included in matching runs over this period. **Figure 4.2** shows the number of pairs included in each matching run, split by pair incompatibility.

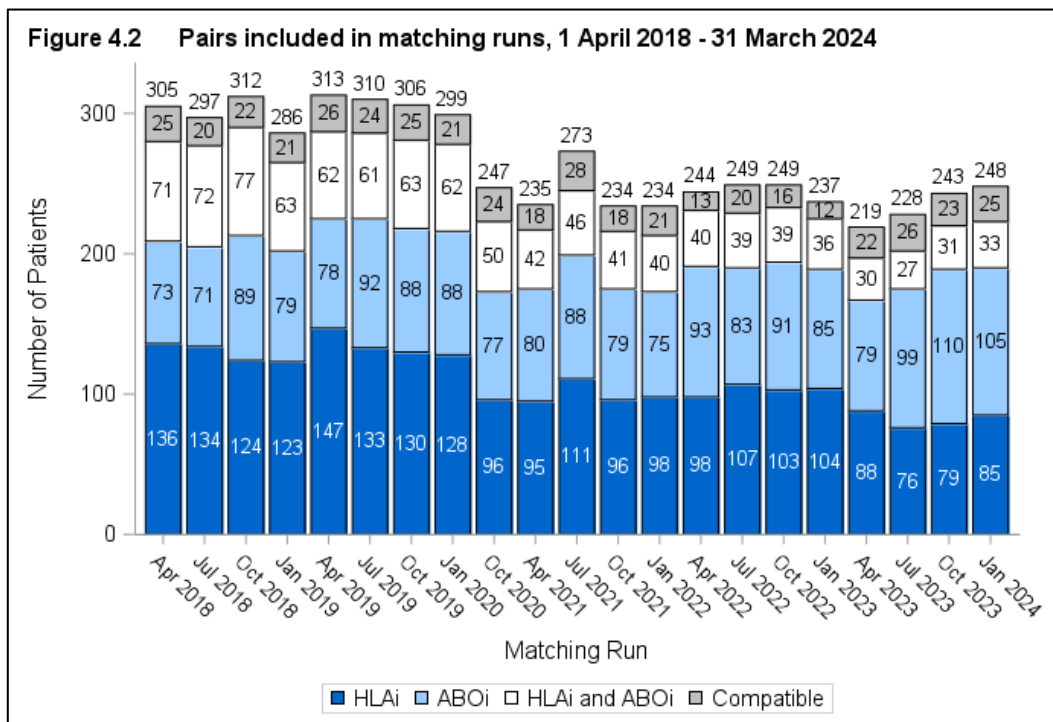
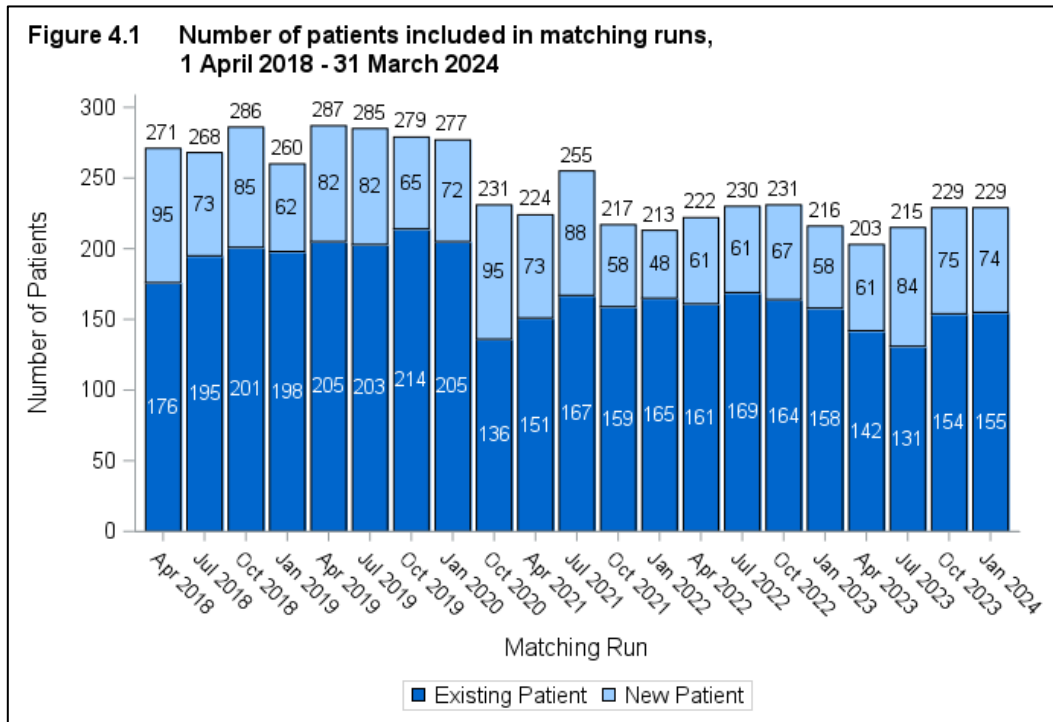


Figure 4.3 shows the number of pairs included in matching runs from 1 April 2018 to 31 March 2024 by centre. This is broken down further by the nature of the incompatibility between the pair. Most pairs registered over this period were ABO incompatible (37%). This information is also shown in **Table 4.1**.

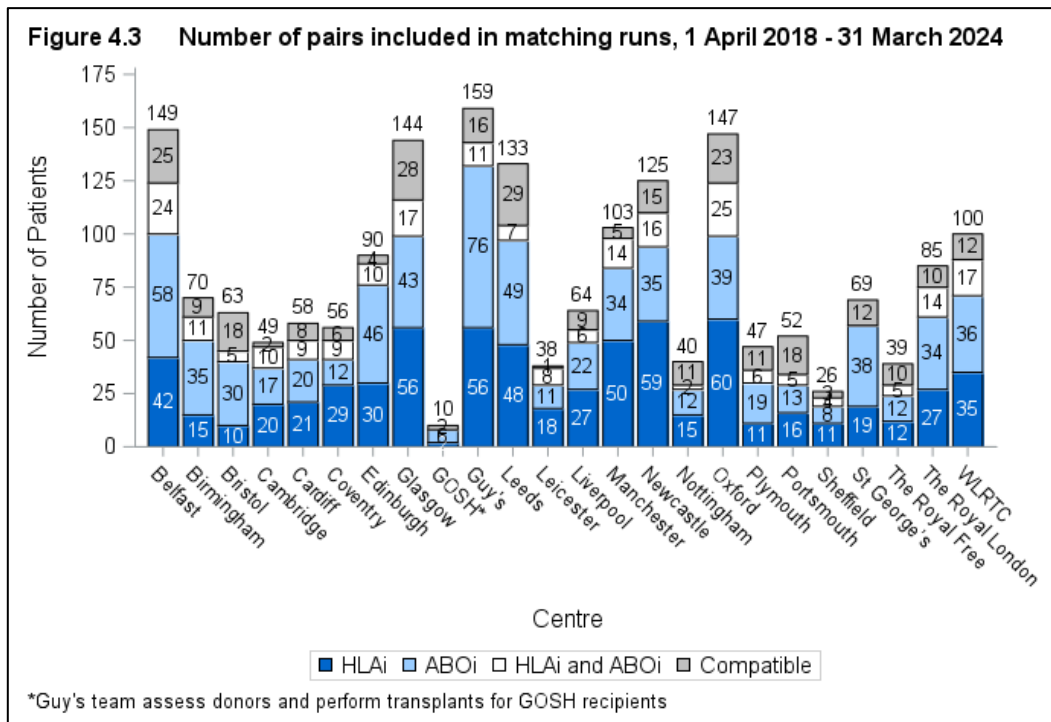


Table 4.1 Pairs included in matching runs by compatibility and Centre, April 2018 - March 2024						
Centre	Number of pairs	HLAi	ABOi	HLAi and ABOi	Compatible	
Belfast	149	42	58	24	25	
Birmingham	70	15	35	11	9	
Bristol	63	10	30	5	18	
Cambridge	49	20	17	10	2	
Cardiff	58	21	20	9	8	
Coventry	56	29	12	9	6	
Edinburgh	90	30	46	10	4	
Glasgow	144	56	43	17	28	
GOSH*	10	2	6	0	2	
Guy's	159	56	76	11	16	
Leeds	133	48	49	7	29	
Leicester	38	18	11	8	1	
Liverpool	64	27	22	6	9	
Manchester	103	50	34	14	5	
Newcastle	125	59	35	16	15	
Nottingham	40	15	12	2	11	
Oxford	147	60	39	25	23	
Plymouth	47	11	19	6	11	
Portsmouth	52	16	13	5	18	
Sheffield	26	11	8	4	3	
St George's	69	19	38	0	12	
The Royal Free	39	12	12	5	10	
The Royal London	85	27	34	14	10	
WLRTC	100	35	36	17	12	
UK	1916	689	705	235	287	

*Guy's team assess donors and perform transplants for GOSH recipients

Table 4.2 Recipients registered with different blood groups or unacceptable antigens, 1 April 2018 - 31 March 2024						
Year	Registered with different blood groups		Registered with unacceptable antigens		Total number of patients registered	
	N	%	N	%		
18/19	1	0.3	25	8.6	291	
19/20	4	1.5	25	9.2	271	
20/21	0	0	6	6.6	91	
21/22	8	3	4	1.5	267	
22/23	2	0.8	1	0.4	244	
23/24	10	3.4	14	4.7	295	

4.1.2 Outcomes: Matching Runs, 1 April 2020 – 31 March 2024

Figure 4.4 shows the outcomes of recipients included in matching runs from 1 April 2020 to 31 March 2024, split by centre. Overall, 48% of recipients registered have had a transplant through the paired donation scheme.

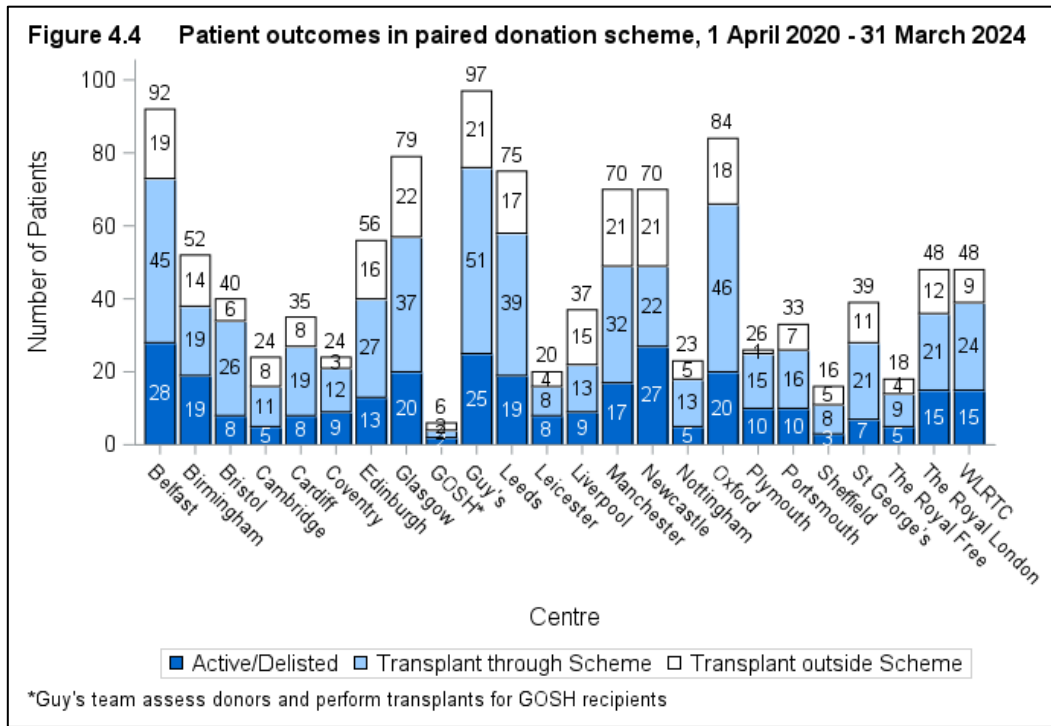
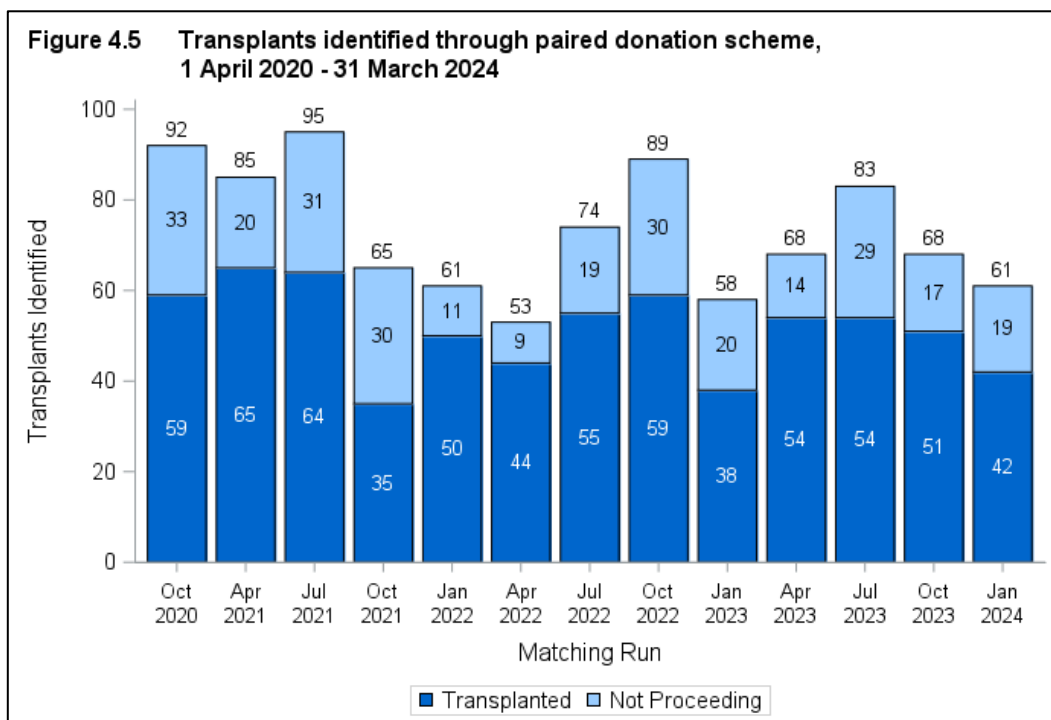


Figure 4.5 shows the transplants identified in each matching run from 1 April 2020 to 31 March 2024. The number of those that proceeded to transplant is also shown. Overall, 70% of transplants identified through the paired donation scheme have proceeded to transplant over this period.



Tables 4.3 and 4.4 show the number of transplants split by recipient calculated reaction frequency and recipient and donor blood group respectively.

Table 4.3 Transplants as a proportion of registered recipients by calculated reaction frequency, 1 April 2020 - 31 March 2024			
Calculated Reaction Frequency	Recipients Registered	Recipients Transplanted	
		N	(%)
0-9%	466	264	(57)
10-84%	314	182	(58)
85-94%	89	40	(45)
95-99%	150	48	(32)
100%	93	2	(2)

Table 4.4 Transplants as a proportion of registered pairs by blood group, 1 April 2020 - 31 March 2024					
Donor Blood Group	Patient Blood Group (Patients Transplanted/Pairs Registered (%))				
	O	A	B	AB	
O	145/ 276 (53%)	71/ 112 (63%)	20/ 47 (43%)	1/ 5 (20%)	
A	103/ 343 (30%)	66/ 126 (52%)	40/ 67 (60%)	5/ 9 (56%)	
B	32/ 94 (34%)	29/ 45 (64%)	6/ 21 (29%)	1/ 2 (50%)	
AB	5/ 13 (38%)	10/ 21 (48%)	2/ 9 (22%)	0/ 3 (0%)	

Figure 4.6 shows the number of recipients transplanted from matching runs between 1 April 2020 and 31 March 2024. This is split by centre and exchange type.

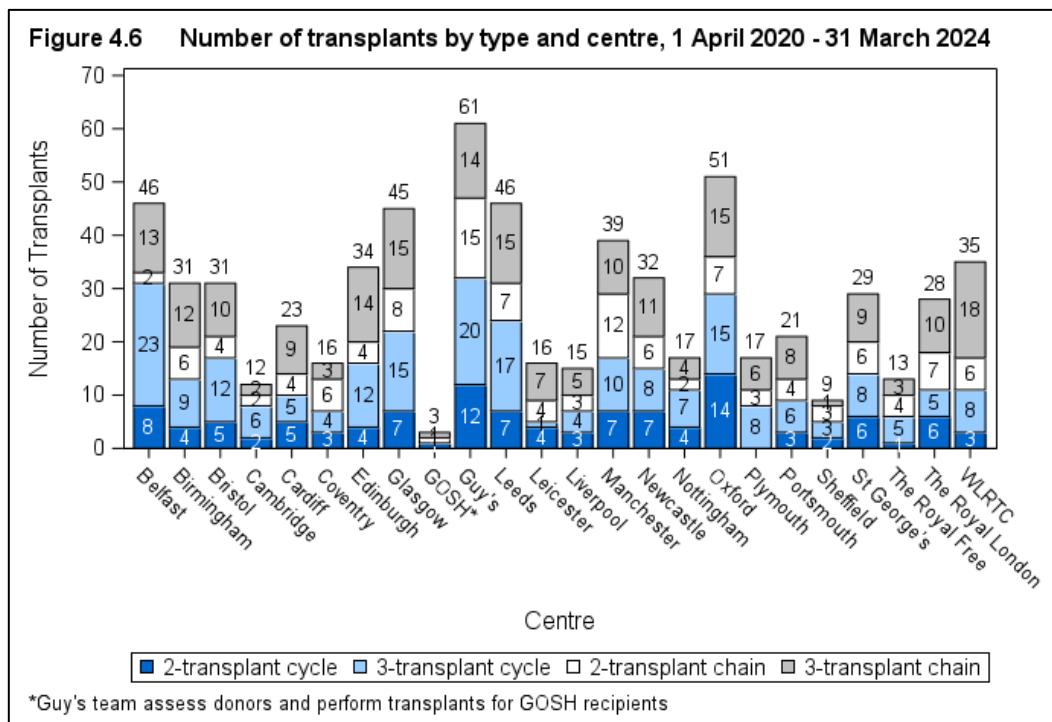
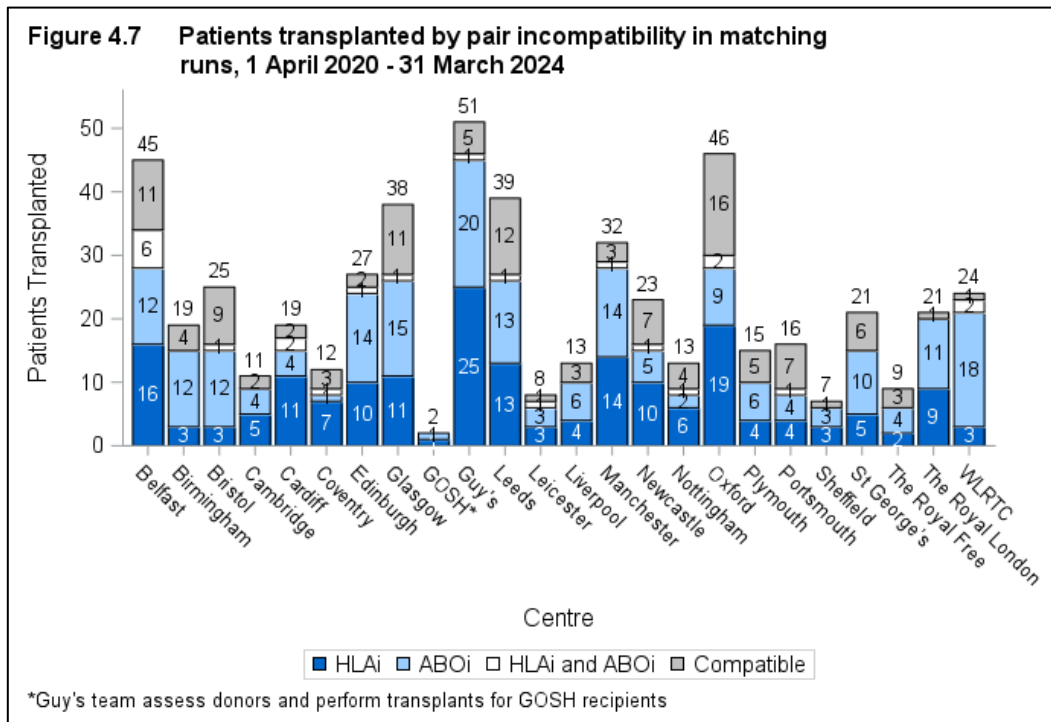


Figure 4.7 shows the recipients transplanted from matching runs between 1 April 2020 and 31 March 2024. This is split by centre and the incompatibility of the recipient with their registered donor. **Table 4.5** shows the number of transplants by exchange type and centre. **Table 4.6** shows the number of transplants by compatibility and centre. **Table 4.7** shows the average waiting time for transplant in the paired donation scheme. Data is censored if the recipient received a transplant outside the scheme.



**Table 4.5 Transplants by group type and centre
April 2020 - March 2024**

Centre	Number of Transplants	2-transplant cycle	3-transplant cycle	2-transplant chain	3-transplant chain
Belfast	46	2	8	13	23
Birmingham	31	6	4	12	9
Bristol	31	4	5	10	12
Cambridge	12	2	2	2	6
Cardiff	23	4	5	9	5
Coventry	16	6	3	3	4
Edinburgh	34	4	4	14	12
Glasgow	45	8	7	15	15
GOSH*	3	1	1	1	0
Guy's	61	15	12	14	20
Leeds	46	7	7	15	17
Leicester	16	4	4	7	1
Liverpool	15	3	3	5	4
Manchester	39	12	7	10	10
Newcastle	32	6	7	11	8
Nottingham	17	2	4	4	7
Oxford	51	7	14	15	15
Plymouth	17	3	0	6	8
Portsmouth	21	4	3	8	6
Sheffield	9	3	2	1	3
St George's	29	6	6	9	8
The Royal Free	13	4	1	3	5
The Royal London	28	7	6	10	5
WLRTC	35	6	3	18	8
UK	670	126	118	215	211

*Guy's team assess donors and perform transplants for GOSH recipients

Table 4.6 Transplants by compatibility and centre 1 April 2020 - 31 March 2024						
Centre	Number of Transplants	HLAi	ABOi	HLA and ABOi	Compatible	
Belfast	46	0	4	0	42	
Birmingham	31	0	0	0	31	
Bristol	31	1	0	0	30	
Cambridge	12	0	0	0	12	
Cardiff	23	0	1	0	22	
Coventry	16	3	0	0	13	
Edinburgh	34	1	0	0	33	
Glasgow	45	0	0	0	45	
GOSH*	3	0	0	0	3	
Guy's	61	0	0	0	61	
Leeds	46	1	0	0	45	
Leicester	16	0	0	0	16	
Liverpool	15	0	0	0	15	
Manchester	39	1	0	0	38	
Newcastle	32	0	1	0	31	
Nottingham	17	0	0	0	17	
Oxford	51	1	0	1	49	
Plymouth	17	0	0	0	17	
Portsmouth	21	0	0	0	21	
Sheffield	9	0	0	0	9	
St George's	29	0	0	0	29	
The Royal Free	13	0	0	0	13	
The Royal London	28	0	0	0	28	
WLRTC	35 ¹	1	0	0	33	
UK	670	9	6	1	653	

*Guy's team assess donors and perform transplants for GOSH recipients
¹Transplant compatibility is unknown for one transplant

Table 4.7 Median waiting time to paired donation kidney transplant in the UK, for patients registered 1 April 2014 - 31 March 2020			
Pair Incompatibility	Number of patients registered	Waiting time (days)	
		Median	95% Confidence interval
HLAi	571	424	342 - 506
ABOi	535	389	338 - 440
All Pairs	1498	418	375 - 461

4.2 Non-directed Altruistic Donation

4.2.1 Transplants, 1 April 2015 – 31 March 2024

Figure 4.8 shows the number of non-directed altruistic donor kidney transplants from 1 April 2015 to 31 March 2024. This is split by whether the donation was to the deceased donor waiting list or the paired donation scheme.

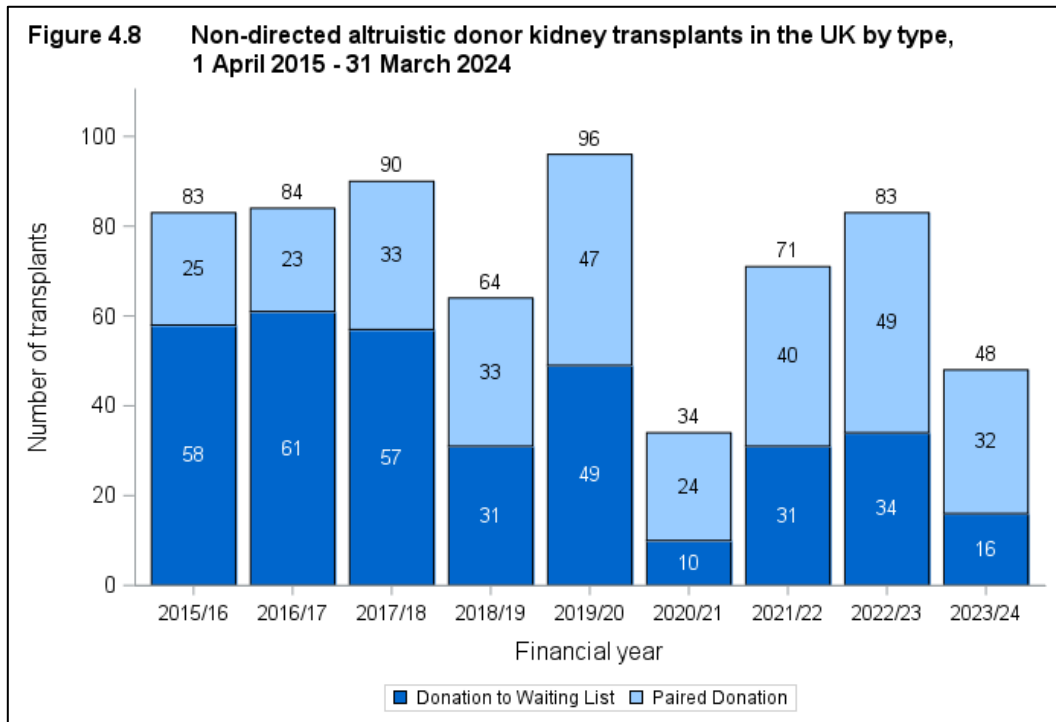
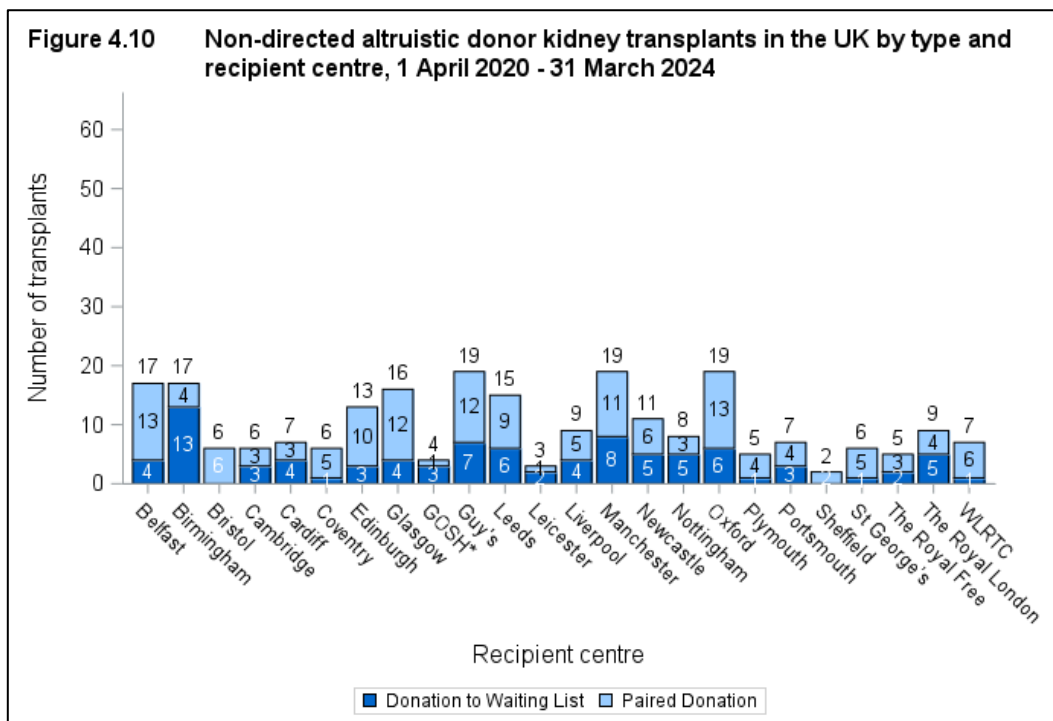
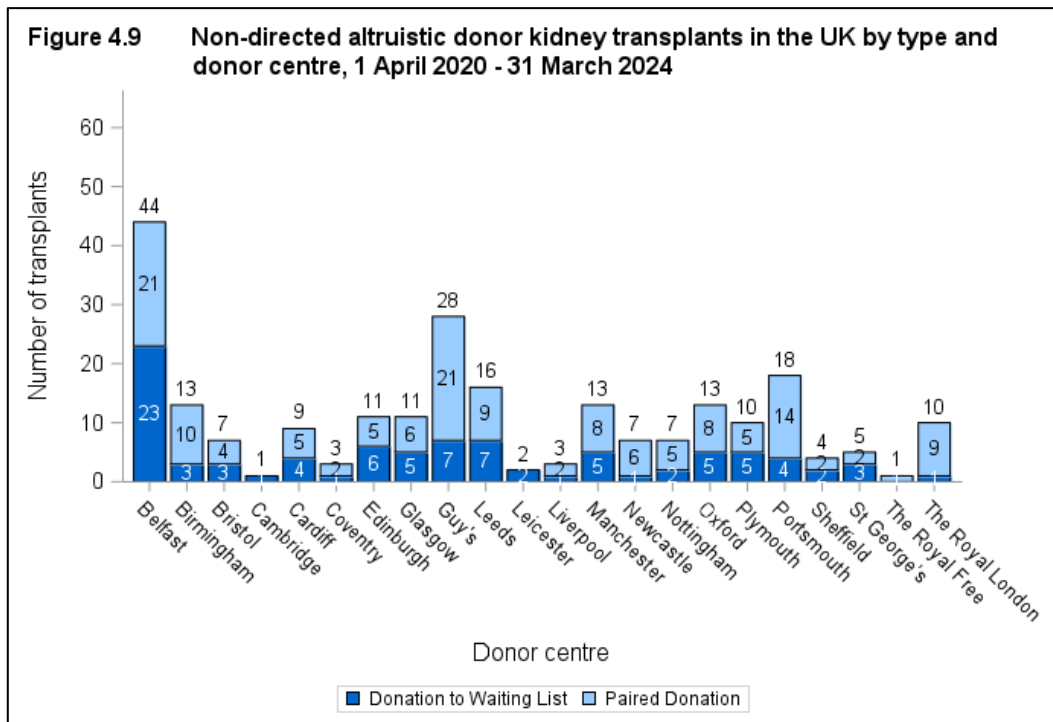


Figure 4.9 shows the number of non-directed altruistic donor kidney transplants from 1 April 2020 to 31 March 2024 by donor centre. **Figure 4.10** shows the number of non-directed altruistic donor kidney transplants from 1 April 2020 to 31 March 2024 by recipient centre.



4.2.2 Time to donation, 1 April 2020 – 31 March 2024

Figure 4.11 shows the median time in months from notification to donation from 1 April 2020 to 31 March 2024, by centre. This data is shown further in **Table 4.8**. The boxplot shows the minimum, lower quartile, median, upper quartile and maximum values. The boxplots are used to show the variation in the data and indicate any outlying values, which are shown by the circles on the plot. The box itself shows the interquartile range and the line inside the box indicates the median value.

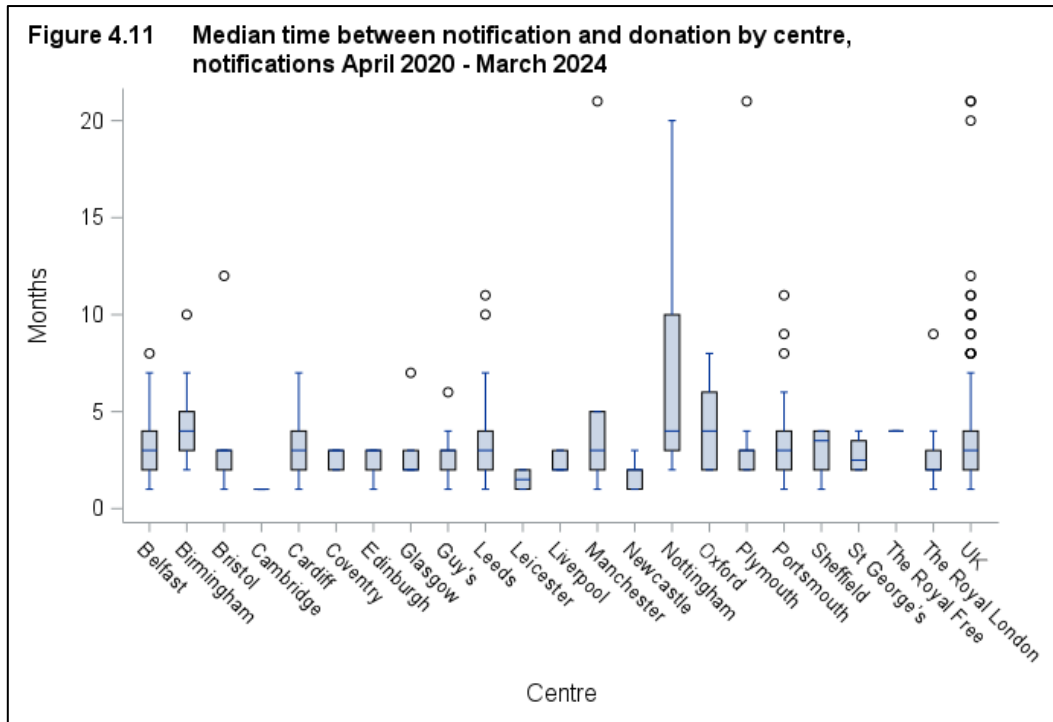


Table 4.8 Median time between notification and donation by Centre, Donations April 2020 - March 2024

Centre	Number of donors	Median	Lower quartile	Upper quartile
Belfast	41	3	2	4
Birmingham	9	4	3	5
Bristol	6	3	2	3
Cambridge	1	1	1	1
Cardiff	9	3	2	4
Coventry	3	3	2	3
Edinburgh	9	3	2	3
Glasgow	10	2	2	3
Guy's	26	3	2	3
Leeds	14	3	2	4
Leicester	2	1	1	2
Liverpool	3	2	2	3
Manchester	6	3	2	5
Newcastle	7	2	1	2
Nottingham	7	4	3	10
Oxford	13	4	2	6
Plymouth	9	3	2	3
Portsmouth	18	3	2	4
Sheffield	4	3	2	4
St George's	4	3	2	4
The Royal Free	1	4	4	4
The Royal London	10	2	2	3
WLRTC	0	-	-	-
UK	212	3	2	4

Antibody Incompatible Transplants

This section only includes living donor antibody incompatible kidney only transplants.

Antibody Incompatible transplant data is collected on the Antibody Incompatible Transplant Details form. **Figure 5.1** and **Table 5.1** show the form return rates by centre and include data on forms relating to antibody incompatible transplants from direct living donation and via the UKLKSS. The remainder of the section contains data on direct transplants only.

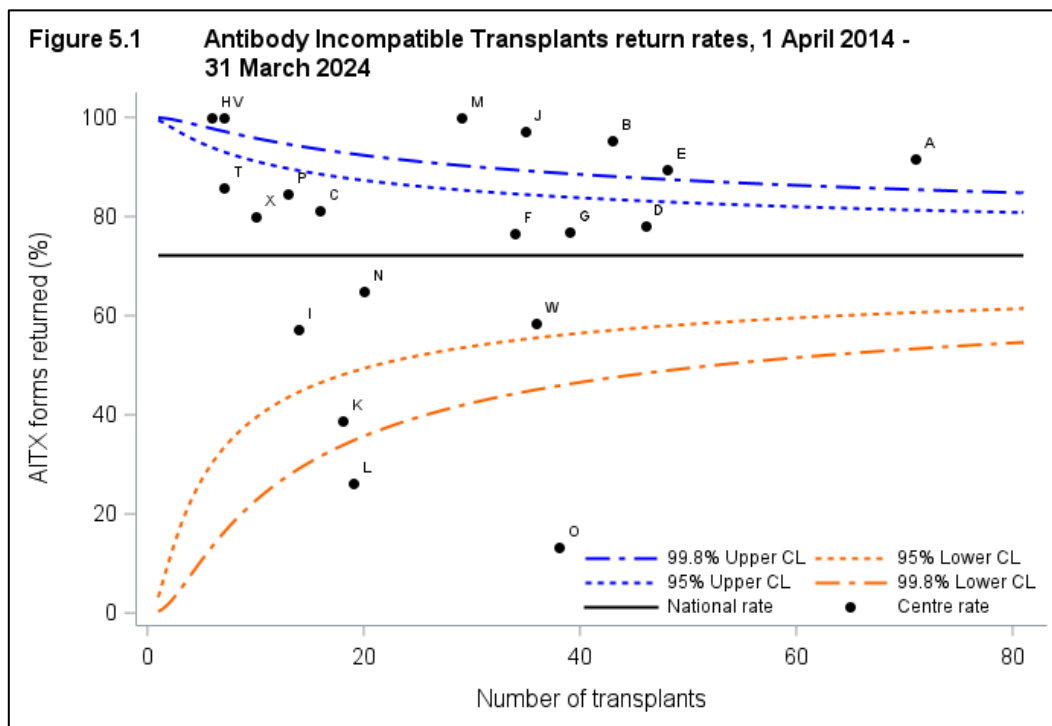


Table 5.1**Antibody incompatible transplant form return rates,
1 April 2014 – 31 March 2024**

Transplant Centre	Code	Number of transplants	AITX forms returned	
			N	%
Belfast	A	71	65	92
Birmingham	B	43	41	95
Bristol	C	16	13	81
Cambridge	D	46	36	78
Cardiff	E	48	43	90
Coventry	F	34	26	76
Edinburgh	G	39	30	77
Glasgow	H	6	6	100
GOSH*	I	14	8	57
Guy's	J	35	34	97
Leeds	K	18	7	39
Leicester	L	19	5	26
Liverpool	M	29	29	100
Manchester	N	20	13	65
Newcastle	O	38	5	13
Nottingham	P	13	11	85
Oxford	Q	25	-	-
Plymouth	R	0	-	-
Portsmouth	S	0	-	-
Sheffield	T	7	6	86
St George's	U	0	-	-
The Royal Free	V	7	7	100
The Royal London	W	36	21	58
WLRTC	X	10	8	80
UK		574	414	72

*Guy's team assess donors and perform transplants for GOSH recipients

ADULT

Figures 5.2 and 5.3 show the number of living donor antibody incompatible kidney transplants by financial year and centre respectively.

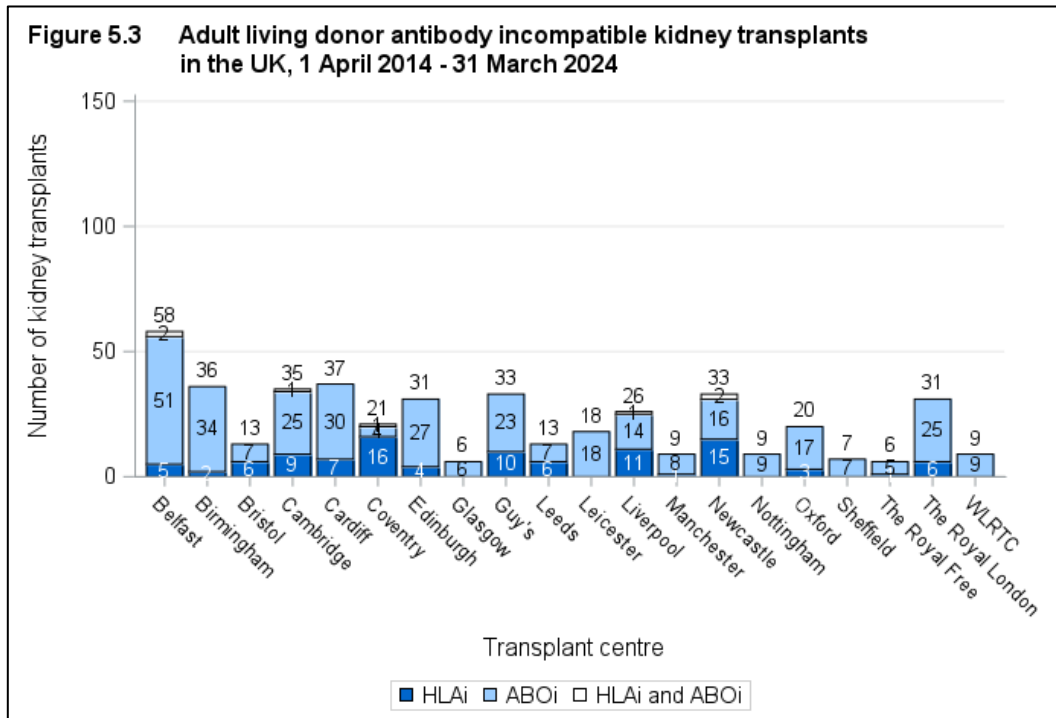
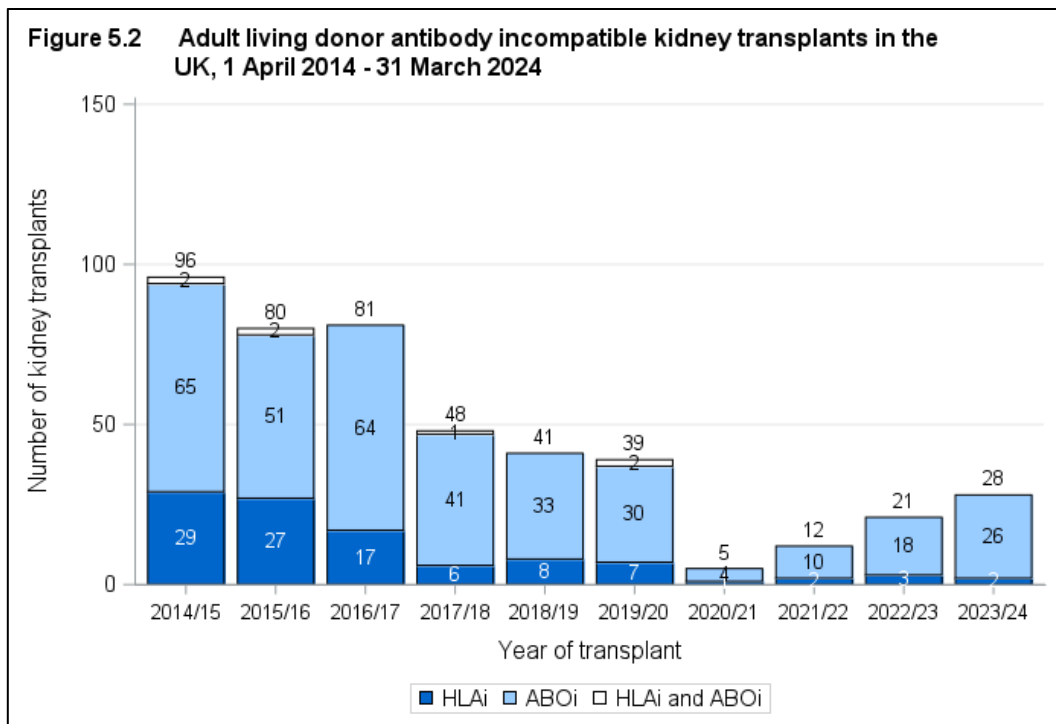


Table 5.2 shows the donor and recipient blood group for all ABOi transplants.

Table 5.2 Donor and recipient blood group for all adult ABOi transplants, 1 April 2014 - 31 March 2024						
Recipient blood group	Donor blood group					
	A		B		AB	
	N	(%)	N	(%)	N	(%)
A	1	(0.3)	26	(7.4)	19	(5.4)
B	42	(12.0)	-		20	(5.7)
O	169	(48.4)	66	(18.9)	4	(1.1)

Table 5.3 shows the donor and recipient ABO by recipient CRF at transplant.

Table 5.3 Donor and recipient ABO by recipient CRF at transplant, 1 April 2014 - 31 March 2024								
Donor-Recipient ABO	Recipient CRF at transplant							
	0-9		10-84		85-94		95-100	
	N	(%)	N	(%)	N	(%)	N	(%)
A-A	9	(2.0)	8	(1.8)	4	(0.9)	7	(1.6)
A-AB	-		1	(0.2)	1	(0.2)	-	
A-B	32	(7.1)	7	(1.6)	2	(0.4)	1	(0.2)
A-O	111	(24.6)	44	(9.8)	7	(1.6)	8	(1.8)
AB-A	14	(3.1)	5	(1.1)	-		-	
AB-AB	-		-		-		1	(0.2)
AB-B	17	(3.8)	2	(0.4)	-		1	(0.2)
AB-O	2	(0.4)	1	(0.2)	1	(0.2)	-	
B-A	18	(4.0)	5	(1.1)	2	(0.4)	1	(0.2)
B-B	2	(0.4)	3	(0.7)	2	(0.4)	2	(0.4)
B-O	41	(9.1)	19	(4.2)	4	(0.9)	2	(0.4)
O-A	6	(1.3)	2	(0.4)	1	(0.2)	2	(0.4)
O-AB	-		1	(0.2)	-		-	
O-B	-		1	(0.2)	2	(0.4)	1	(0.2)
O-O	14	(3.1)	14	(3.1)	6	(1.3)	14	(3.1)

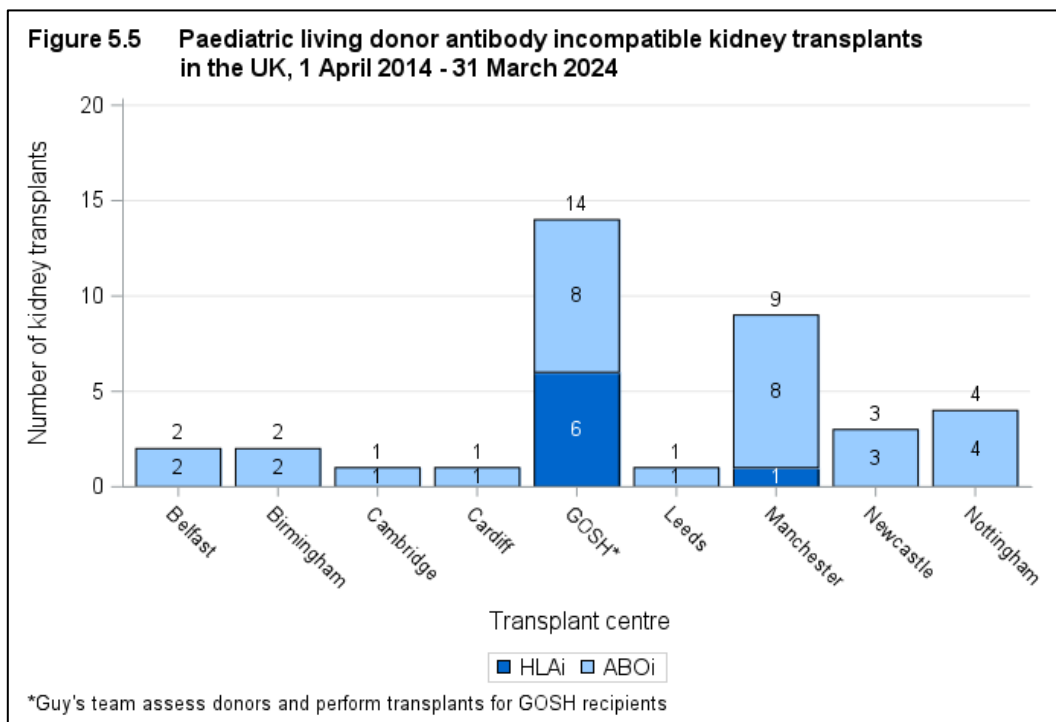
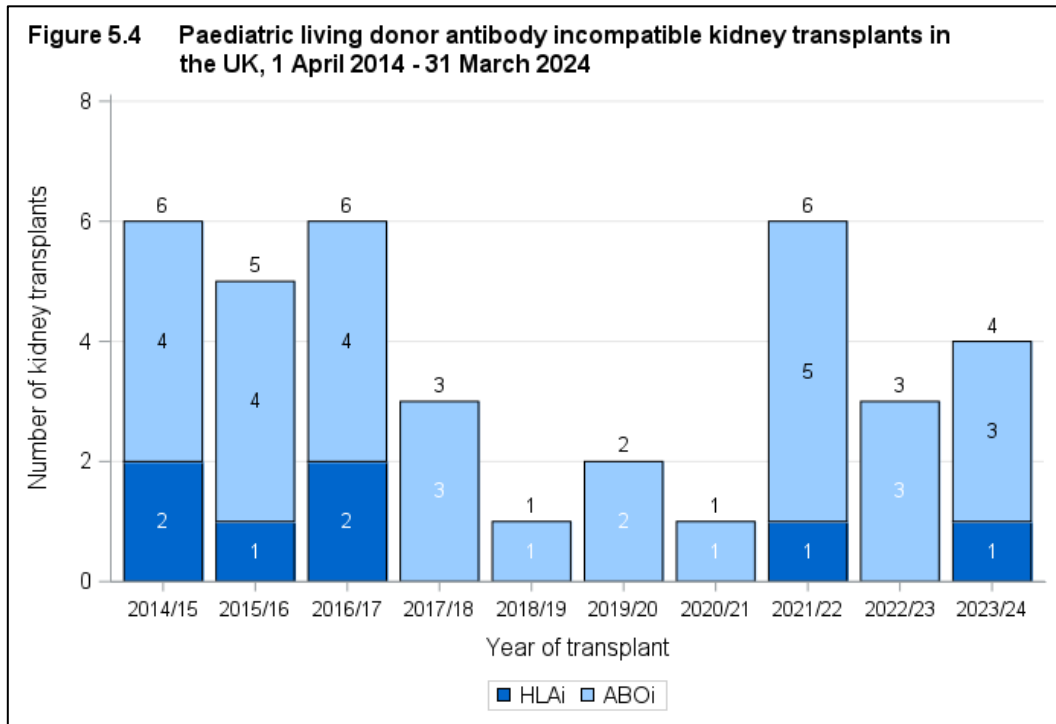
Table 5.4 shows the pre and at transplant level group for all HLAi transplants. Data are only presented for cases where an antibody incompatible form has been completed and returned. **Table 5.5** shows the calculated reaction frequency by incompatibility type.

Table 5.4 Pre and at transplant antibody level group for all adult HLAi transplants, 1 April 2014 - 31 March 2024												
Pre treatment antibody level group	At Transplant antibody level group											
	CDC pos, Flow pos, DSA SPA pos		CDC neg, Flow pos, DSA SPA pos		CDC neg, Flow neg, DSA SPA pos		CDC neg, Flow neg, DSA SPA neg		CDC NT, Flow pos, DSA SPA pos		Unknown	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
CDC NT, Flow pos, DSA SPA pos	-	-	-	-	5	(4.1)	-	-	8	(6.5)	-	-
CDC neg, Flow neg, DSA SPA pos	-	-	-	-	38	(30.9)	2	(1.6)	-	-	1	(0.8)
CDC neg, Flow pos, DSA SPA pos	-	-	17	(13.8)	13	(10.6)	11	(8.9)	-	-	10	(8.1)
CDC pos, Flow pos, DSA SPA pos	-	-	1	(0.8)	1	(0.8)	-	-	-	-	-	-
Unknown	-	-	1	(0.8)	-	-	2	(1.6)	-	-	13	(10.6)

Table 5.5 At transplant calculated reaction frequency by incompatibility type, 1 April 2014 - 31 March 2024						
Calculated Reaction Frequency	ABOi		HLAi		HLAi and ABOi	
	N	%	N	%	N	%
0-9	236	(69.0)	29	(28.4)	1	(14.3)
10-84	81	(23.7)	31	(30.4)	1	(14.3)
85-94	15	(4.4)	16	(15.7)	1	(14.3)
95-100	10	(2.9)	26	(25.5)	4	(57.1)

PAEDIATRIC

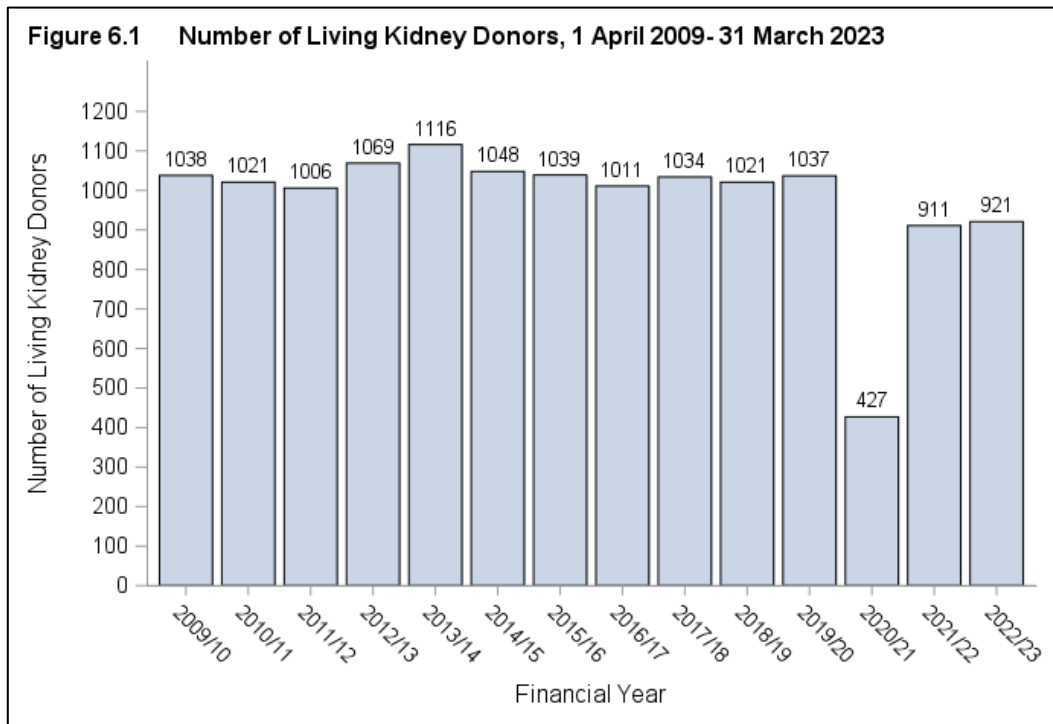
Figures 5.4 and 5.5 show the number of living donor antibody incompatible kidney transplants by financial year and centre respectively.



Living Donor Follow-Up

This section contains information on all living donors who have donated to both adult and paediatric recipients from 2009/10 to 2022/23. Percentages are omitted if the reported proportion of the data item at 1 year is less than 75%, at 5 years is less than 50% or at 10 years is less than 35% at each centre.

Figure 6.1 shows the number of living donor kidney donors by financial year from 2009/10 to 2022/23.



Of the living donors over this period, 113 deaths have been recorded. The causes of death are shown in **Table 6.1**. Two donors joined the kidney waiting list and received a kidney from a deceased donor, and one received a kidney transplant from a living donor.

Table 6.1 Cause of death for living donors 1 April 2009 – 31 March 2023

Cause of Death	N	%
Cancer	36	32
Bowel	2	2
Breast	2	2
Colonic	2	2
Liver	2	2
Lung	5	4
Oesophagus	2	2
Pancreatic	6	5
Prostate	2	2
Testicular	1	1
Other	12	11
Brain Tumor	2	2
Intracranial hemorrhage	2	2
Seizure	3	3
Parkinson's disease	1	1
RTA	3	3
Suicide	4	4
Bronchopneumonia	2	2
Other	26	23
Unknown	34	30
TOTAL	113	100

6.1 Prescription of Antihypertensive drugs, 1 April 2009– 31 March 2023

Figure 6.2, 6.3 and 6.4 show the proportion of living donor kidney donors where the donor has been prescribed antihypertensive drugs at 1, 5 and 10 year follow-up by centre, respectively. The same information is summarised in Table 6.2.

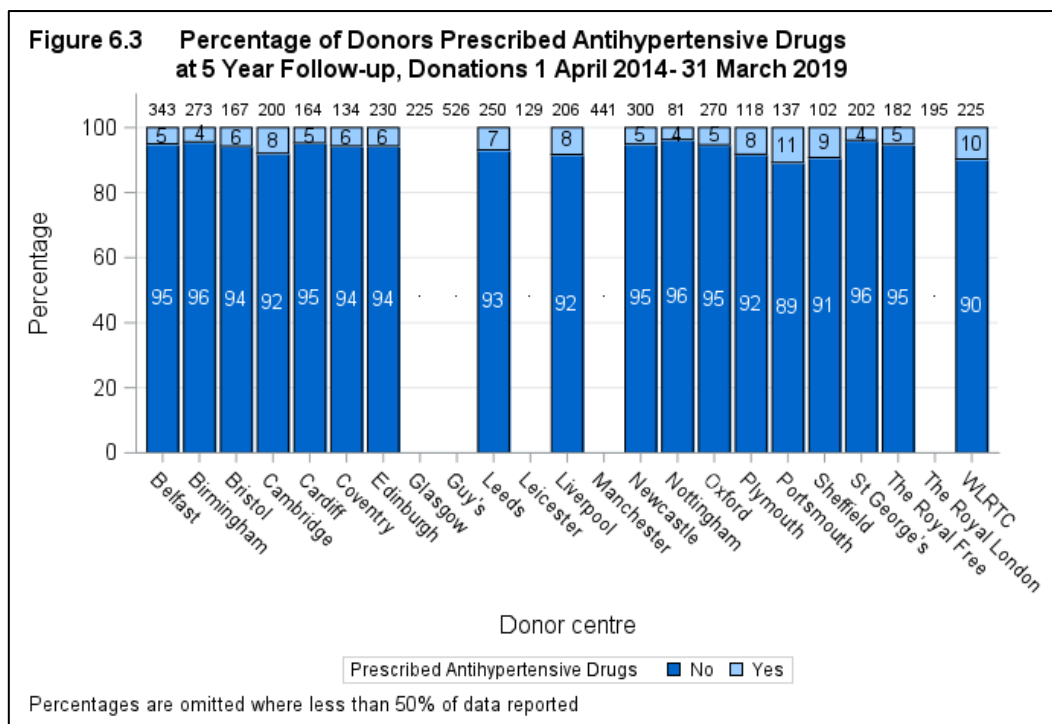
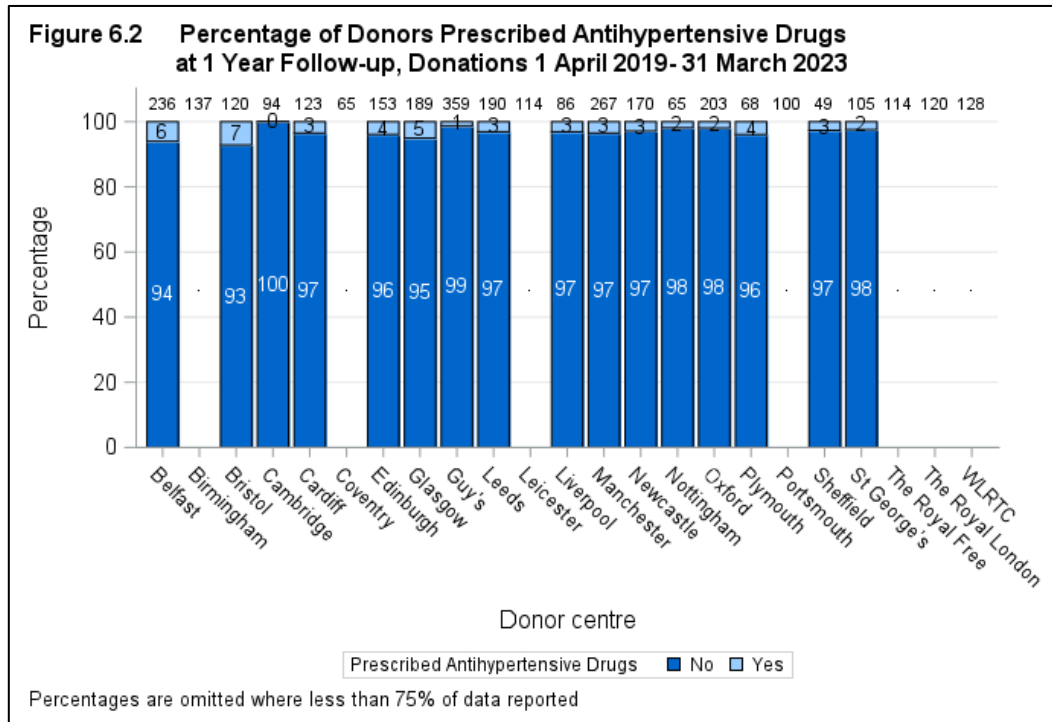
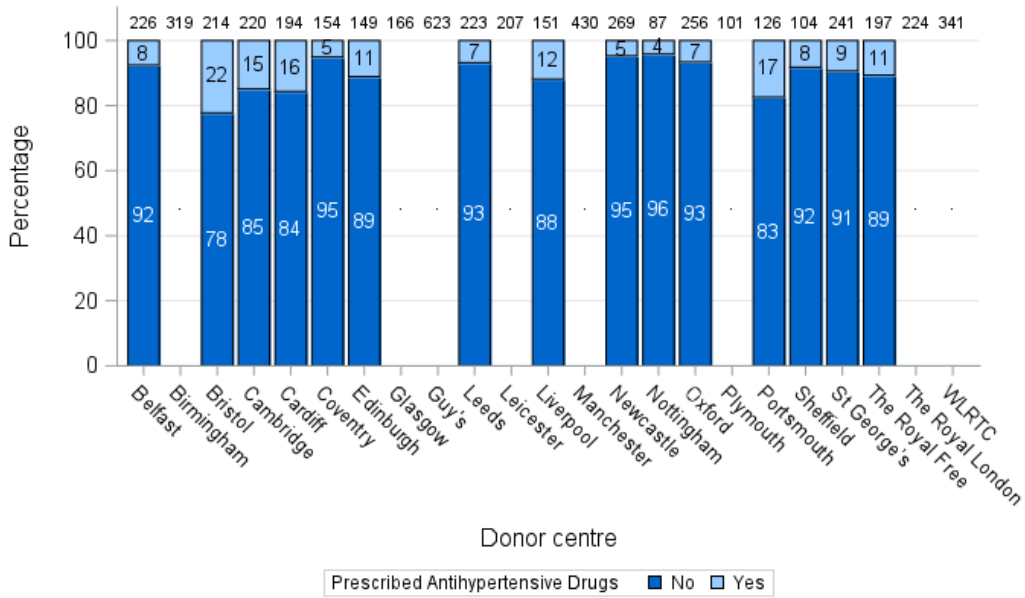


Figure 6.4 Percentage of Donors Prescribed Antihypertensive Drugs at 10 Year Follow-up, Donations 1 April 2009- 31 March 2014



Percentages are omitted where less than 35% of data reported

Table 6.2 Percentage of Donors Prescribed Antihypertensive Drugs by Centre, Donations April 2009 - March 2023

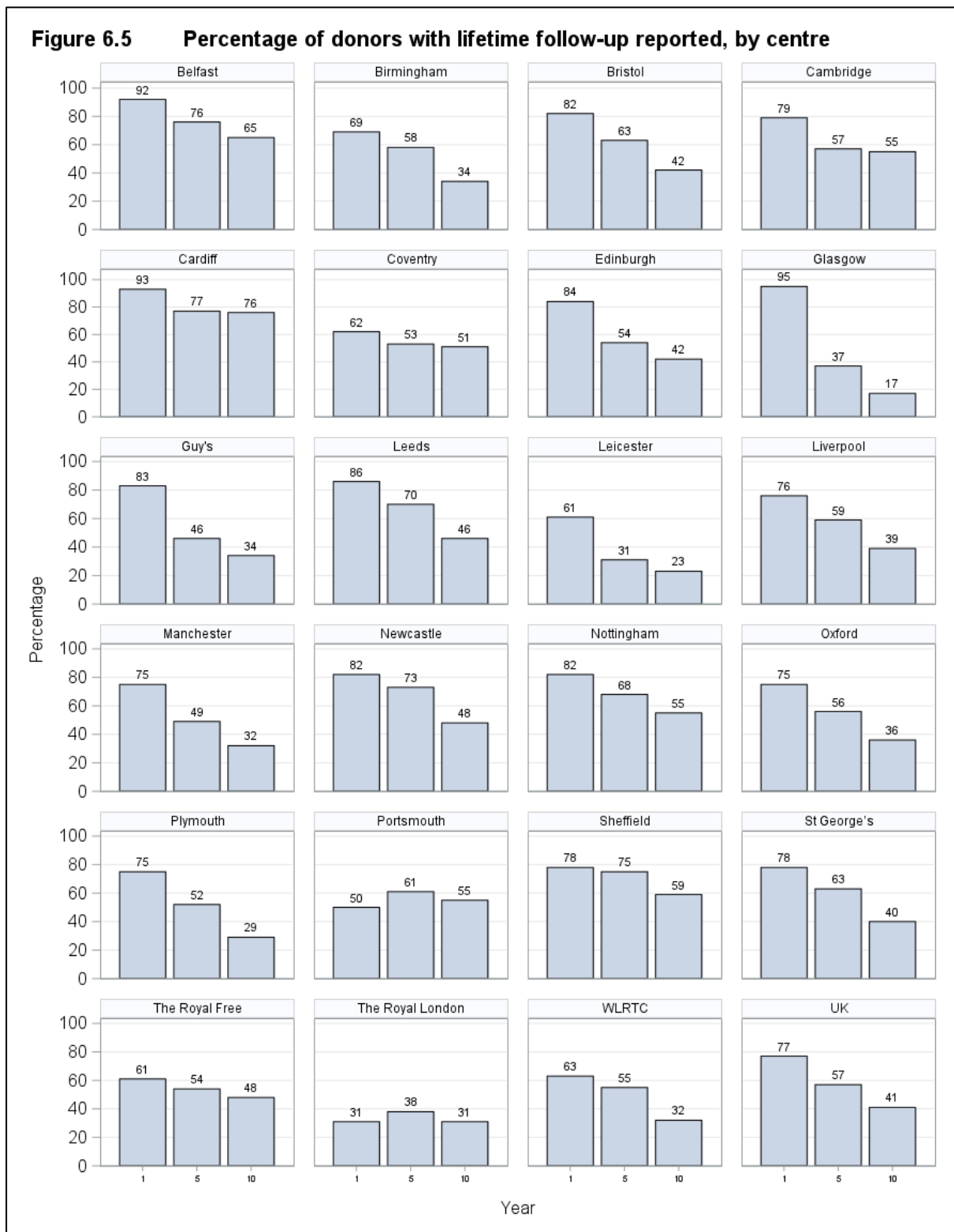
Centre	1 Year			5 Year			10 Year		
	N	% ¹	% ²	N	% ¹	% ²	N	% ¹	% ²
Belfast	236	92	6	343	76	5	226	65	8
Birmingham	137	69	-	273	58	4	319	34	-
Bristol	120	82	7	167	63	6	214	42	22
Cambridge	94	79	0	200	57	8	220	55	15
Cardiff	123	93	3	164	77	5	194	76	16
Coventry	65	62	-	134	53	6	154	51	5
Edinburgh	153	84	4	230	54	6	149	42	11
Glasgow	189	95	5	225	37	-	166	17	-
Guy's	359	83	1	526	46	-	623	34	-
Leeds	190	86	3	250	70	7	223	46	7
Leicester	114	61	-	129	31	-	207	23	-
Liverpool	86	76	3	206	59	8	151	39	12
Manchester	267	75	3	441	49	-	430	32	-
Newcastle	170	82	3	300	73	5	269	48	5
Nottingham	65	82	2	81	68	4	87	55	4
Oxford	203	75	2	270	56	5	256	36	7
Plymouth	68	75	4	118	52	8	101	29	-
Portsmouth	100	50	-	137	61	11	126	55	17
Sheffield	49	78	3	102	75	9	104	59	8
St George's	105	78	2	202	63	4	241	40	9
The Royal Free	114	61	-	182	54	5	197	48	11
The Royal London	120	31	-	195	38	-	224	31	-
WLRTC	128	63	-	225	55	10	341	32	-
UK	3255	77	4	5100	57	6	5222	41	11

¹% of donors with follow-up reported

²% of donors that have been prescribed antihypertensive drugs (where follow-up returned)

- Percentages are omitted where less than 75%, 50% or 35% of data reported at 1yr, 5yrs or 10yrs

Figure 6.5 shows the percentage of donors with follow-up reported by centre, for donations between April 2009 - March 2023.



6.2 Serum creatinine, 1 April 2009 – 31 March 2023

Figure 6.6, 6.7 and 6.8 show the median serum creatinine at 1, 5 and 10 year follow-up by centre, respectively. The same information is summarised in Table 6.3.

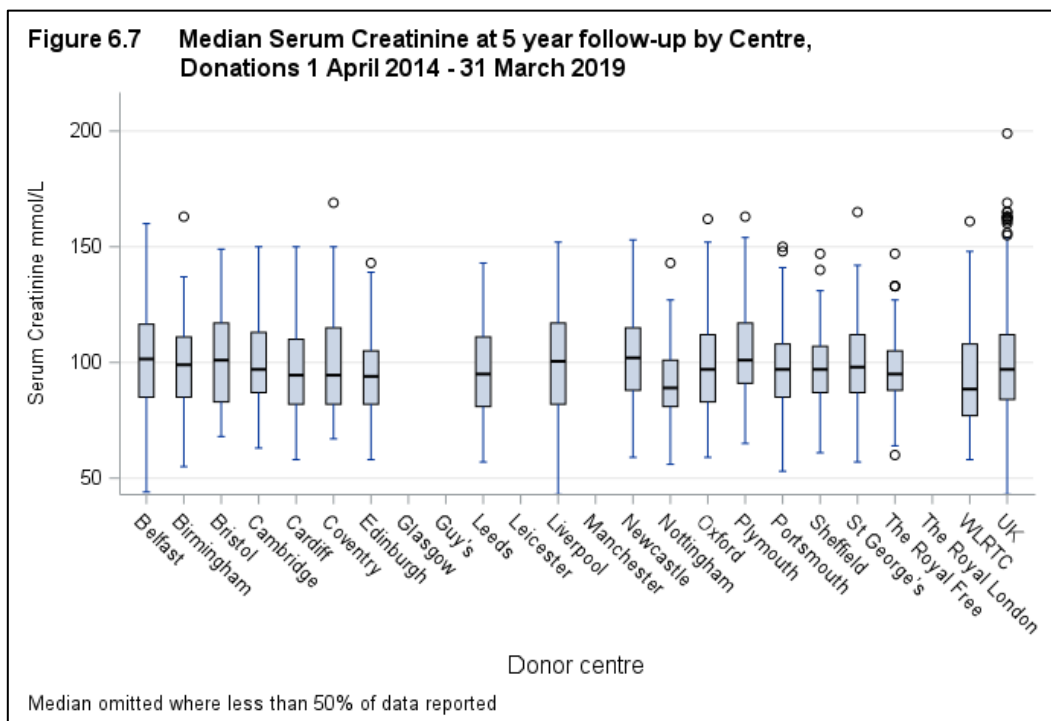
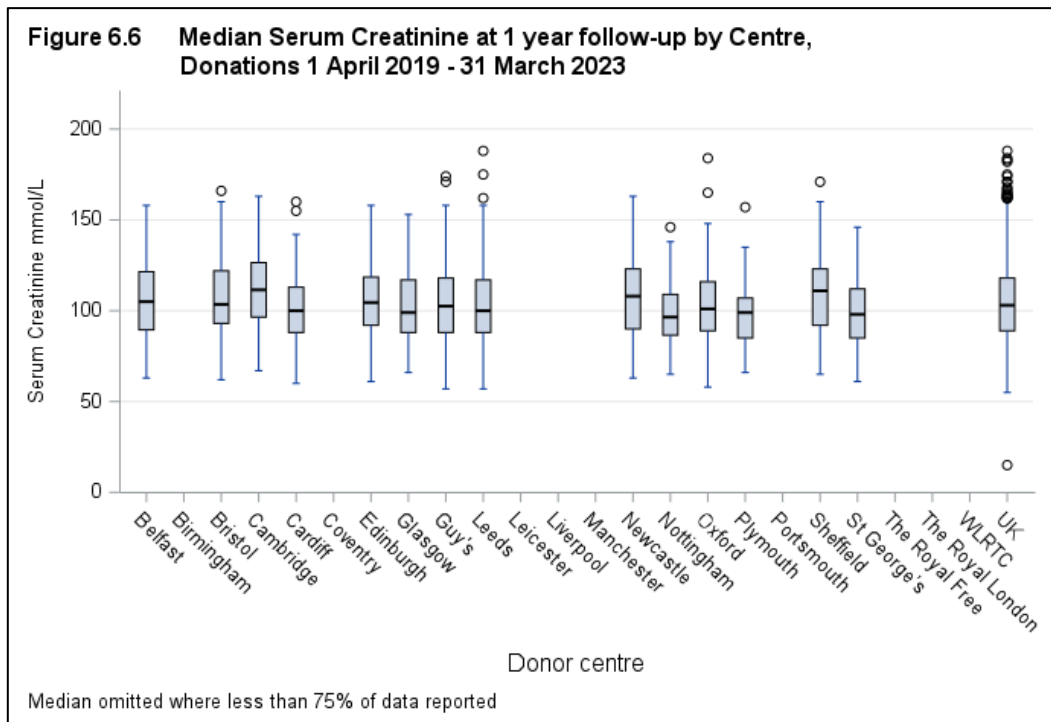


Figure 6.8 Median Serum Creatinine at 10 year follow-up by Centre, Donations 1 April 2009 - 31 March 2014

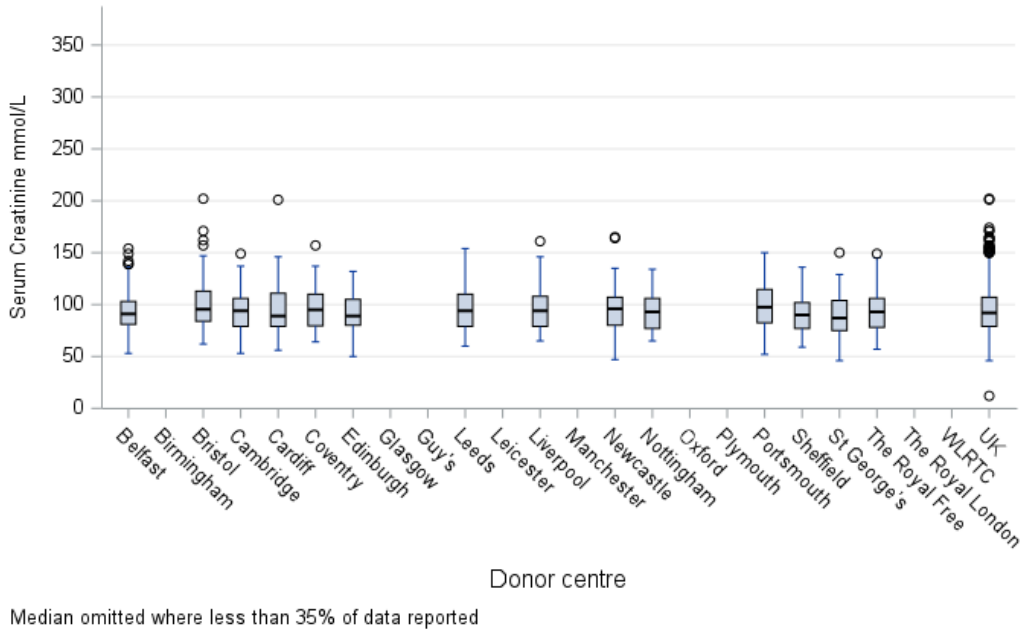


Table 6.3 Median serum creatinine at 1, 5 and 10 year follow up by centre, donations 1 April 2009 - 31 March 2023

Centre	1 Year			5 Year			10 Year		
	N	% ¹	Median (IQ range)	N	% ¹	Median (IQ range)	N	% ¹	Median (IQ range)
Belfast	236	92	105 (89.5-121.5)	343	76	101.5 (85-116.5)	226	65	91 (81-103)
Birmingham	137	68	- (---)	273	57	99 (85-111)	319	33	(-)
Bristol	120	80	103.5 (93-122)	167	62	101 (83-117)	214	42	95.5 (84-113)
Cambridge	94	77	111.5 (96.5-126.5)	200	57	97 (87-113)	220	54	94 (79-106)
Cardiff	123	93	100 (88-113)	164	77	94.5 (82-110)	194	76	89 (79-111)
Coventry	65	68	- (---)	134	52	94.5 (82-115)	154	52	95 (79.5-110)
Edinburgh	153	81	104.5 (92-118.5)	230	52	94 (82-105)	149	42	89 (80-105)
Glasgow	189	95	99 (88-117)	225	37	(-)	166	17	(-)
Guy's	359	82	102.5 (88-118)	526	46	(-)	623	33	(-)
Leeds	190	85	100 (88-117)	250	70	95 (81-111)	223	46	94 (79-110)
Leicester	114	61	- (---)	129	32	(-)	207	23	(-)
Liverpool	86	69	- (---)	206	55	100.5 (82-117)	151	38	94 (79-108)
Manchester	267	66	- (---)	441	46	(-)	430	32	(-)
Newcastle	170	82	108 (90-123)	300	72	102 (88-115)	269	47	96 (80-107)
Nottingham	65	80	96.5 (86.5-109)	81	68	89 (81-101)	87	54	93 (77-106)
Oxford	203	75	101 (89-116)	270	56	97 (83-112)	256	35	98 (79-106)
Plymouth	68	75	99 (85-107)	118	52	101 (91-117)	101	29	(-)
Portsmouth	100	47	- (---)	137	59	97 (85-108)	126	51	97.5 (82.5-114.5)
Sheffield	49	76	111 (92-123)	102	75	97 (87-107)	104	59	90 (77-102)
St George's	105	78	98 (85-112)	202	63	98 (87-112)	241	39	87 (75-104)
The Royal Free	114	61	- (---)	182	54	95 (88-105)	197	48	93 (78-106)
The Royal London	120	30	- (---)	195	37	(-)	224	31	(-)
WLRTC	128	63	- (---)	225	55	88.5 (77-108)	341	32	(-)
UK	3255	75	103 (89-118)	5100	56	97 (84-112)	5222	40	92 (79-107)

¹% of donors with follow-up reported

- Medians are omitted where less than 75%, 50% or 35% of data reported at 1yr, 5yrs or 10yrs

6.3 Return to normal activity, 1 April 2009 – 31 March 2029

Figure 6.9 shows the median time (in months) to return to normal activity after donation, by centre. The median ranged from 0 to 3 months post-transplant.

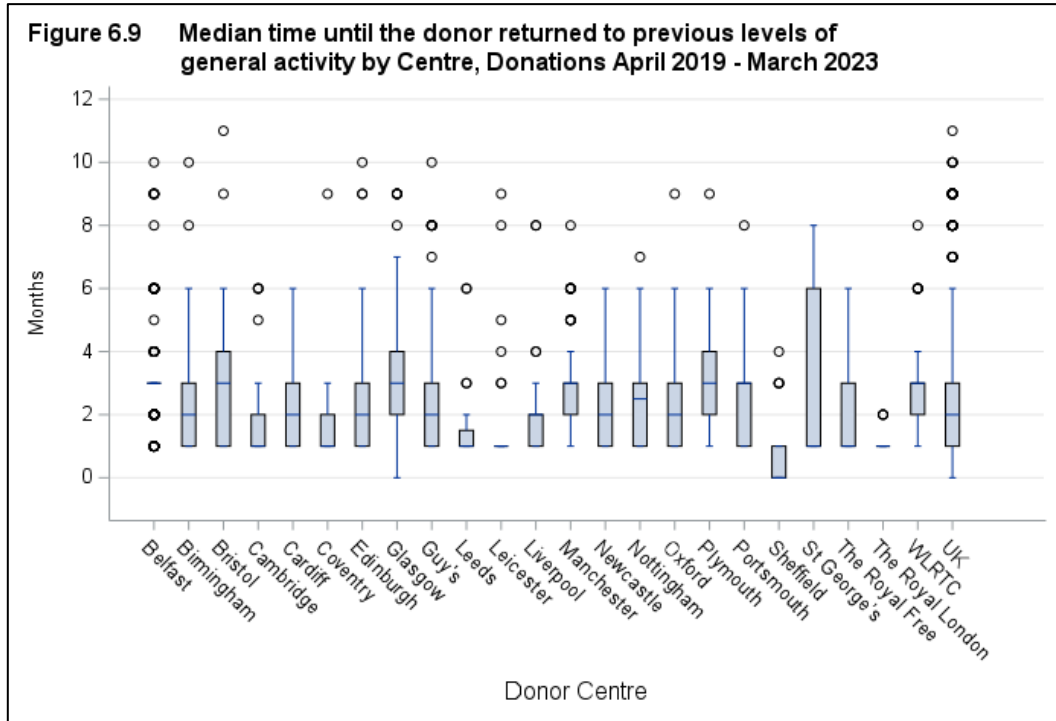
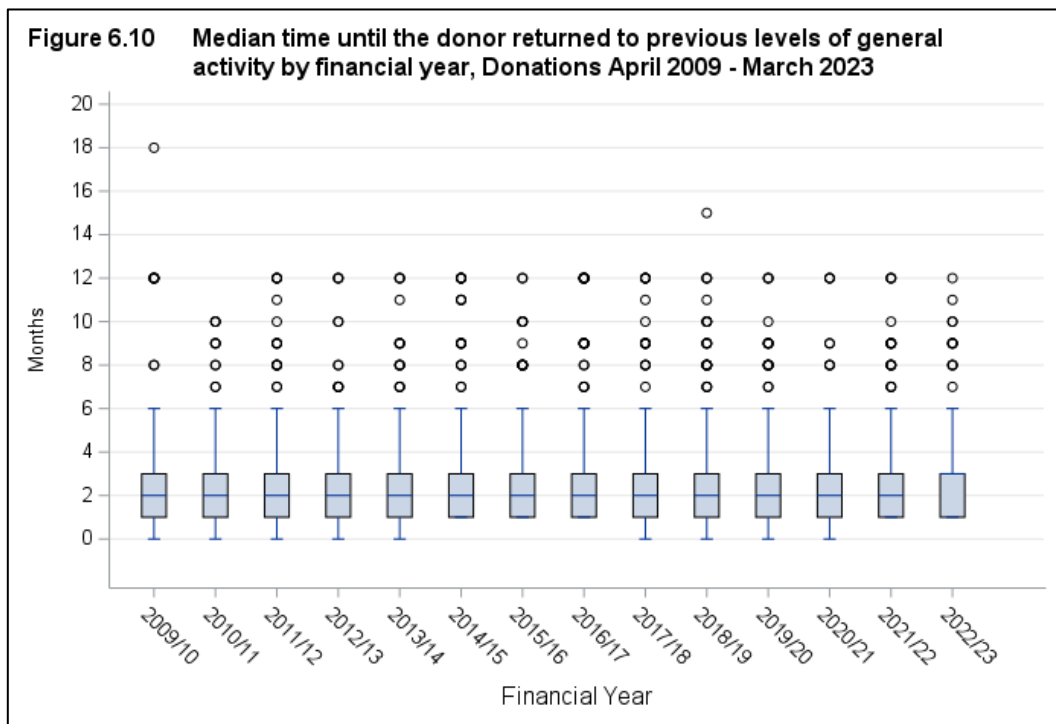


Figure 6.10 shows the median time (in months) to return to normal activity after donation in the UK, by financial year.



Graft and Patient survival

ADULT

One and five year graft and patient survival are shown in **Figures 7.1-7.4** following adult living donor kidney transplants by donor type. **Tables 7.1-7.4** show the survival rates and 95% confidence limits.

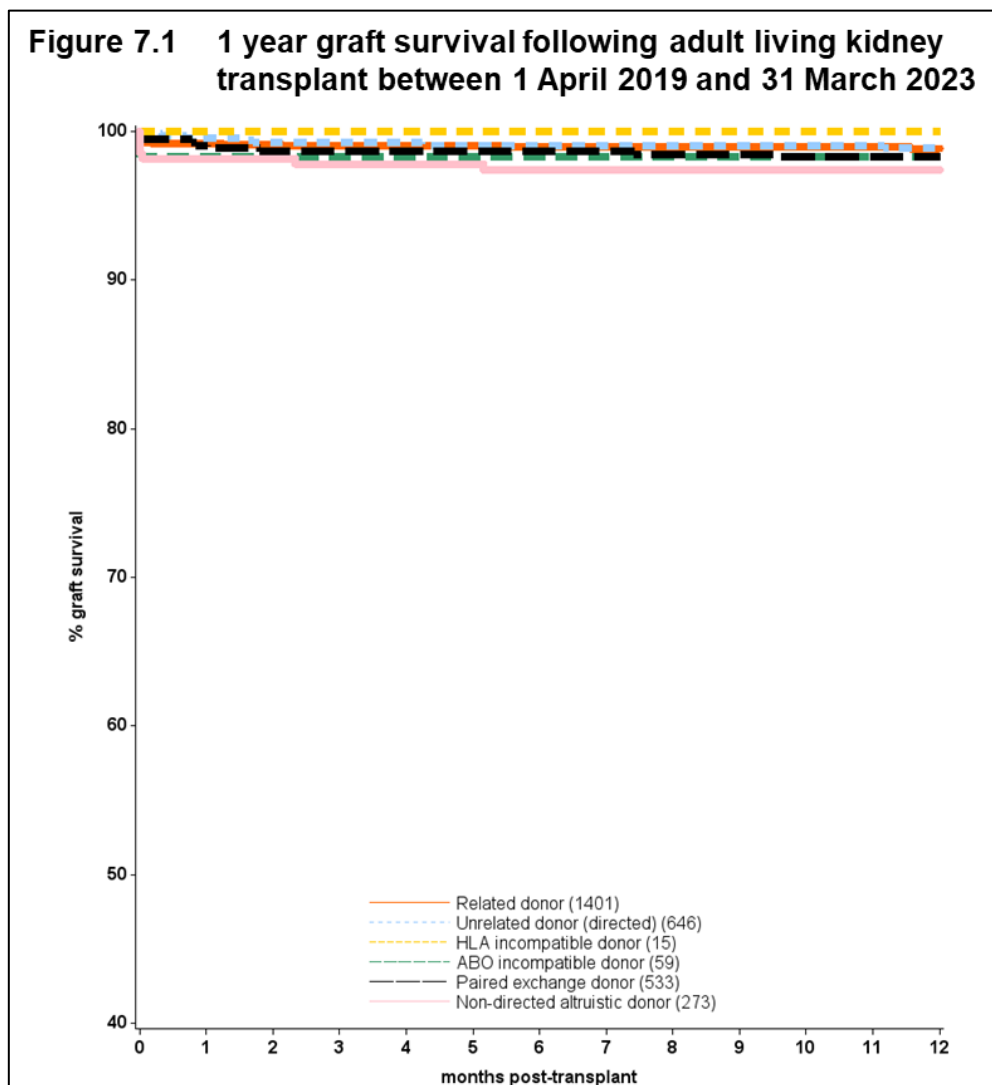


Table 7.1 1 year graft survival following living kidney transplant between 1 April 2019 and 31 March 2023 (p=0.2897)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Unrelated donor (directed)	645	99.0	(98-100)
Related donor	1399	98.8	(98-99)
ABO incompatible donor	59	98.3	(89-100)
Paired exchange donor	533	98.2	(97-99)
Non-directed altruistic donor	273	97.4	(95-99)
HLA incompatible donor*	15	-	-

* There were no events in this group over the follow-up period so no survival estimate is given

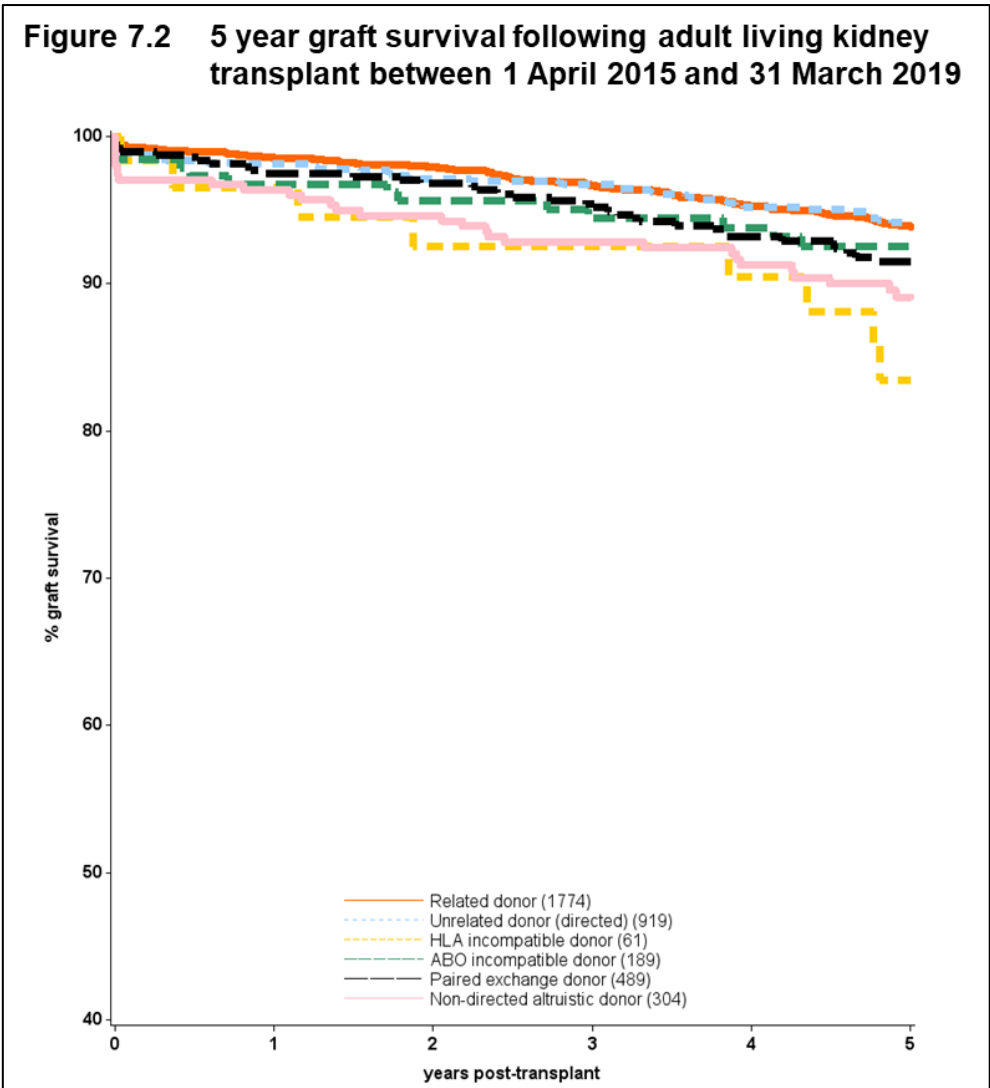


Table 7.2 5 year graft survival following living kidney transplant between 1 April 2015 and 31 March 2019 (p=0.0028)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Unrelated donor (directed)	919	94.0	(92-95)
Related donor	1774	93.8	(93-95)
ABO incompatible donor	189	92.5	(87-96)
Paired exchange donor	489	91.5	(88-94)
Non-directed altruistic donor	304	89.1	(85-92)
HLA incompatible donor	61	83.4	(69-91)

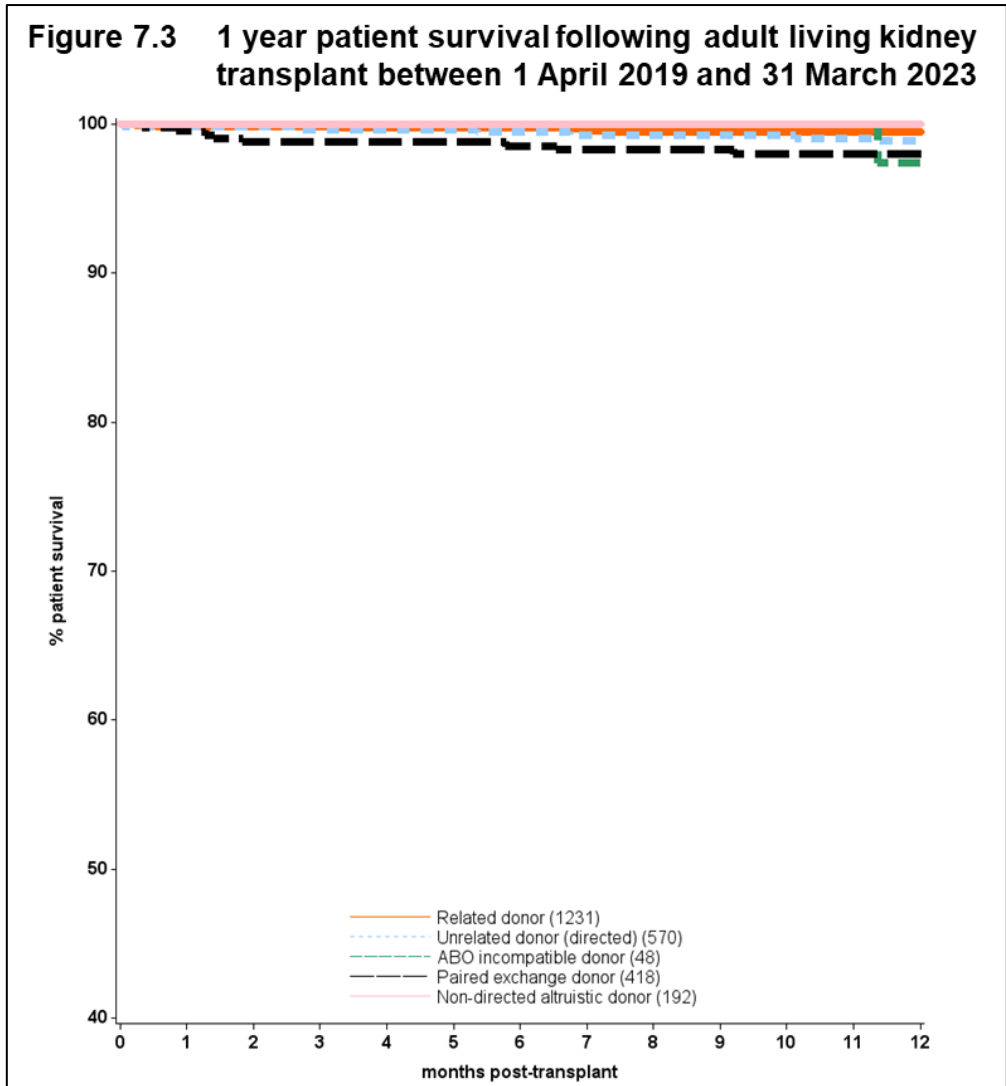


Table 7.3 1 year patient survival following living kidney transplant between 1 April 2019 and 31 March 2023 (p=0.0321)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1231	99.5	(99-100)
Unrelated donor (directed)	570	98.8	(97-99)
Paired exchange donor	418	98.0	(96-99)
ABO incompatible donor	48	97.4	(83-100)
Non-directed altruistic donor	192	-	-
HLA incompatible donor*	9	-	-

* There were no events in this group over the follow-up period so no survival estimate is given

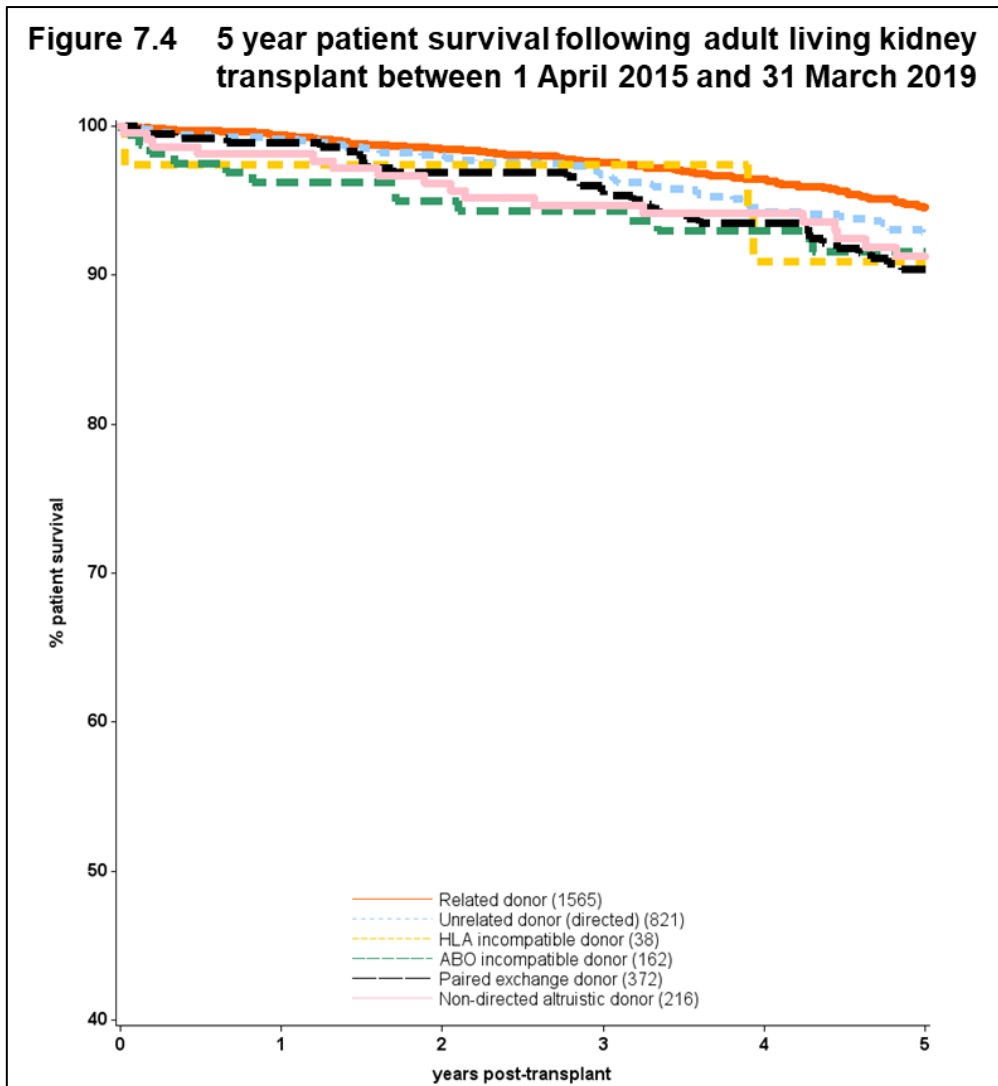


Table 7.4 5 year patient survival following living kidney transplant between 1 April 2015 and 31 March 2019 (p=0.0510)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1565	94.5	(93-96)
Unrelated donor (directed)	821	92.9	(91-95)
ABO incompatible donor	162	91.6	(86-95)
Non-directed altruistic donor	216	91.2	(86-94)
HLA incompatible donor	38	90.9	(74-97)
Paired exchange donor	372	90.4	(87-93)

We present a visual comparison of survival rates among centres that is based on a graphical display known as a funnel plot (1, 2). This display is used to show how consistent the rates of the different transplant units are with the national rate. Funnel plots show the survival rate plotted against the number of transplants for each centre, with the overall national survival rate (solid line), and its 95% (thin dotted lines) and 99.8% (thick dotted lines) confidence limits superimposed. Each dot in the plot represents one of the centres. Note that many recipients return to local renal units for follow-up care after their transplant and although we report survival according to transplant unit, recipients may in fact be followed up quite distantly from their transplant centre.

Interpreting the funnel plots

If a centre lies within all the limits, then that centre has a survival rate that is statistically consistent with the national rate. If a centre lies outside the 95% confidence limits, this serves as an alert that the centre may have a rate that is significantly different from the national rate. If a centre lies outside the 99.8% limits, then further investigations may be carried out to determine the reasons for the possible difference. When a centre lies above the upper limits, this indicates a survival rate that is higher than the national rate, while a centre that lies below the lower limits has a survival rate that is lower than the national rate. It is important to note that adjusting for recipient mix through the use of risk-adjustment models may not account for all possible causes of centre differences. There may be other factors that are not taken into account in the risk-adjustment process that may affect the survival rate of a particular centre.

References

1. Tekkis PP, McCulloch P, Steger AC, Benjamin IS, Poloniecki JD. Mortality control charts for comparing performance of surgical units: validation study using hospital mortality data. *British Medical Journal* 2003; 326: 786 – 788.
2. Stark J, Gallivan S, Lovegrove J, Hamilton JRL, Monro JL, Pollock JCS, Watterson KG. Mortality rates after surgery for congenital heart defects in children and surgeons' performance. *Lancet* 2000; 355: 1004 – 1007.

Figures 7.5 to 7.9 shows one year risk adjusted survival rates following adult living donor kidney transplants by centre for each donor type. **Table 7.5** shows the survival rates by centre and donor type. There were no events within 1 year of an adult living HLAi donor kidney transplant so a figure for this group has not been included in this report.

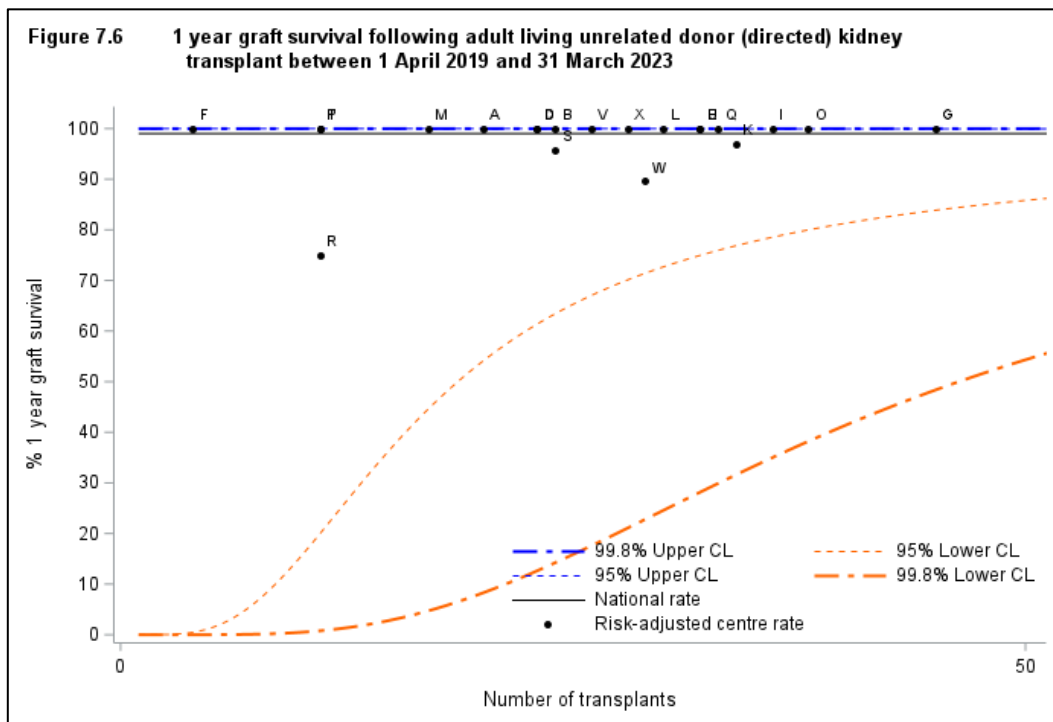
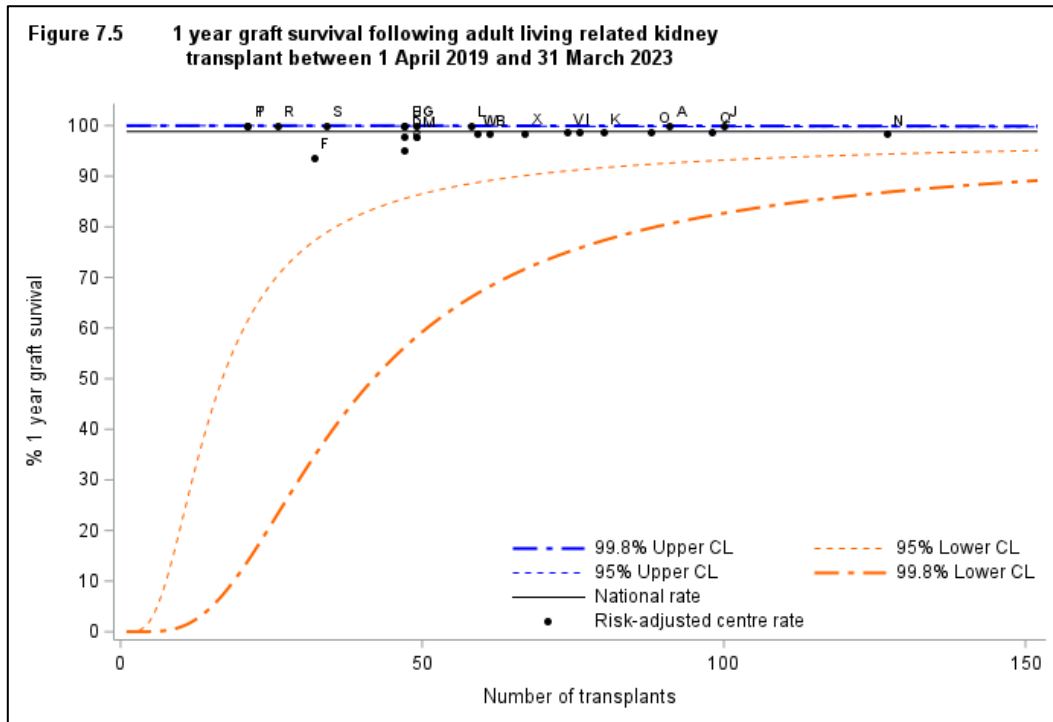


Figure 7.7 1 year graft survival following adult living ABOi donor kidney transplant between 1 April 2019 and 31 March 2023

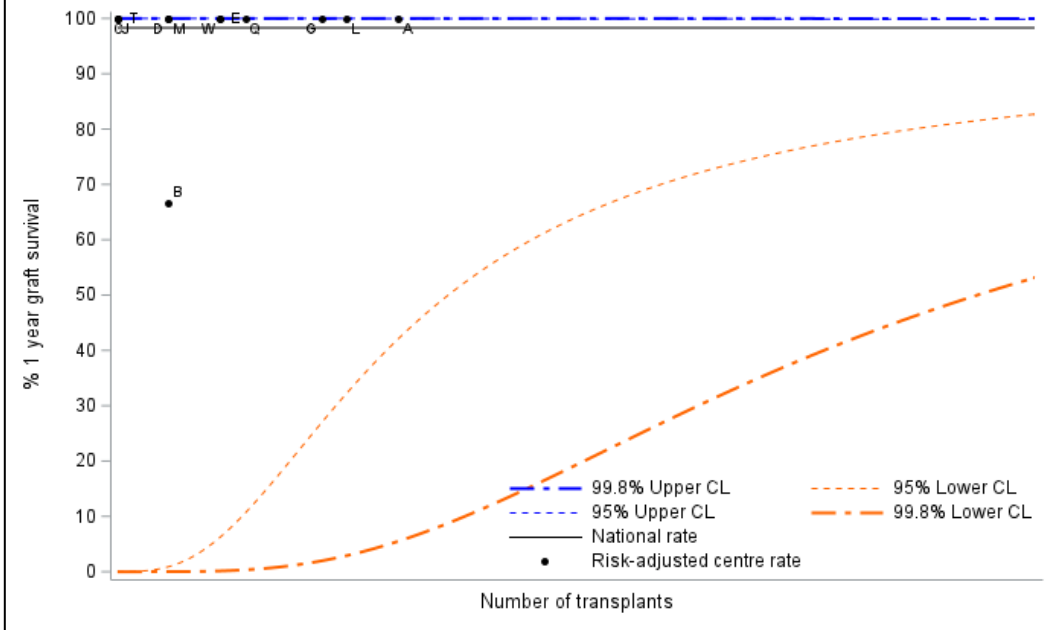
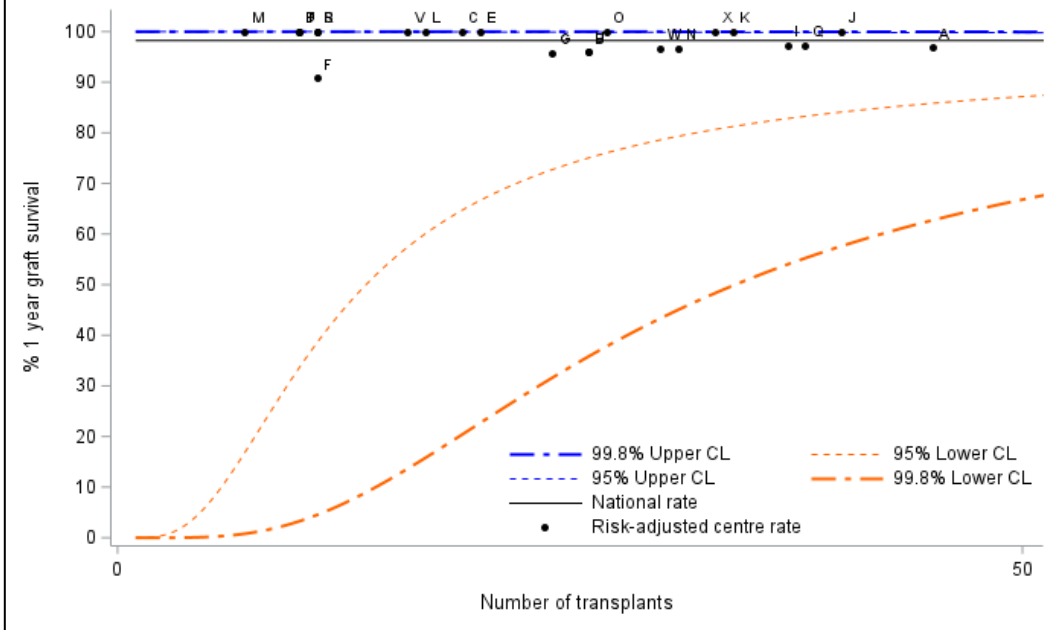


Figure 7.8 1 year graft survival following adult living paired exchange donor kidney transplant between 1 April 2019 and 31 March 2023



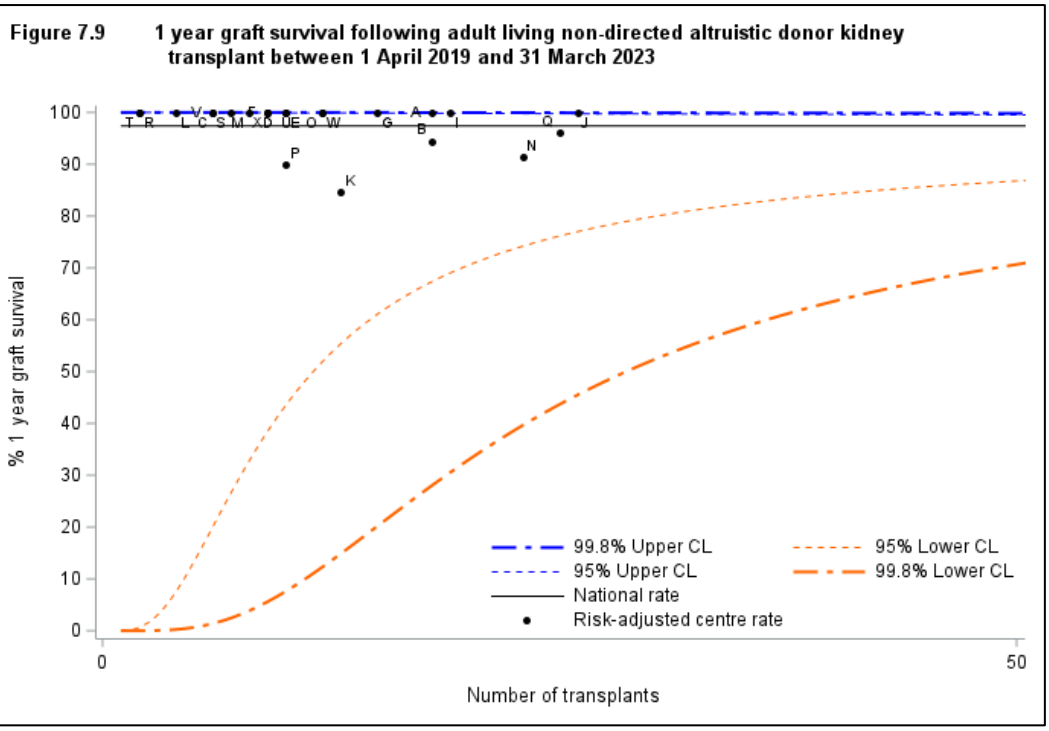


Table 7.5 1 year graft survival following adult living donor kidney transplant between 1 April 2019 and 31 March 2023, by donor type and centre

Centre	Code	Related		Unrelated		HLAi		ABOi		Paired		Non-directed altruistic	
		N	% ¹	N	% ¹	N	% ¹	N	% ¹	N	% ¹	N	% ¹
Belfast	A	91	100	20	100			12	100	45	97	18	100
Birmingham	B	61	98	24	100	1	100	3	67	26	96	18	94
Bristol	C	47	95	23	100	1	100	1	100	19	100	6	100
Cambridge	D	47	98	23	100	3	100	3	100	10	100	9	100
Cardiff	E	47	100	32	100			5	100	20	100	10	100
Coventry	F	32	94	4	100	1	100			11	91	9	100
Edinburgh	G	49	100	45	100			9	100	24	96	15	100
Glasgow	I	76	99	36	100					37	97	19	100
Guy's	J	100	100	57	100	1	100	1	100	40	100	26	100
Leeds	K	80	99	34	97	1	100			34	100	13	85
Leicester	L	58	100	30	100			10	100	17	100	4	100
Liverpool	M	49	98	17	100	1	100	3	100	7	100	8	100
Manchester	N	127	98	57	100					31	97	23	91
Newcastle	O	88	99	38	100	3	100			27	100	12	100
Nottingham	P	21	100	11	100					10	100	10	90
Oxford	Q	98	99	33	100	2	100	6	100	38	97	25	96
Plymouth	R	26	100	11	75					11	100	2	100
Portsmouth	S	34	100	24	96					11	100	7	100
Sheffield	T	21	100	11	100			1	100	10	100	2	100
St George's	U	47	100	32	100					26	96	10	100
The Royal Free	V	74	99	26	100	1	100			16	100	6	100
The Royal London	W	59	98	29	90			5	100	30	97	12	100
WLRTC	X	67	99	28	100					33	100	9	100
UK		1399	99	645	99	15	100	59	98	533	98	273	97

¹ % 1 year graft survival

PAEDIATRIC

Numbers are too small to present paediatric graft and patient survival broken down by living donor transplant type. Overall living donor survival is presented in the Annual report on kidney transplantation.

Appendix

A1 Glossary of terms

ABO

The most important human blood group system for transplantation is the ABO system. Every human being is of blood group O, A, B or AB, or of one of the minor variants of these four groups. ABO blood groups are present on other tissues and, unless special precautions are taken, a group A kidney transplanted to a group O recipient will be rapidly rejected.

Active transplant list

When a recipient is registered for a transplant, they are registered on what is called the 'active' transplant list. This means that when a donor kidney becomes available, the recipient is included among those who are matched against the donor to determine whether or not the kidney is suitable for them. It may sometimes be necessary to take a recipient off the transplant list, either temporarily or permanently. This may be done, for example, if someone becomes too ill to receive a transplant. The recipient is told about the decision to suspend them from the list and is informed whether the suspension is temporary or permanent. If a recipient is suspended from the list, they are not included in the matching of any donor kidneys that become available.

Case mix

The types of recipients treated at a unit for a common condition. This can vary across units depending on the facilities available at the unit as well as the types of people in the catchment area of the unit. The definition of what type of recipient a person is depends on the recipient characteristics that influence the outcome of the treatment. For example the case mix for recipients registered for a kidney transplant is defined in terms of various factors such as the blood group, tissue type and age of the recipient. These factors have an influence on the chance of a recipient receiving a transplant.

Confidence interval (CI)

When an estimate of a quantity such as a survival rate is obtained from data, the value of the estimate depends on the set of recipients whose data were used. If, by chance, data from a different set of recipients had been used, the value of the estimate may have been different. There is therefore some uncertainty linked with any estimate. A confidence interval is a range of values whose width gives an indication of the uncertainty or precision of an estimate. The number of transplants or recipients analysed influences the width of a confidence interval. Smaller data sets tend to lead to wider confidence intervals compared to larger data sets. Estimates from larger data sets are therefore more precise than those from smaller data sets. Confidence intervals are calculated with a stated probability, usually 95%. We then say that there is a 95% chance that the confidence interval includes the true value of the quantity we wish to estimate.

Confidence limit

The upper and lower bounds of a confidence interval.

Cox Proportional Hazards model

A statistical model that relates the instantaneous risk (hazard) of an event occurring at a given time point to the risk factors that influence the length of time it takes for the event to occur. This model can be used to compare the hazard of an event of interest, such as graft failure or recipient death, across different groups of recipients.

Cross-match

A cross-match is a test for recipient antibodies against donor antigens. A positive cross-match shows that the donor and recipient are incompatible. A negative cross-match means there is no reaction between donor and recipient and that the transplant may proceed.

Funnel plot

A graphical method that shows how consistent the survival rates of the different transplant units are compared to the national rate. The graph shows for each unit, a survival rate plotted against the number of transplants undertaken, with the national rate and confidence limits around this national rate superimposed. In this report, 95% and 99.8% confidence limits were used. Units that lie within the confidence limits have survival rates that are statistically consistent with the national rate. When a unit is close to or outside the limits, this is an indication that the centre may have a rate that is considerably different from the national rate.

Graft survival rate

The percentage of recipients whose grafts are still functioning. This is usually specified for a given time period after transplant. For example, a five-year transplant survival rate is the percentage of transplants still functioning five years after transplant.

HLA mismatch

Human Leucocyte Antigen (HLA) antigens are carried on many cells in the body and the immune system can distinguish between those that can be recognised as 'self' (belonging to you or identical to your own) and those that can be recognised as 'nonself'. The normal response of the immune system is to attack foreign/non-self material by producing antibodies against the foreign material. This is one of the mechanisms that provide protection against infection. This is unfortunate from the point of view of transplantation as the immune system will see the graft as just another 'infection' to be destroyed, produce antibodies against the graft and rejection of the grafted organ will take place. To help overcome this response, it is recognised that 'matching' the recipient and donor on the basis of HLA (and blood group) reduces the chances of acute rejection and, with the added use of immunosuppressive drugs, very much improves the chances of graft survival. 'Matching' refers to the similarity of the recipient HLA type and donor HLA type. HLA mismatch refers to the number of mismatches between the donor and the recipient at the A, B and DR (HLA) loci. There can only be a total of two mismatches at each locus. For example, an HLA mismatch value of 000, means that the donor and recipient are identical at all three loci, while an HLA mismatch value of 210 means that the donor and recipient differ completely at the A locus, are partly the same at the B locus and are identical at the DR locus.

Inter-quartile range

The values between which the middle 50% of the data fall. The lower boundary is the lower quartile, the upper boundary the upper quartile.

Kaplan-Meier method

A method that allows patients with incomplete follow-up information to be included in estimating survival rates. For example, in a cohort for estimating one year patient survival rates, a recipient was followed up for only nine months before they relocated. If we calculated a crude survival estimate using the number of recipients who survived for at least a year, this recipient would have to be excluded as it is not known whether or not the recipient was still alive at one year after transplant. The Kaplan-Meier method allows information about such recipients to be used for the length of time that they are followed-up, when this information would otherwise be discarded. Such instances of incomplete follow-up are not uncommon and the Kaplan-Meier method allows the computation of estimates that are more meaningful in these cases.

Living donor

A donor who is a living person and who is usually, but not always, a relative of the transplant recipient. For example, a parent may donate one of their kidneys to their child.

Median

The midpoint in a series of numbers, so that half the data values are larger than the median, and half are smaller.

Multi-organ transplant

A transplant in which the recipient receives more than one organ. For example, a recipient may undergo a transplant of a kidney and liver.

National Kidney Allocation Scheme

A nationally agreed set of rules for sharing and allocating kidneys for transplant between transplant centres in the UK. The scheme is administered by NHS Blood and Transplant.

Patient survival rate

The percentage of recipients who are still alive (whether the graft is still functioning or not). This is usually specified for a given time period after transplant. For example, a five-year patient survival rate is the percentage of recipients who are still alive five years after their first transplant.

p value

In the context of comparing survival rates across centres, the p value is the probability that the differences observed in the rates across centres occurred by chance. As this is a probability, it takes values between 0 and 1. If the p value is small, say less than 0.05, this implies that the differences are unlikely to be due to chance and there may be some identifiable cause for these differences. If the p value is large, say greater than 0.1, then it is quite likely that any differences seen are due to chance.

Pre-emptive

Recipients that are placed on the kidney transplant list or receive a transplant prior to the need for dialysis are termed as pre-emptive. Recipients listed pre-emptively will usually require dialysis within six months of being placed on the transplant list.

Risk-adjusted survival rate

Some transplants have a higher chance than others of failing at any given time. The differences in expected survival times arise due to differences in certain factors, the risk factors, among recipients. A risk-adjusted survival rate for a centre is the expected survival rate for that centre given the case mix of their recipients. Adjusting for case mix in estimating centre-specific survival rates allows valid comparison of these rates across centres and to the national rate.

Risk factors

These are the characteristics of a recipient, transplant or donor that influence the length of time that a graft is likely to function or a recipient is likely to survive following a transplant. For example, when all else is equal, a transplant from a younger donor is expected to survive longer than that from an older donor and so donor age is a risk factor.

Unadjusted survival rate

Unadjusted survival rates do not take account of risk factors and are based only on the number of transplants at a given centre and the number and timing of those that fail within the post-transplant period of interest. In this case, unlike for risk-adjusted rates, all transplants are assumed to be equally likely to fail at any given time. However, some centres may have lower unadjusted survival rates than others simply because they tend to undertake transplants that have increased risks of failure. Comparison of unadjusted survival rates across centres and to the national rate is therefore inappropriate.

A2 Statistical methodology for survival rate estimation

Unadjusted estimates of patient and graft survival are given for each centre. Unadjusted rates give an estimate of what the survival rate at a centre is, assuming that all recipients at the centre have the same chance of surviving a given length of time after transplant.

Computing unadjusted survival rates

Unadjusted survival rates were calculated using the Kaplan-Meier method, which allows recipients with incomplete follow-up information to be included in the computation. For example, in a cohort for estimating one-year patient survival rates, a recipient was followed up for only nine months before they relocated. If we calculated a crude survival estimate using the number of recipients who survived for at least a year, this recipient would have to be excluded, as it is not known whether or not the recipient was still alive one year after transplant. The Kaplan-Meier method allows information about such recipients to be used for the length of time that they are followed-up, when this information would otherwise be discarded. Such instances of incomplete follow-up are not uncommon in the analysis of survival data and the Kaplan-Meier method therefore allows the computation of survival estimates that are more meaningful.

Prepared by:

Statistics and Clinical Research, NHS Blood and Transplant

Dr Matthew Robb
Maria Jacobs