



Blood and Transplant

ANNUAL REPORT ON LIVING DONOR KIDNEY TRANSPLANTATION

**REPORT FOR 2022/2023
(1 APRIL 2008 – 31 MARCH 2023)**

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Contents



1 Executive Summary	1
2 Introduction	3
ADULT	6
PAEDIATRIC	9
3 Demographic Characteristics.....	12
ADULT	13
PAEDIATRIC	17
4 UK Living Kidney Sharing Schemes.....	21
4.1 Paired Donation Scheme.....	22
4.1.1 Registrations: Matching Runs, 1 April 2017 – 31 March 2023	22
4.1.2 Outcomes: Matching Runs, 1 April 2019 – 31 March 2023.....	25
4.2 Non-directed Altruistic Donation	30
4.2.1 Transplants, 1 April 2014 – 31 March 2023	30
4.2.2 Time to donation, 1 April 2019 – 31 March 2023	32
5 Antibody Incompatible Transplants.....	34
ADULT	37
PAEDIATRIC	40
6 Living Donor Follow-Up	41
6.1 Prescription of Antihypertensive drugs, 1 April 2008– 31 March 2022.....	44
6.2 Serum creatinine, 1 April 2008 – 31 March 2022	48
6.3 Return to normal activity, 1 April 2008 – 31 March 2022.....	51
7 Recipient Graft and Recipient survival.....	52
ADULT	53
PAEDIATRIC	61
Appendix	62
A1 Glossary of terms.....	63
A2 Statistical methodology for survival rate estimation	67

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 2008. 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 834 adult living donor kidney transplants performed in the UK in 2022/23, an increase of 28 transplants compared to 2021/22. Of these, 391 (393 in 2021/22) were genetically related, 176 (173 in 2021/22) were unrelated, 3 (3 in 2022/23) was HLAi, 17 (10 in 2022/23) were ABOi, 167 (160 in 2022/23) were paired/pooled and 80 (67 in 2022/23) were non-directed altruistic donor transplants. The equivalent number of paediatric transplants was 77, a 25% decrease from 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 93%, genetically related 94%, non-directed altruistic 89%, paired exchange 90%, ABOi 89% and HLAi 87%.
- 48% of registered recipients in the UK Living Kidney Sharing Scheme have been transplanted and 69% of identified transplants proceed.

Use of the contents of this report should be acknowledged as follows:
Annual Report on Living Donor Kidney Transplantation 2022/23. NHS Blood and Transplant

Introduction

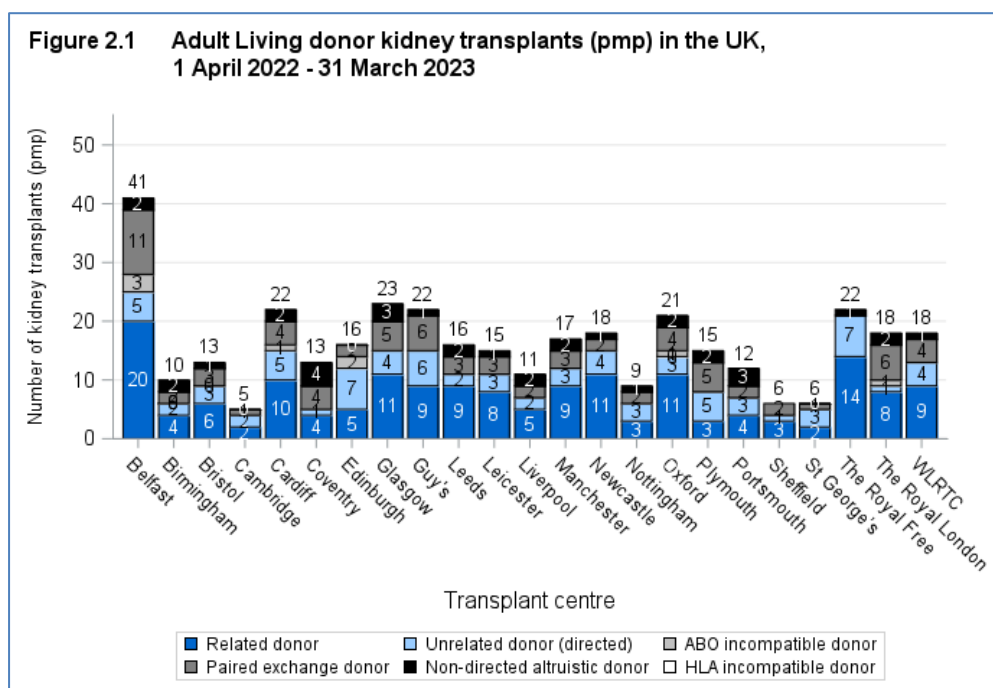
This report presents information on transplant activity between 1 April 2008 and 31 March 2023, for all 24 centres performing living donor kidney transplantation in the UK. Data were obtained from the UK Transplant Registry, at NHS Blood & Transplant, that holds information relating to donors, recipients 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 2018 to 31 March 2022 and five-year post-transplant for the period 1 April 2014 to 31 March 2018. 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 2022/23 in each transplant centre.



ADULT

Figure 2.2 shows the number of adult living donor kidney transplants performed in the UK between 1 April 2008 and 31 March 2023.

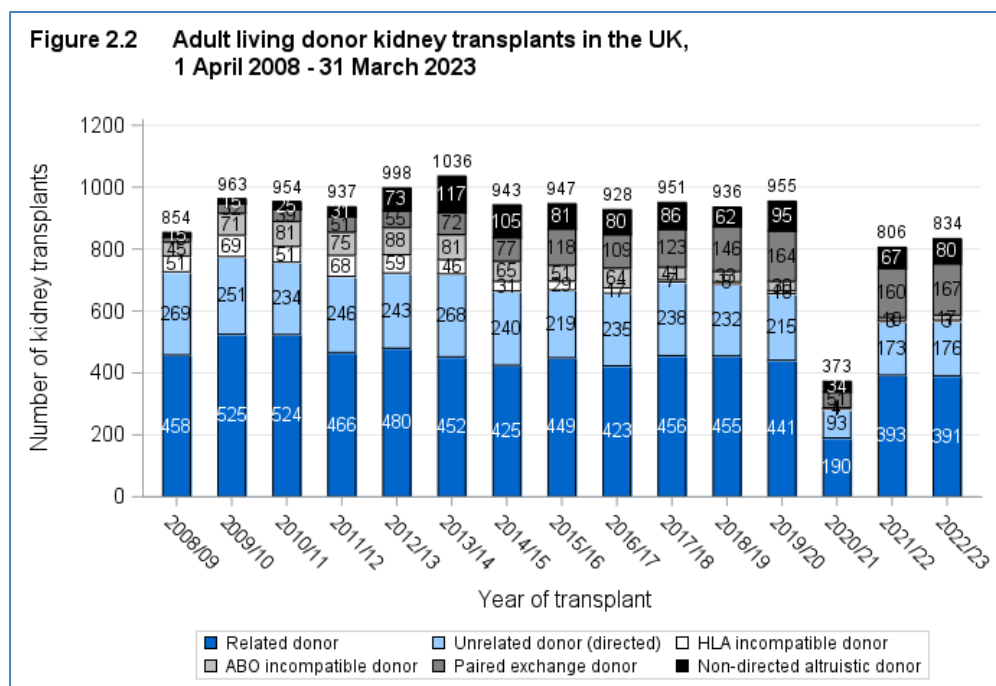


Figure 2.3 and **Table 2.1** show the number of adult living donor kidney transplants performed in 2022/23 in each transplant centre.

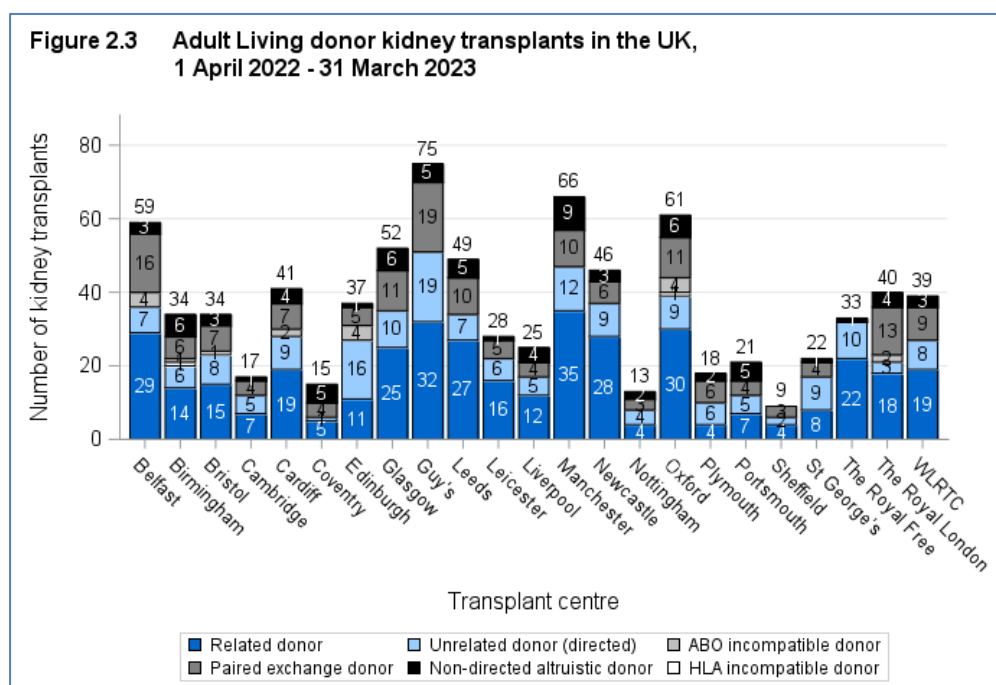


Table 2.1 Adult living donor kidney transplants in the UK, 1 April 2022 - 31 March 2023

Transplant Centre	Donor type					
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	Non-directed altruistic donor
Belfast	29	7	0	4	16	3
Birmingham	14	6	1	1	6	6
Bristol	15	8	1	0	7	3
Cambridge	7	5	0	0	4	1
Cardiff	19	9	0	2	7	4
Coventry	5	1	0	0	4	5
Edinburgh	11	16	0	4	5	1
Glasgow	25	10	0	0	11	6
Guy's	32	19	0	0	19	5
Leeds	27	7	0	0	10	5
Leicester	16	6	0	0	5	1
Liverpool	12	5	0	0	4	4
Manchester	35	12	0	0	10	9
Newcastle	28	9	0	0	6	3
Nottingham	4	4	0	0	3	2
Oxford	30	9	1	4	11	6
Plymouth	4	6	0	0	6	2
Portsmouth	7	5	0	0	4	5
Sheffield	4	2	0	0	3	0
St George's	8	9	0	0	4	1
The Royal Free	22	10	0	0	0	1
The Royal London	18	3	0	2	13	4
WLRTC	19	8	0	0	9	3

Figure 2.4 shows the proportion of adult living donor kidney transplants by donor type and centre in 2022/2023.

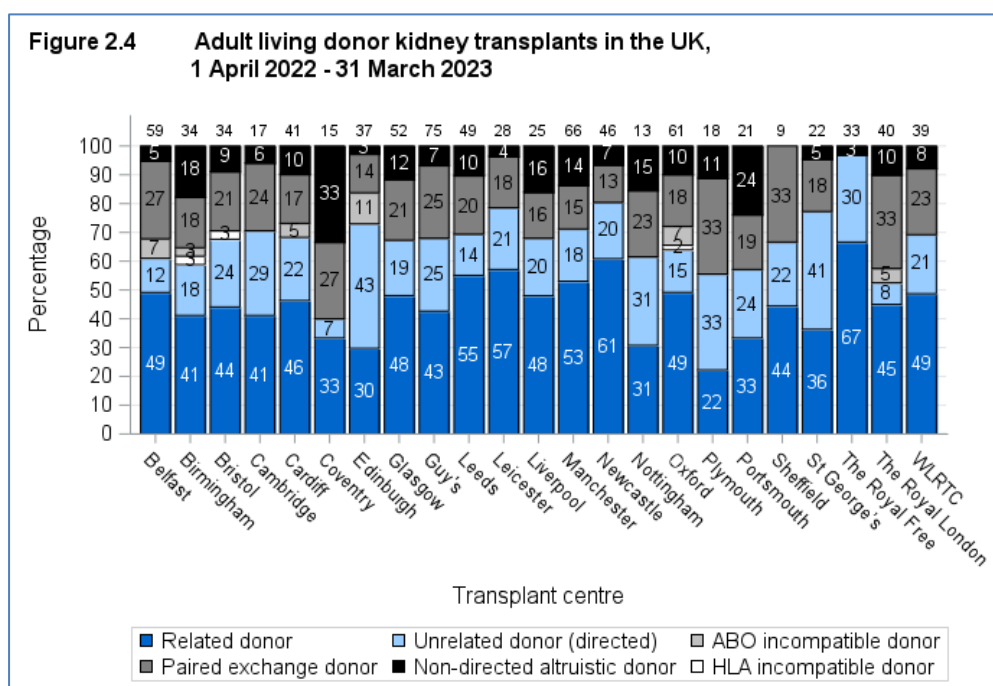
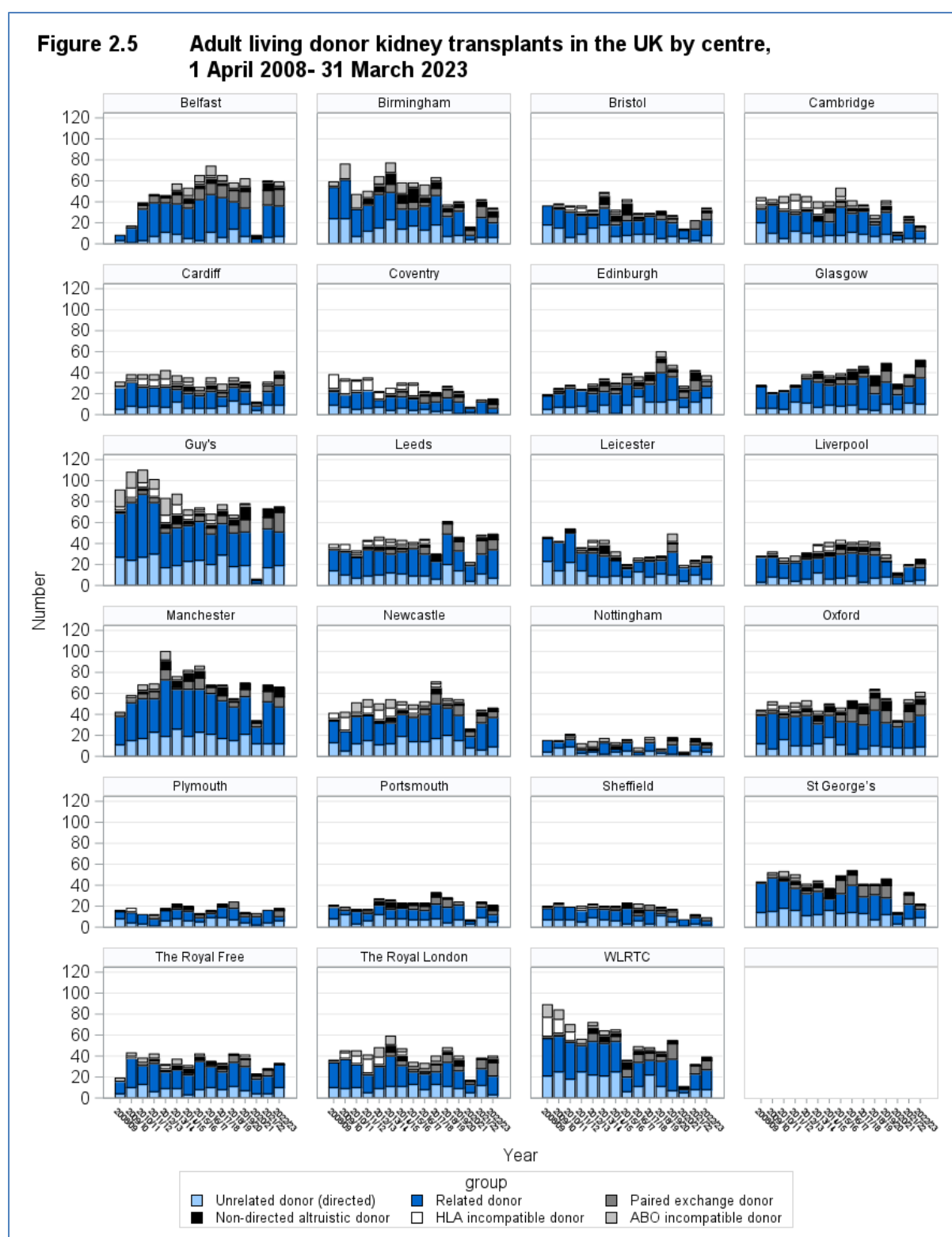


Figure 2.5 shows the number of adult living donor kidney transplants by donor type and centre between 1 April 2008 and 31 March 2023.



PAEDIATRIC

Figure 2.6 shows the number of paediatric living donor kidney transplants performed in the UK between 1 April 2008 and 31 March 2023.

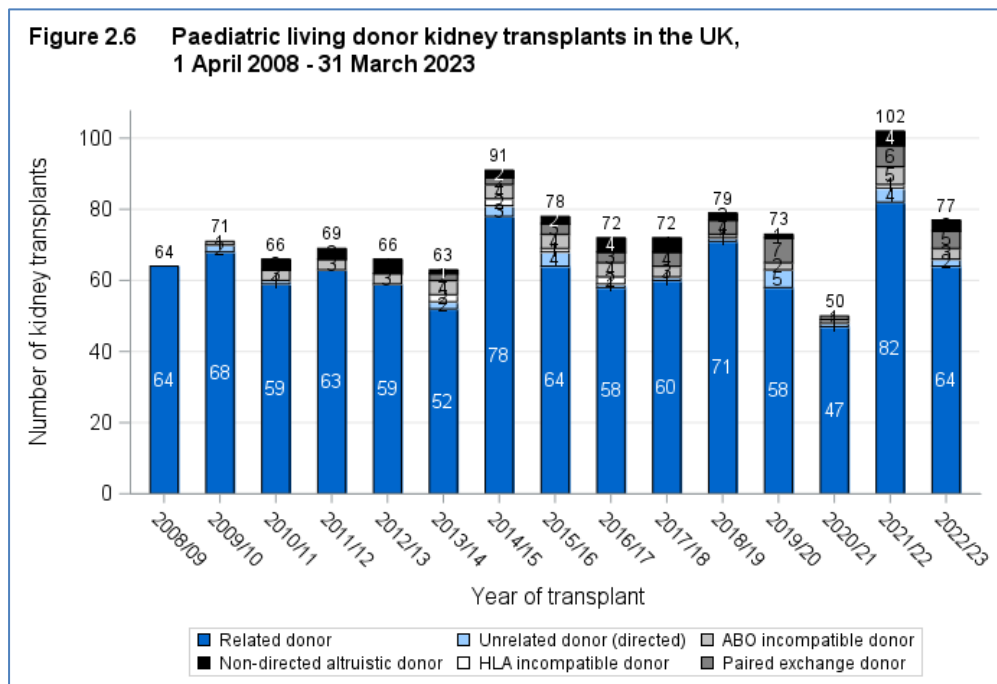


Figure 2.7 and **Table 2.2** show the number of paediatric living donor kidney transplants performed in 2022/23 in each transplant centre.

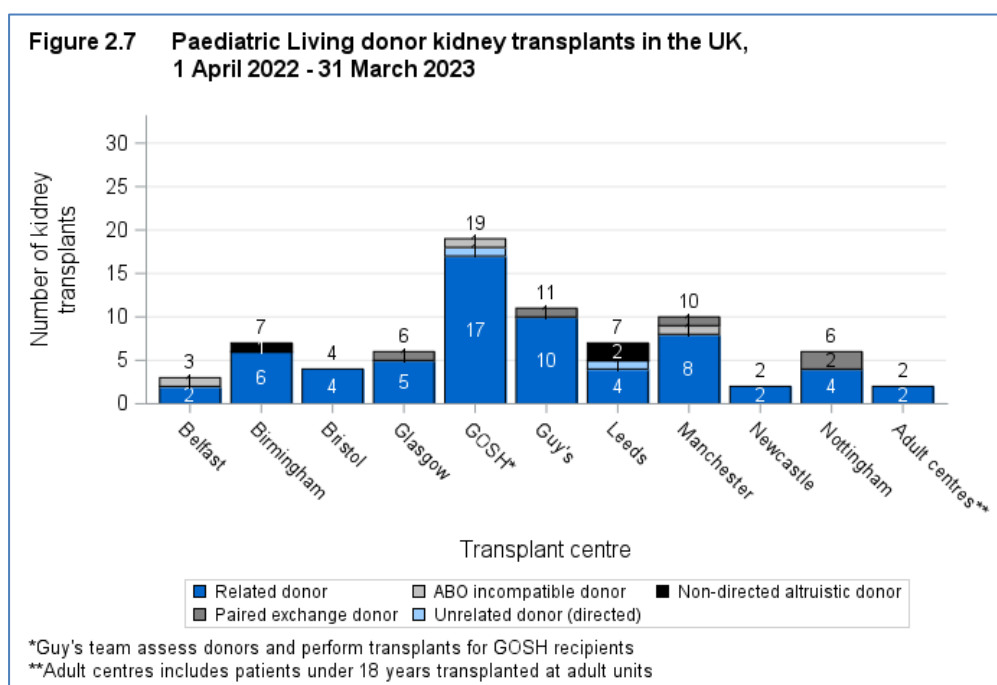


Table 2.2 Paediatric living donor kidney transplants in the UK, 1 April 2022 - 31 March 2023

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	6	0	0	0	0	1
Bristol	4	0	0	0	0	0
GOSH*	17	1	0	1	0	0
Glasgow	5	0	0	0	1	0
Guy's	10	0	0	0	1	0
Leeds	4	1	0	0	0	2
Manchester	8	0	0	1	1	0
Newcastle	2	0	0	0	0	0
Nottingham	4	0	0	0	2	0
Adult centres**	2	0	0	0	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 2022/23.

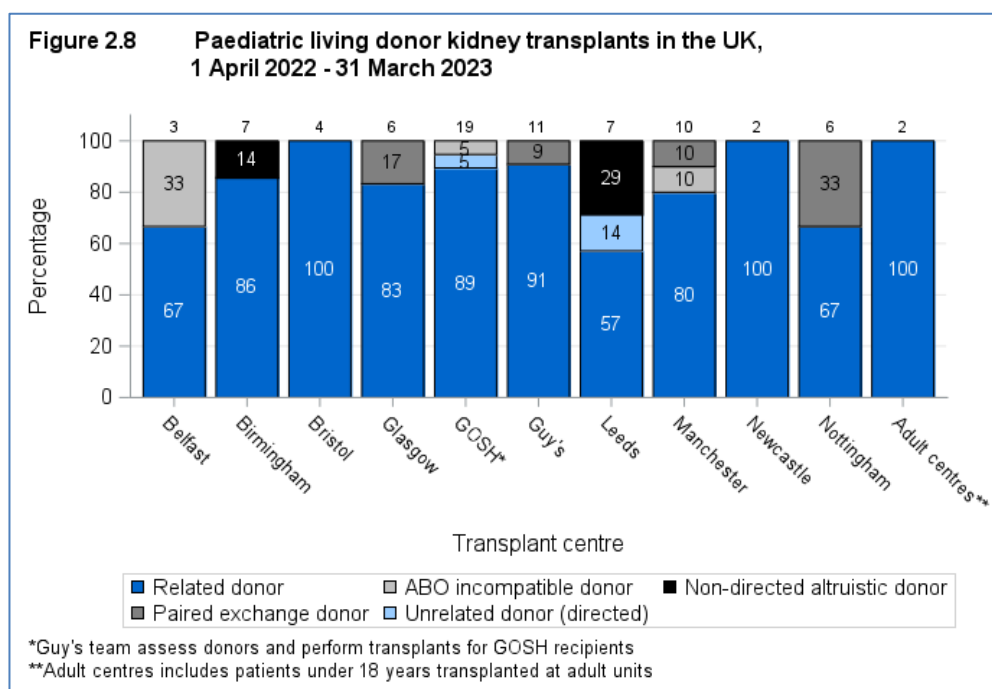
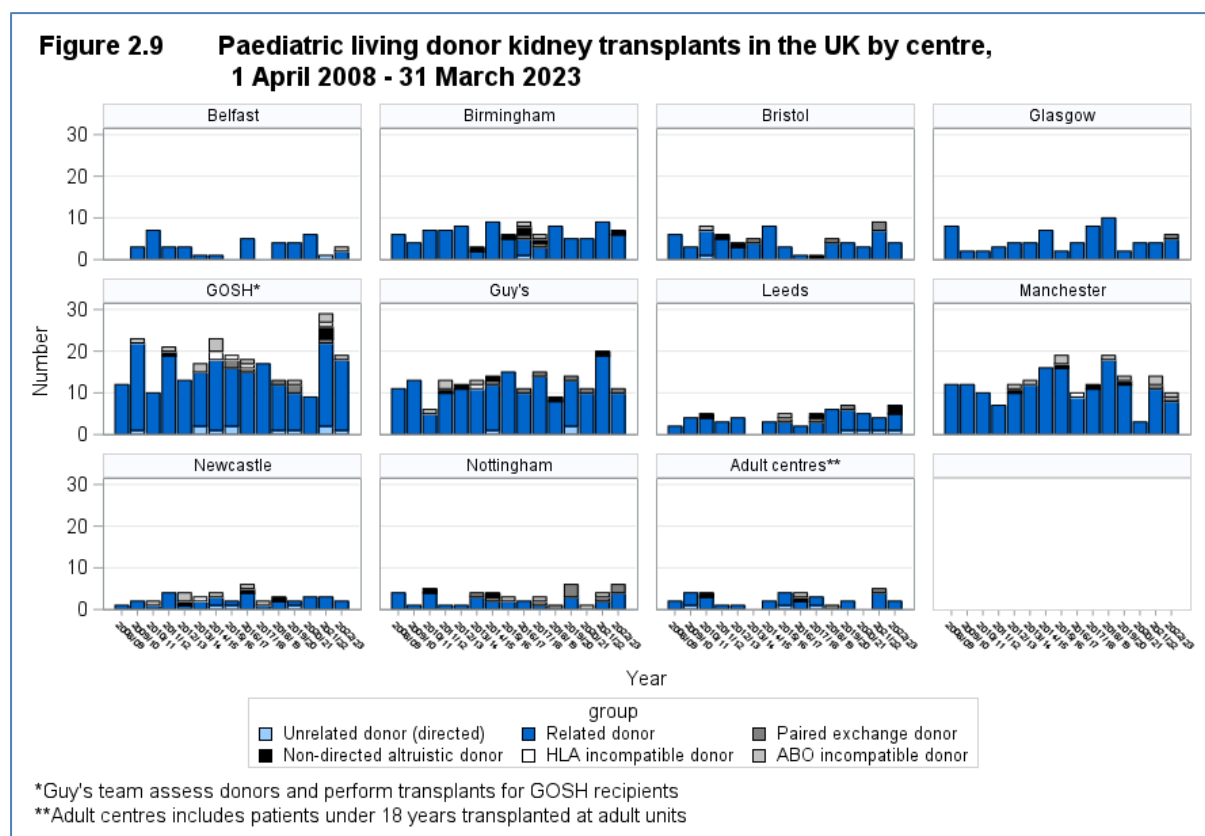


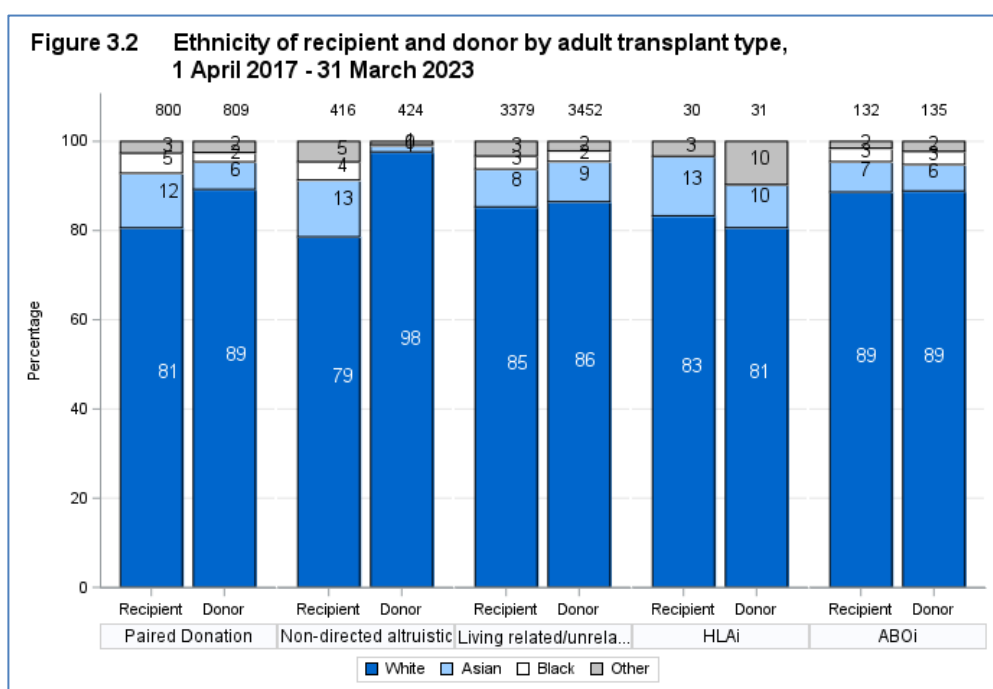
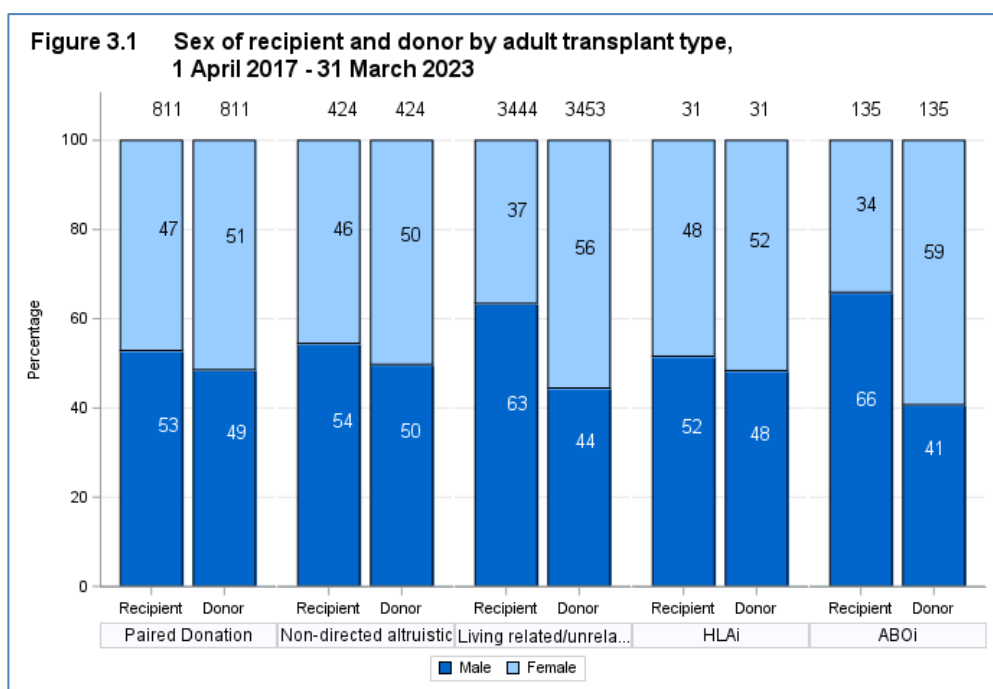
Figure 2.9 shows the number of paediatric living donor kidney transplants by donor type and centre between 1 April 2008 and 31 March 2023.



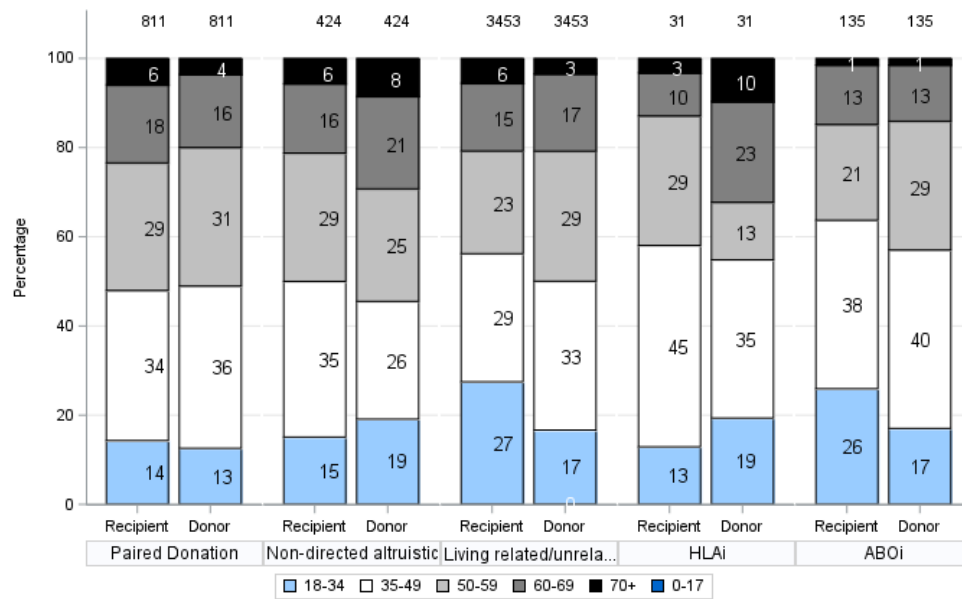
Demographic Characteristics

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 2017 - 31 March 2023**



**Figure 3.4 Recipient Calculated Reaction Frequency by adult transplant type
1 April 2017 - 31 March 2023**

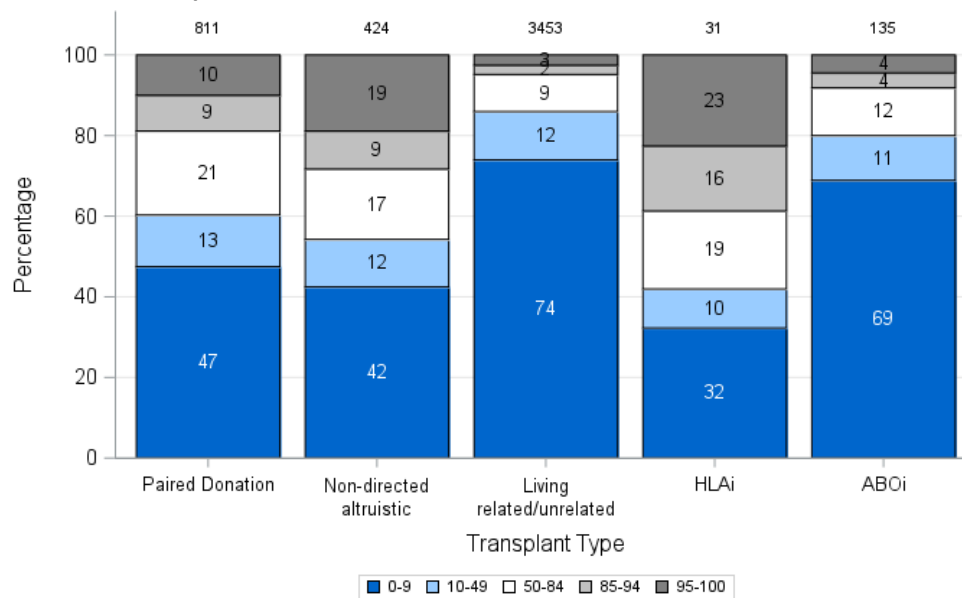


Figure 3.5 Adult HSP by transplant type and year of transplant, 1 April 2017 - 31 March 2023

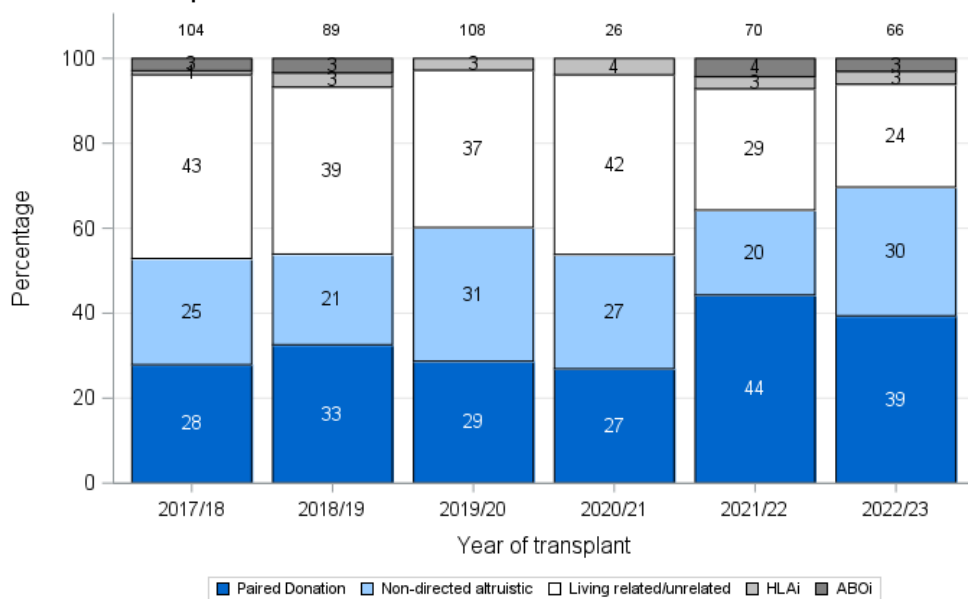


Figure 3.6 Recipient and donor blood group by adult transplant type, 1 April 2017 - 31 March 2023

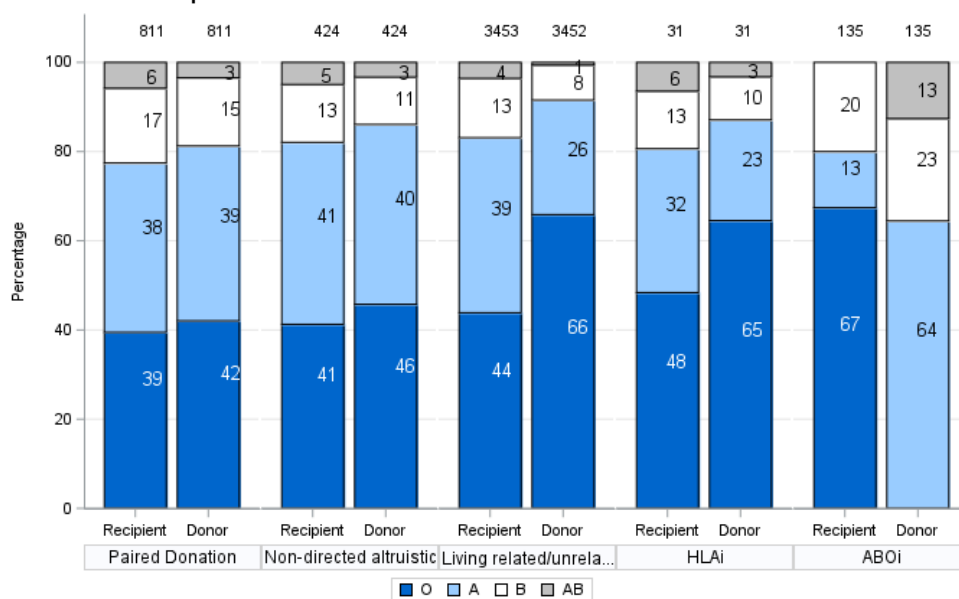


Figure 3.7 Dialysis status at transplant by adult transplant type, 1 April 2017 - 31 March 2023

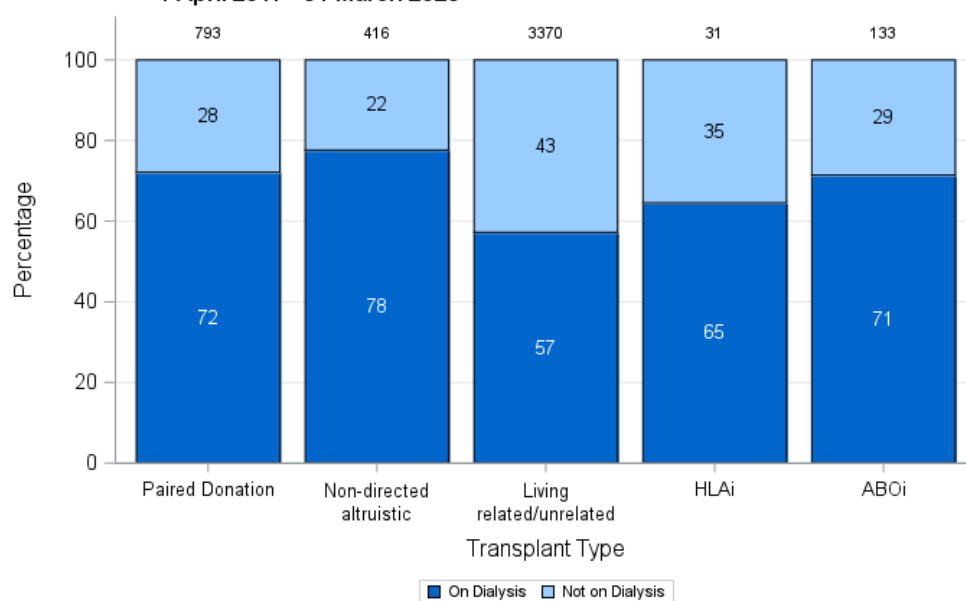
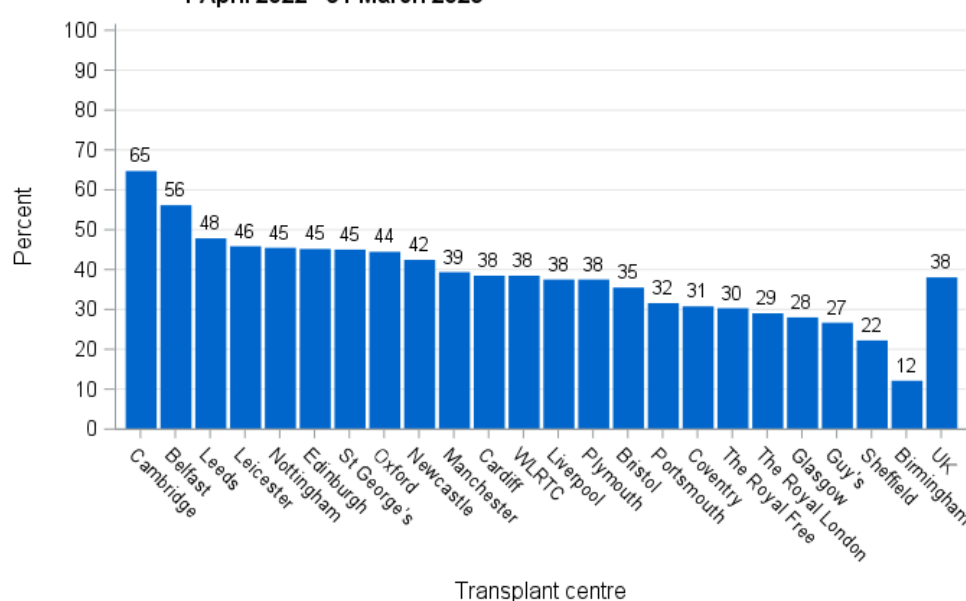


Figure 3.8 Adult living donor pre-emptive transplant rates by centre, 1 April 2022 - 31 March 2023



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.

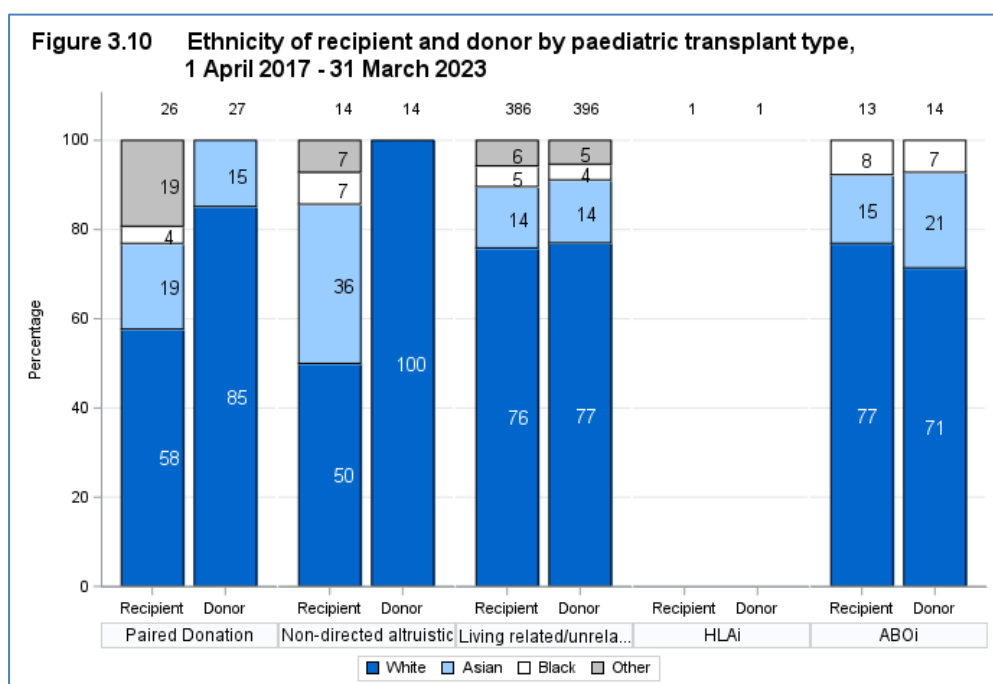
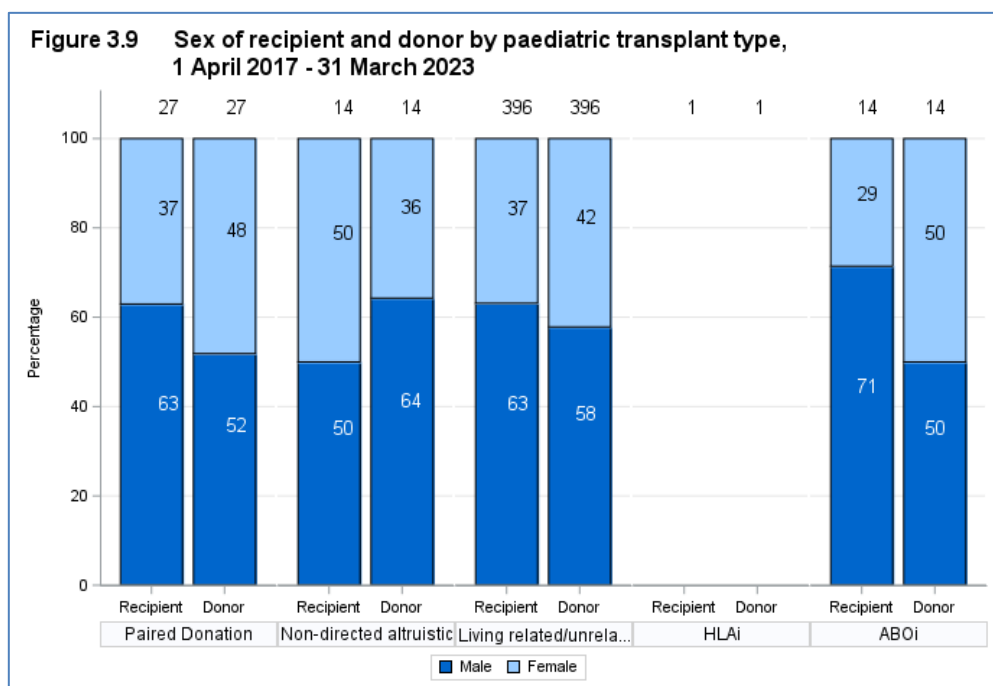


Figure 3.11 Age of recipient and donor by paediatric transplant type, 1 April 2017 - 31 March 2023

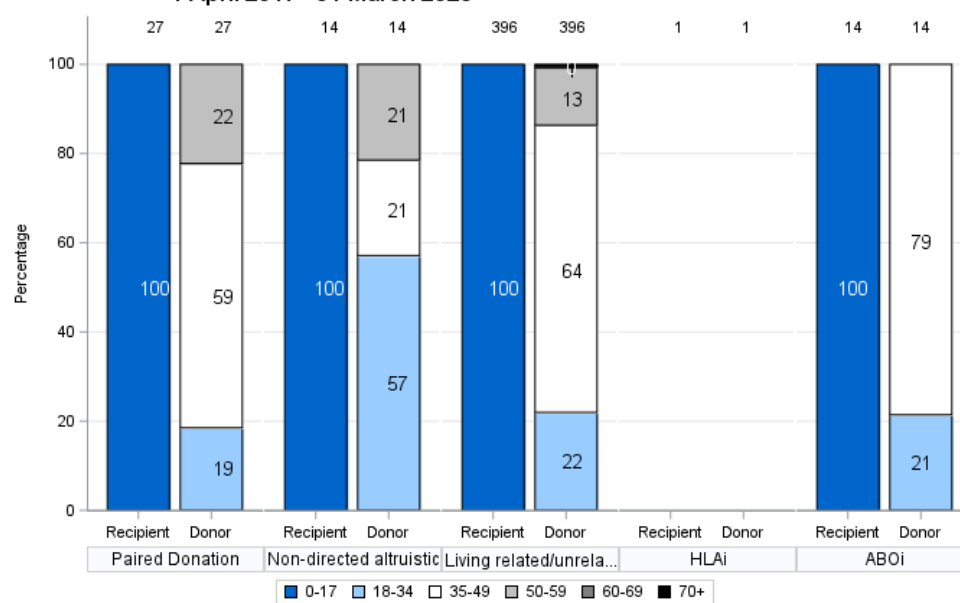


Figure 3.12 Recipient Calculated Reaction Frequency by paediatric transplant type 1 April 2017 - 31 March 2023

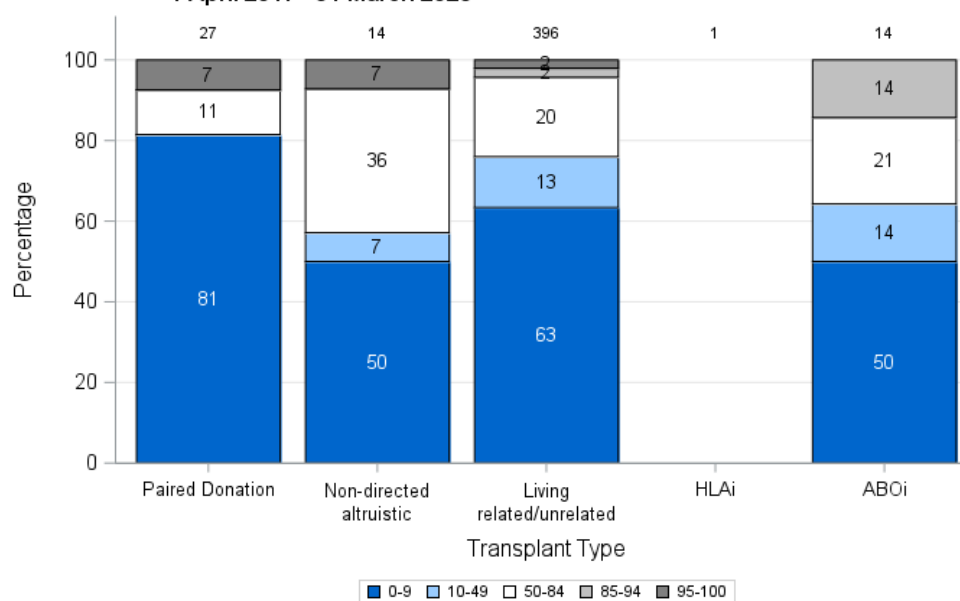


Figure 3.13 Paediatric HSP by transplant type and year of transplant, 1 April 2017 - 31 March 2023

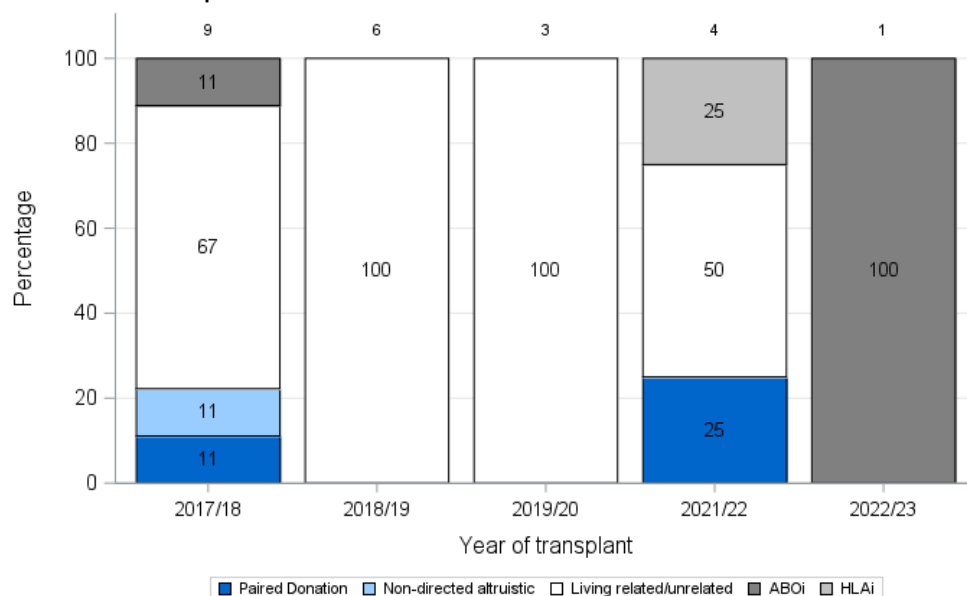
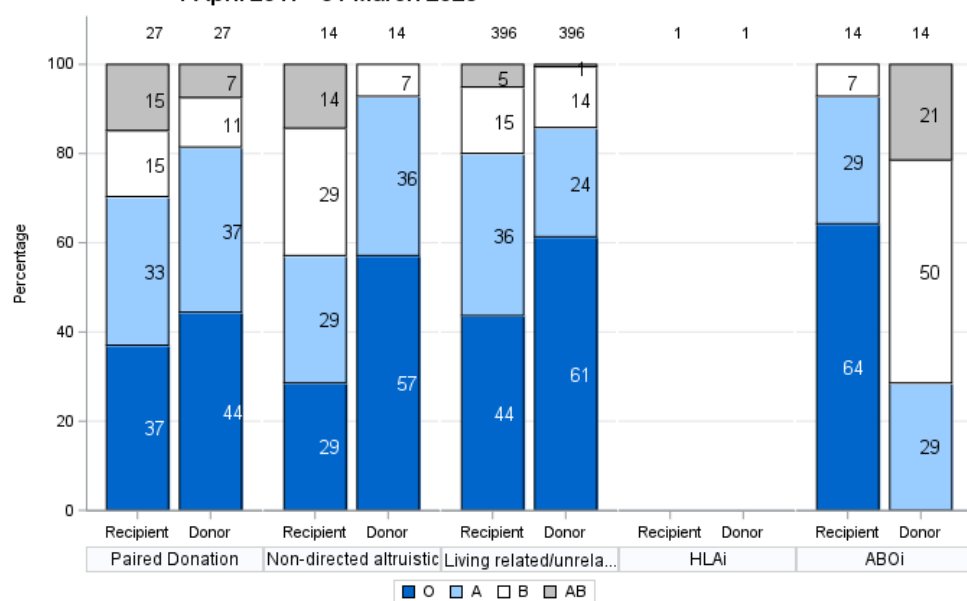
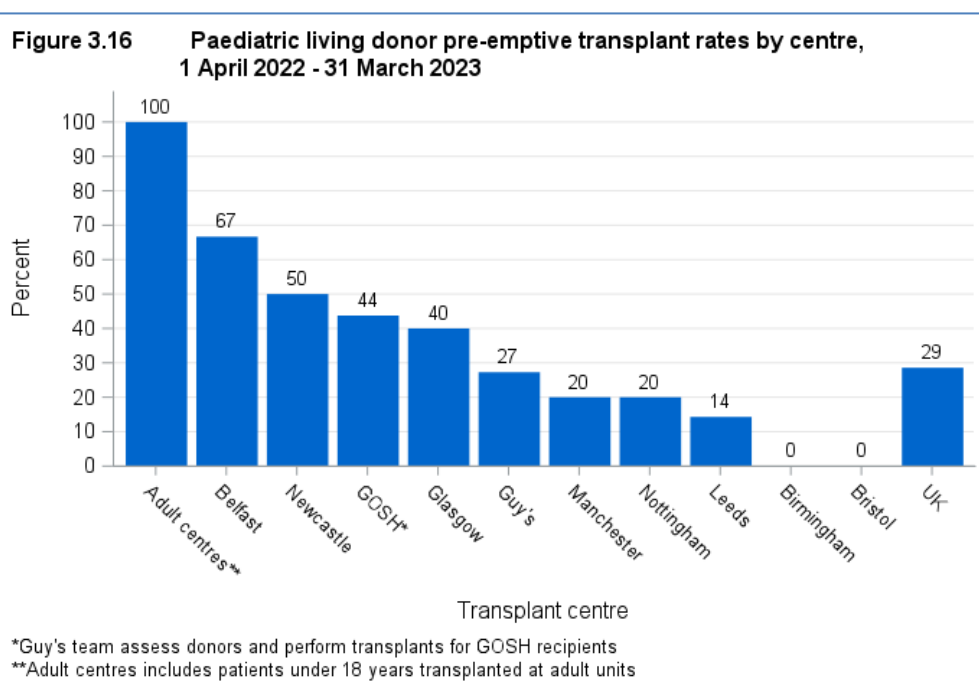
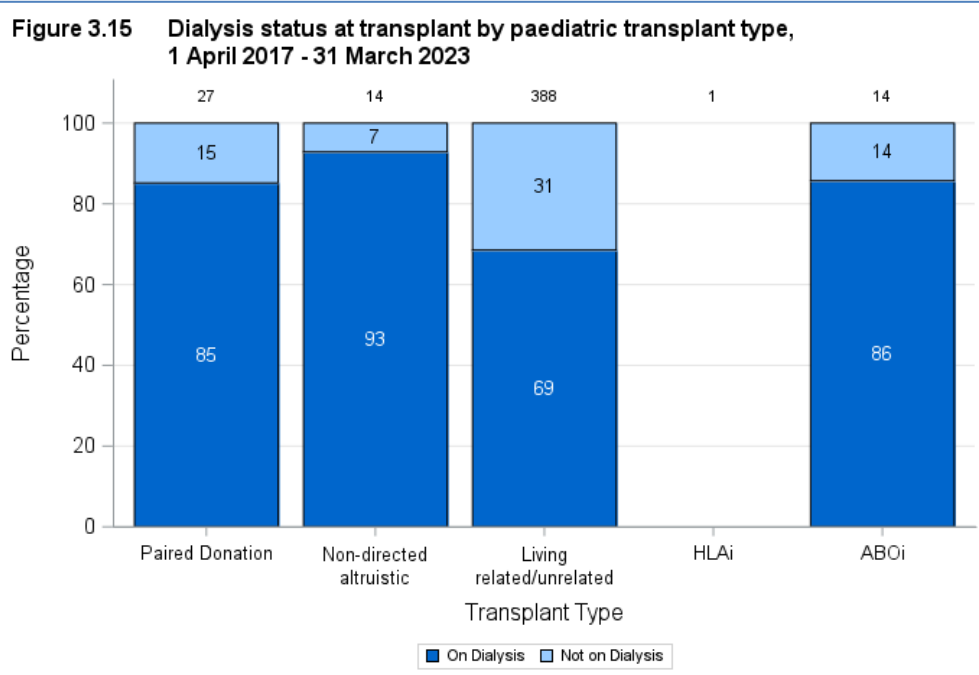


Figure 3.14 Recipient and donor blood group by paediatric transplant type, 1 April 2017 - 31 March 2023





UK Living Kidney Sharing Scheme

4.1 Paired Donation Scheme

4.1.1 Registrations: Matching Runs, 1 April 2017 – 31 March 2023

Figure 4.1 shows the number of recipients included in matching runs from 1 April 2017 to 31 March 2023. Overall, there were 1,716 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.

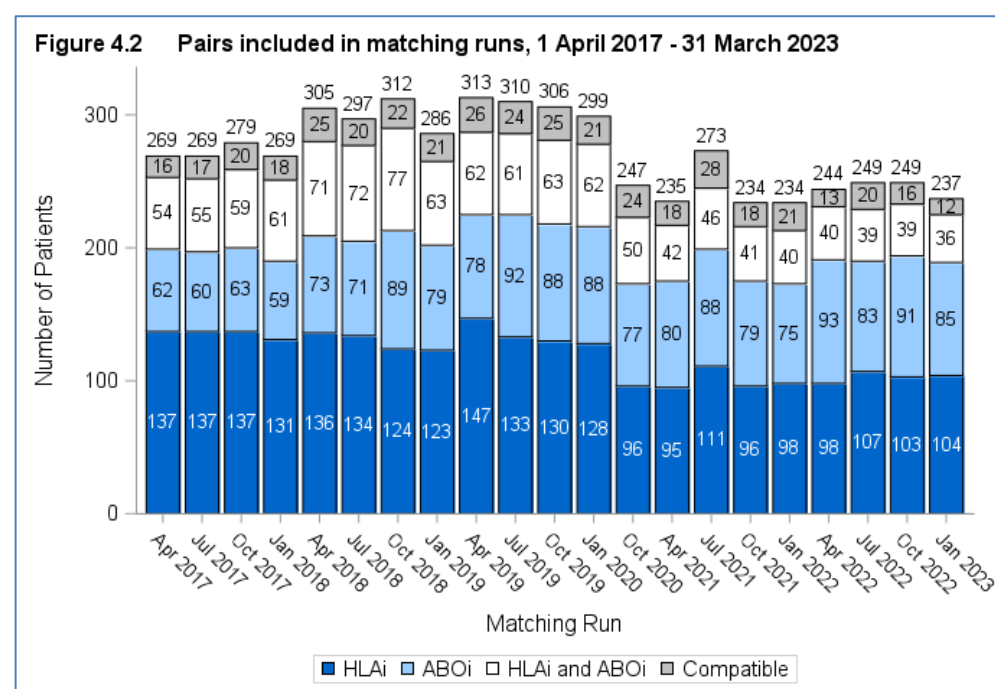
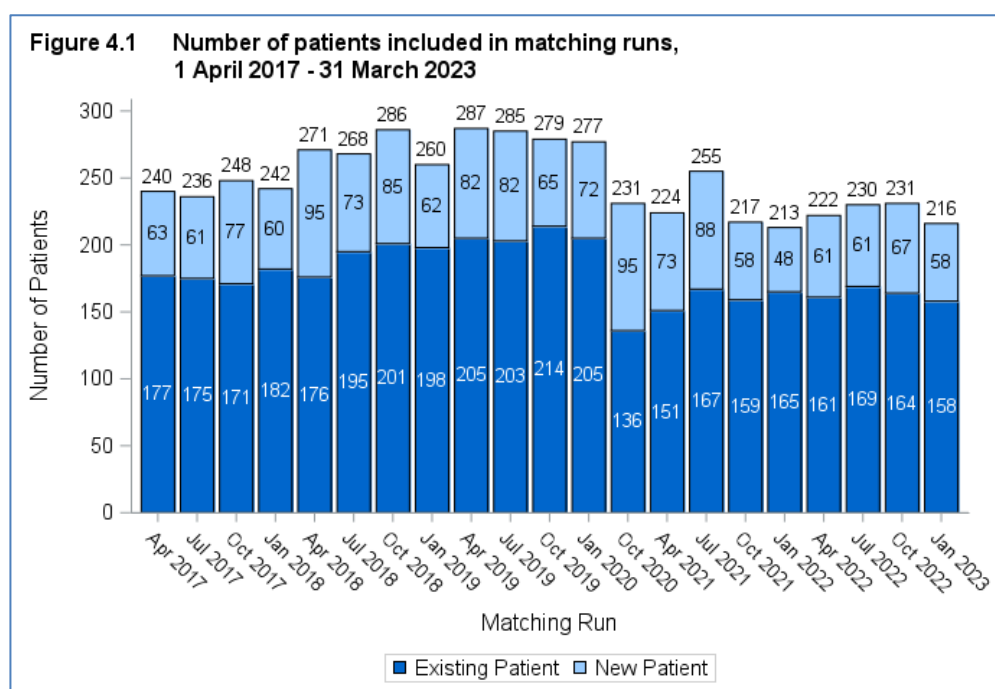


Figure 4.3 shows the number of pairs included in matching runs from 1 April 2017 to 31 March 2023 by centre. This is broken down further by the nature of the incompatibility between the pair. Most pairs registered over this period were HLA incompatible (38%). This information is also shown in **Table 4.1**.

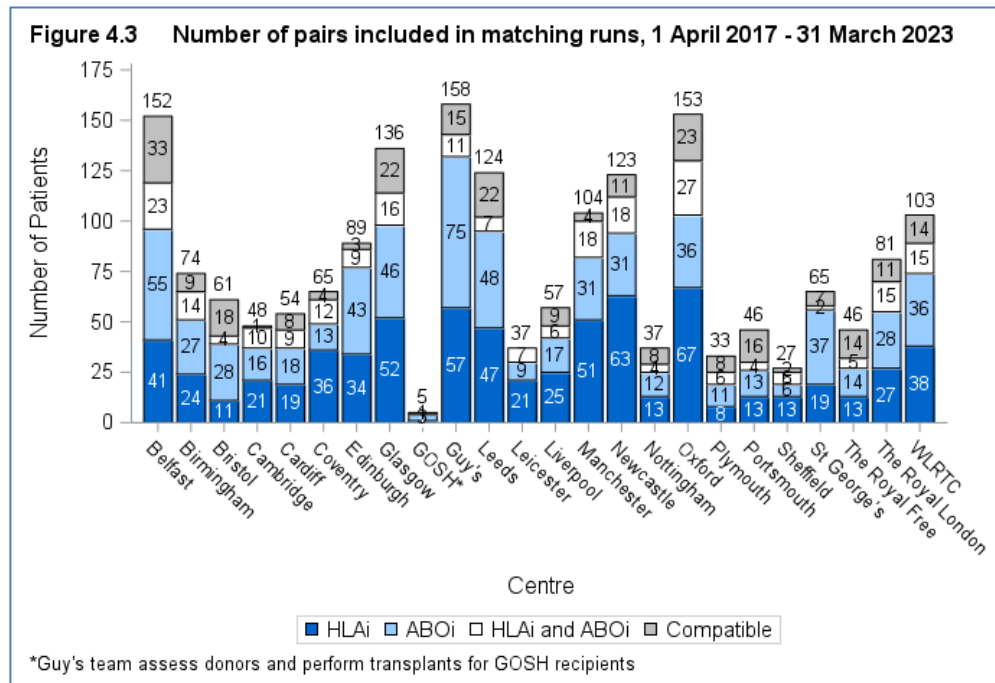


Table 4.1 Pairs included in matching runs by compatibility and Centre, April 2017 - March 2023					
Centre	Number of pairs	HLAi	ABOi	HLAi and ABOi	Compatible
Belfast	152	41	55	23	33
Birmingham	74	24	27	14	9
Bristol	61	11	28	4	18
Cambridge	48	21	16	10	1
Cardiff	54	19	18	9	8
Coventry	65	36	13	12	4
Edinburgh	89	34	43	9	3
Glasgow	136	52	46	16	22
GOSH*	5	1	3	0	1
Guy's	158	57	75	11	15
Leeds	124	47	48	7	22
Leicester	37	21	9	7	0
Liverpool	57	25	17	6	9
Manchester	104	51	31	18	4
Newcastle	123	63	31	18	11
Nottingham	37	13	12	4	8
Oxford	153	67	36	27	23
Plymouth	33	8	11	6	8
Portsmouth	46	13	13	4	16
Sheffield	27	13	6	6	2
St George's	65	19	37	2	7
The Royal Free	46	13	14	5	14
The Royal London	81	27	28	15	11
WLRTC	103	38	36	15	14
UK	1878	714	653	248	263
*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 2017 - 31 March 2023					
Year	Registered with different blood groups		Registered with unacceptable antigens		Total number of recipients registered
	N	%	N	%	
17/18	6	2.4	39	15.8	247
18/19	1	0.3	26	8.9	291
19/20	4	1.5	25	9.2	271
20/21	1	1.1	5	5.5	91
21/22	8	3	5	1.9	267
22/23	5	2	1	0.4	244

4.1.2 Outcomes: Matching Runs, 1 April 2019 – 31 March 2023

Figure 4.4 shows the outcomes of recipients included in matching runs from 1 April 2019 to 31 March 2023, split by centre. Overall, 48% of recipients registered have had a transplant through the paired donation scheme.

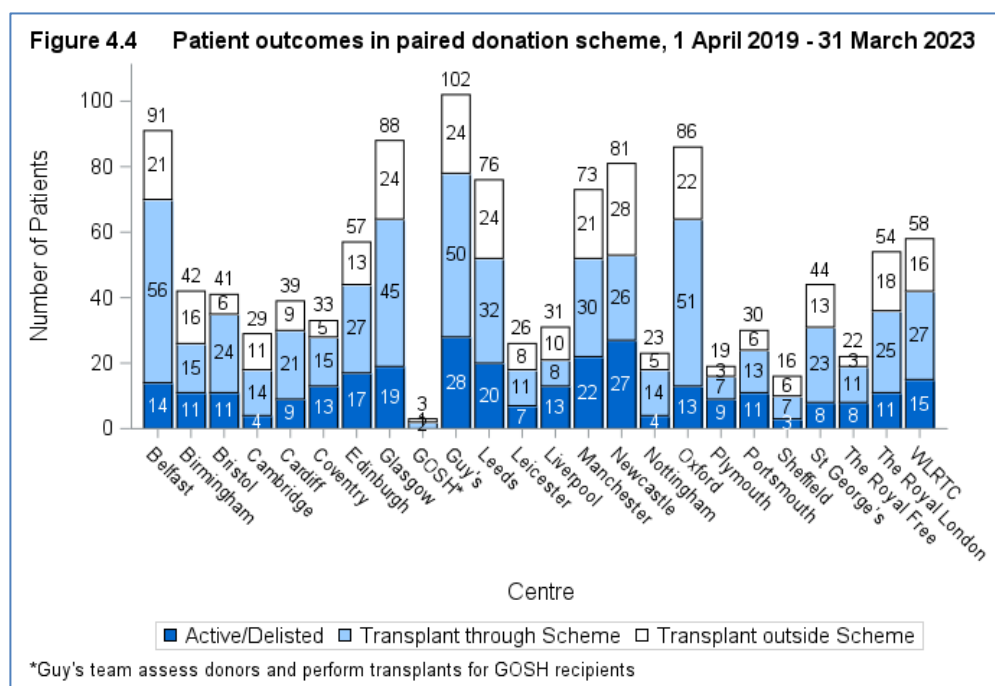
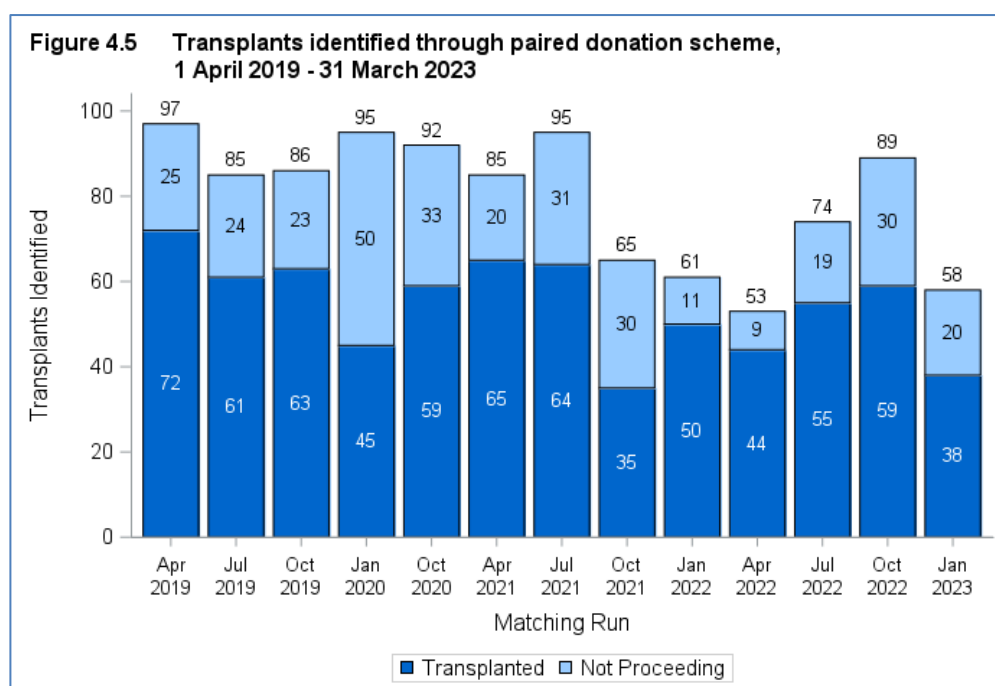


Figure 4.5 shows the transplants identified in each matching run from 1 April 2019 to 31 March 2023. The number of those that proceeded to transplant is also shown. Overall, 69% of transplants identified through the paired donation scheme have proceeded to transplant over this period.



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 2019 - 31 March 2023			
Calculated Reaction Frequency	Recipients Registered	Recipients Transplanted	
		N	(%)
0-9%	458	250	(55)
10-84%	315	196	(62)
85-94%	100	53	(53)
95-99%	176	51	(29)
100%	113	4	(4)

Table 4.4 Transplants as a proportion of registered pairs by blood group, 1 April 2019 - 31 March 2023										
Donor Blood Group	Recipient Blood Group (Recipients Transplanted/Pairs Registered (%))									
	O		A		B		AB			
O	154/ 303	(51%)	61/ 111	(55%)	26/ 51	(51%)	4/ 10	(40%)		
A	93/ 347	(27%)	63/ 133	(47%)	40/ 69	(58%)	6/ 16	(38%)		
B	41/ 95	(43%)	31/ 44	(70%)	11/ 29	(38%)	1/ 1	(100%)		
AB	7/ 14	(50%)	10/ 22	(45%)	6/ 16	(38%)	0/ 3	(0%)		

Figure 4.6 shows the number of recipients transplanted from matching runs between 1 April 2019 and 31 March 2023. This is split by centre and exchange type.

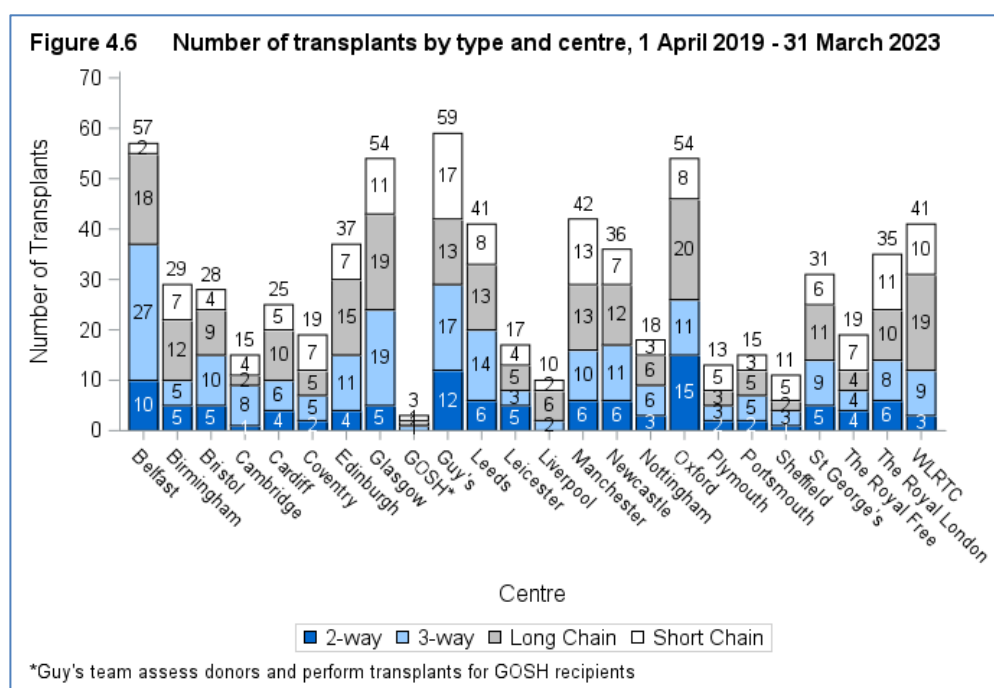


Figure 4.7 shows the recipients transplanted from matching runs between 1 April 2019 and 31 March 2023. This is split by centre and the incompatibility of the recipient with their registered donor. **Table 4.5** shows the number of transplants by exchange type and centre. **Table 4.6** shows the number 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.

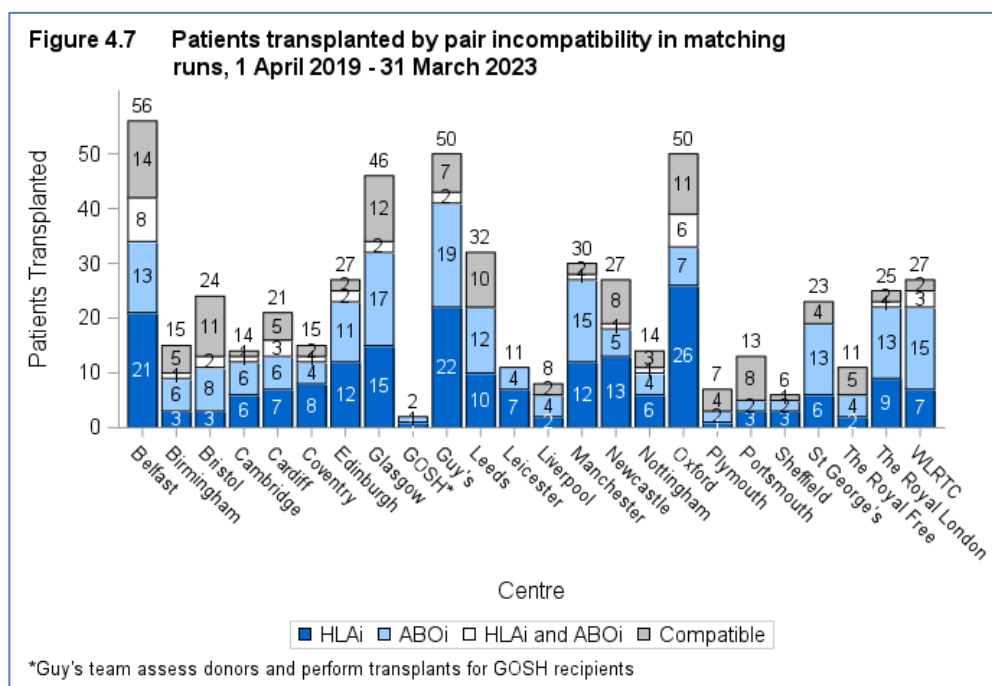


Table 4.5 Transplants by exchange type and Centre April 2019 - March 2023					
Centre	Number of Transplants	2-way	3-way	Short Chain	Long Chain
Belfast	57	10	27	18	2
Birmingham	29	5	5	12	7
Bristol	28	5	10	9	4
Cambridge	15	1	8	2	4
Cardiff	25	4	6	10	5
Coventry	19	2	5	5	7
Edinburgh	37	4	11	15	7
Glasgow	54	5	19	19	11
GOSH*	3	0	1	1	1
Guy's	59	12	17	13	17
Leeds	41	6	14	13	8
Leicester	17	5	3	5	4
Liverpool	10	0	2	6	2
Manchester	42	6	10	13	13
Newcastle	36	6	11	12	7
Nottingham	18	3	6	6	3
Oxford	54	15	11	20	8
Plymouth	13	2	3	3	5
Portsmouth	15	2	5	5	3
Sheffield	11	1	3	2	5
St George's	31	5	9	11	6
The Royal Free	19	4	4	4	7
The Royal London	35	6	8	10	11
WLRTC	41	3	9	19	10
UK	709	112	207	233	157
*Guy's team assess donors and perform transplants for GOSH recipients					

Table 4.6 Transplants by compatibility and Centre 1 April 2019 - 31 March 2023					
Centre	Number of Transplants	HLAi	ABOi	HLA and ABOi	Compatible
Belfast	57	0	6		51
Birmingham	29	0	0		29
Bristol	28	0	0		28
Cambridge	15	0	0		15
Cardiff	25	0	1		24
Coventry	19	2	0		17
Edinburgh	37	0	0		37
Glasgow	54	0	0		54
GOSH*	3	0	0		3
Guy's	59	0	0		59
Leeds	41	1	0		40
Leicester	17	0	0		17
Liverpool	10	0	0		10
Manchester	42	1	0		41
Newcastle	36	1	0		35
Nottingham	18	0	0		18
Oxford	54	1	0		53
Plymouth	13	0	0		13
Portsmouth	15	0	0		15
Sheffield	11	0	0		11
St George's	31	0	0		31
The Royal Free	19	0	0		19
The Royal London	35	0	0		35
WLRTC	41	0	0		41
UK	709	6	7		696
*Guy's team assess donors and perform transplants for GOSH recipients					

Table 4.7 Median waiting time to paired donation kidney transplant in the UK, for recipients registered 1 April 2013 - 31 March 2019			
Pair Incompatibility	Number of recipients registered	Waiting time (days)	
		Median	95% Confidence interval
HLAi	540	457	325 - 589
ABOi	429	461	420 - 502
All Pairs	1201	503	438 - 568

4.2 Non-directed Altruistic Donation

4.2.1 Transplants, 1 April 2014 – 31 March 2023

Figure 4.8 shows the number of non-directed altruistic donor kidney transplants from 1 April 2014 to 31 March 2023. This is split by whether the donation was to the deceased donor waiting list or the paired donation scheme.

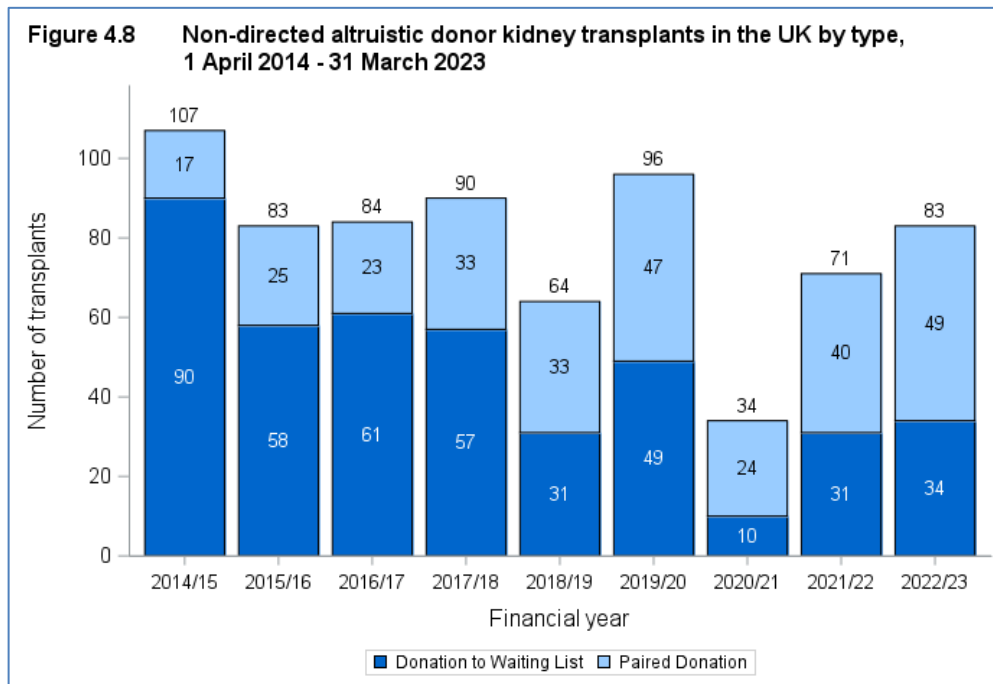
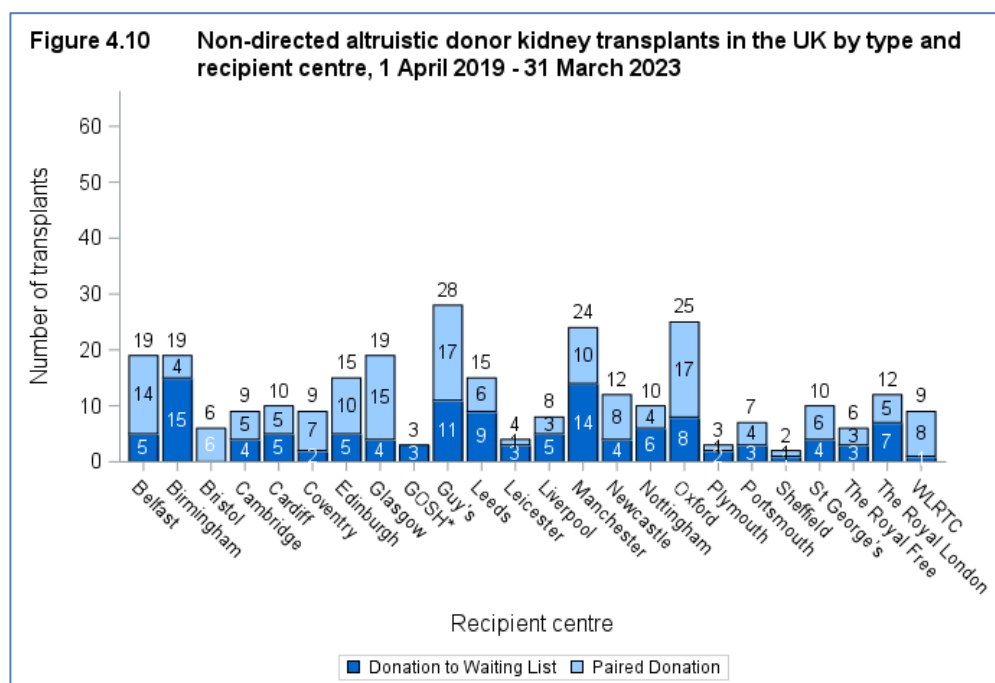
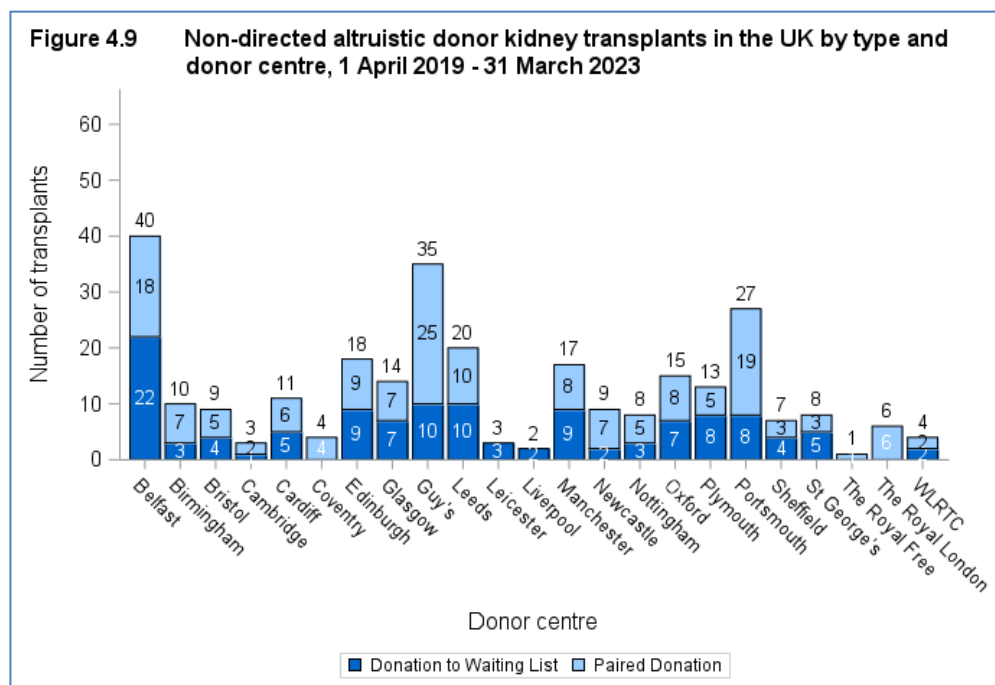


Figure 4.9 shows the number of non-directed altruistic donor kidney transplants from 1 April 2019 to 31 March 2023 by donor centre. **Figure 4.10** shows the number of non-directed altruistic donor kidney transplants from 1 April 2019 to 31 March 2023 by recipient centre



4.2.2 Time to donation, 1 April 2019 – 31 March 2023

Figure 4.11 shows the median time in months from notification to donation from 1 April 2019 to 31 March 2023, 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.

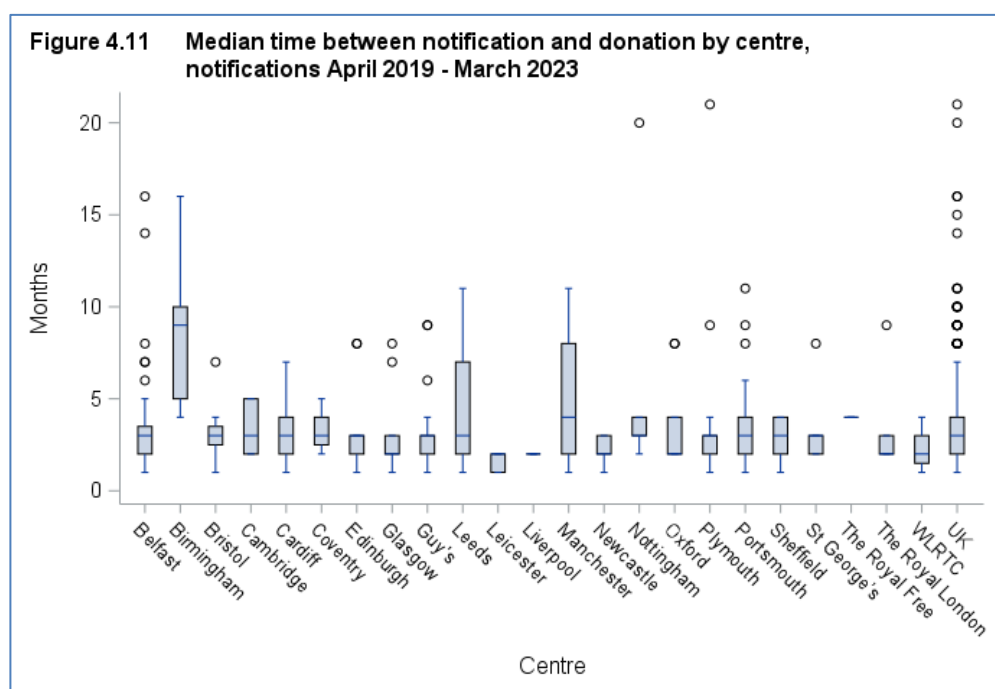


Table 4.8 Median time between notification and donation by Centre, Donations April 2019 - March 2023				
Centre	Number of donors	Median	Lower quartile	Upper quartile
Belfast	40	3	2	4
Birmingham	9	9	5	10
Bristol	8	3	2	4
Cambridge	3	3	2	5
Cardiff	10	3	2	4
Coventry	4	3	2	4
Edinburgh	17	3	2	3
Glasgow	14	2	2	3
Guy's	33	3	2	3
Leeds	18	3	2	7
Leicester	3	2	1	2
Liverpool	1	2	2	2
Manchester	15	4	2	8
Newcastle	9	2	2	3
Nottingham	7	3	3	4
Oxford	12	2	2	4
Plymouth	13	3	2	3
Portsmouth	26	3	2	4
Sheffield	7	3	2	4
St George's	5	3	2	3
The Royal Free	1	4	4	4
The Royal London	6	2	2	3
WLRTC	4	2	2	3
UK	265	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.

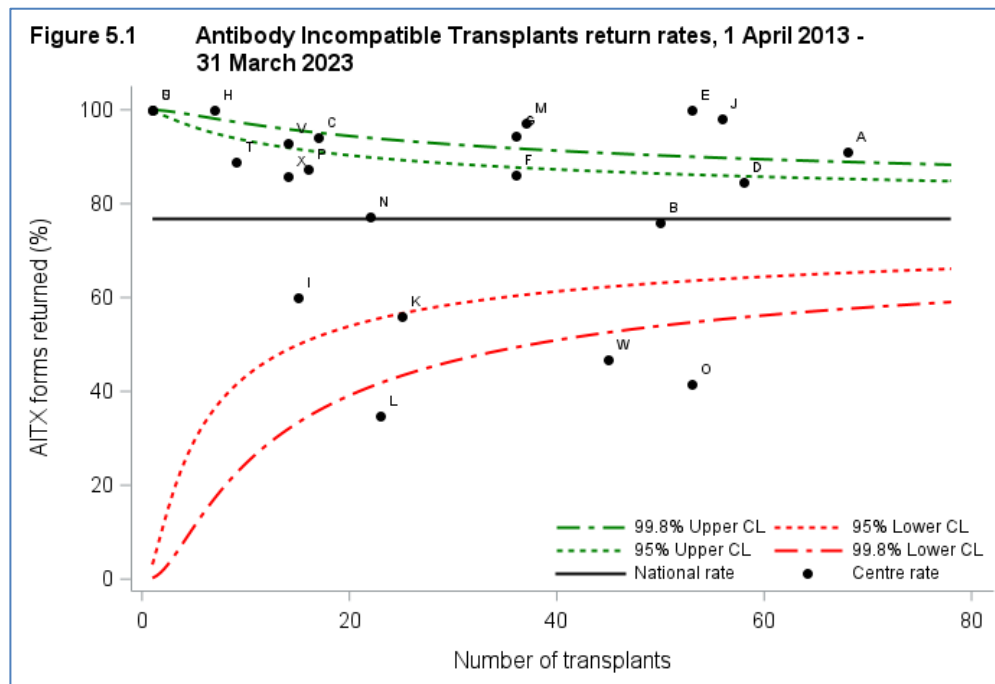


Table 5.1 Antibody incompatible transplant form return rates, 1 April 2013 – 31 March 2023					
Transplant Centre	Code	Number of transplants	AITX forms returned		
			N	%	
Belfast	A	68	62	91	
Birmingham	B	50	38	76	
Bristol	C	17	16	94	
Cambridge	D	58	49	84	
Cardiff	E	53	53	100	
Coventry	F	36	31	86	
Edinburgh	G	36	34	94	
Glasgow	H	7	7	100	
GOSH*	I	15	9	60	
Guy's	J	56	55	98	
Leeds	K	25	14	56	
Leicester	L	23	8	35	
Liverpool	M	37	36	97	
Manchester	N	22	17	77	
Newcastle	O	53	22	42	
Nottingham	P	16	14	88	
Oxford	Q	23	-	-	
Plymouth	R	0	-	-	
Portsmouth	S	1	1	100	
Sheffield	T	9	8	89	
St George's	U	1	1	100	
The Royal Free	V	14	13	93	
The Royal London	W	45	21	47	
WLRTC	X	14	12	86	
UK		679	521	77	
*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.

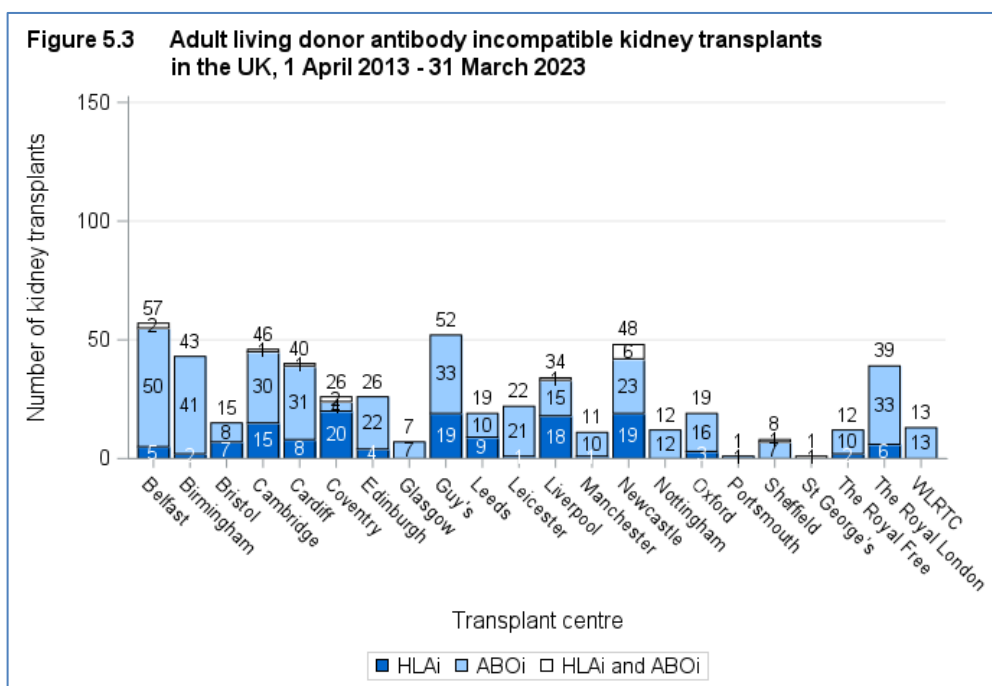
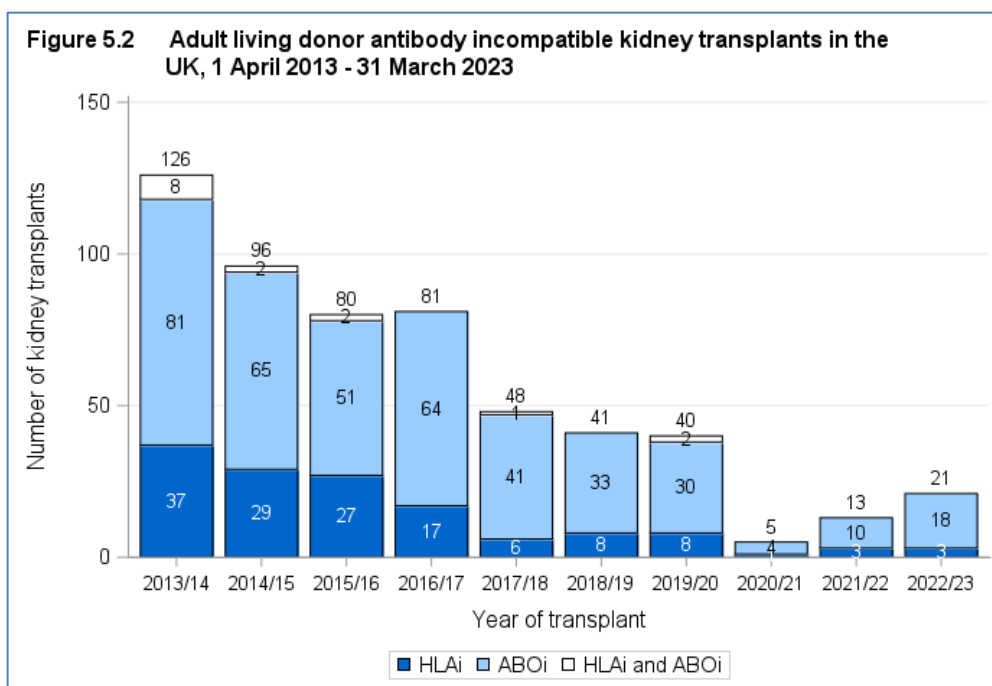


Table 5.2 shows the donor and recipient blood group for all ABOi transplants.

Table 5.2 Donor and recipient blood group for all adult ABOi transplants, 1 April 2013 - 31 March 2023						
Recipient blood group	Donor blood group					
	A		B		AB	
	N	(%)	N	(%)	N	(%)
A	1	(0.2)	30	(7.3)	25	(6.1)
B	47	(11.4)	-		21	(5.1)
O	203	(49.3)	77	(18.7)	7	(1.7)

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 2013 - 31 March 2023								
Donor-Recipient ABO	Recipient CRF at transplant							
	0-9		10-84		85-94		95-100	
	N	(%)	N	(%)	N	(%)	N	(%)
A-A	10	(1.8)	10	(1.8)	5	(0.9)	11	(2.0)
A-AB	-		1	(0.2)	1	(0.2)	-	
A-B	37	(6.7)	6	(1.1)	2	(0.4)	2	(0.4)
A-O	137	(24.9)	52	(9.4)	7	(1.3)	8	(1.5)
AB-A	16	(2.9)	7	(1.3)	1	(0.2)	1	(0.2)
AB-AB	-		-		-		2	(0.4)
AB-B	19	(3.4)	2	(0.4)	-		-	
AB-O	4	(0.7)	1	(0.2)	2	(0.4)	-	
B-A	22	(4.0)	5	(0.9)	2	(0.4)	1	(0.2)
B-AB	-		-		-		1	(0.2)
B-B	2	(0.4)	3	(0.5)	3	(0.5)	4	(0.7)
B-O	49	(8.9)	21	(3.8)	5	(0.9)	2	(0.4)
O-A	8	(1.5)	4	(0.7)	2	(0.4)	4	(0.7)
O-AB	-		1	(0.2)	-		-	
O-B	-		1	(0.2)	2	(0.4)	3	(0.5)
O-O	13	(2.4)	20	(3.6)	7	(1.3)	22	(4.0)

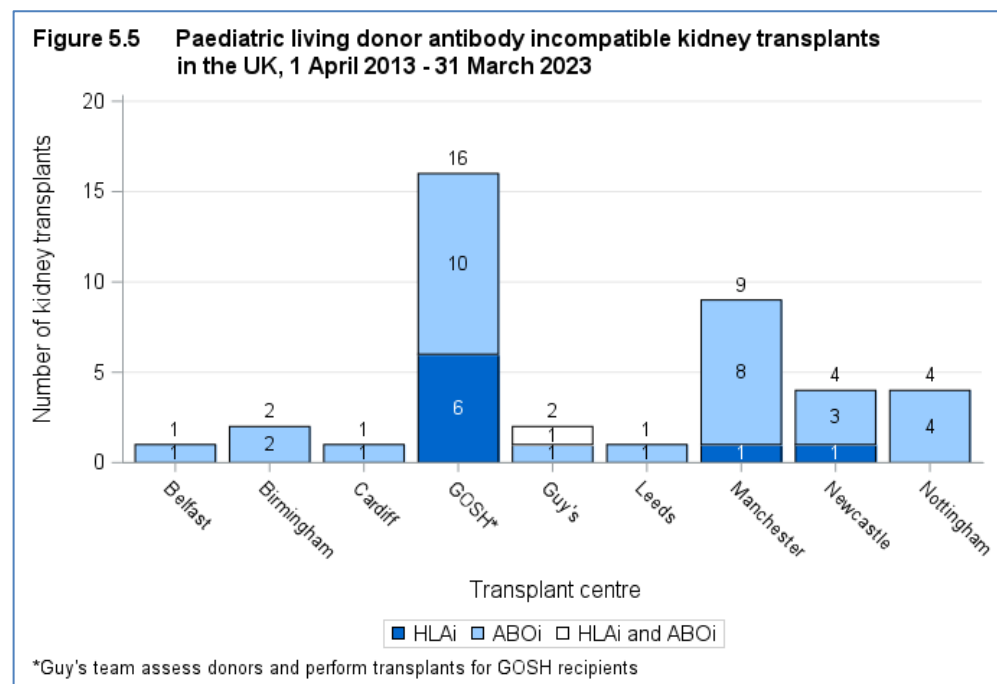
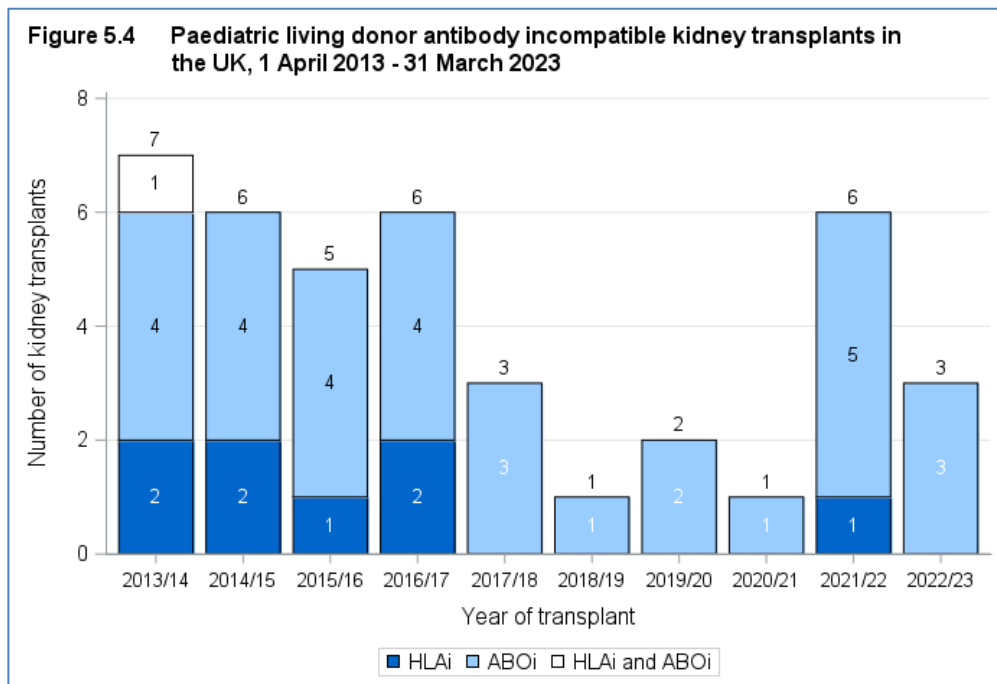
Table 5.4 shows the pre and at transplant level group for all HLAI transplants. Data are only presented for cases where an antibody incompatible form has been completed and returned. **Table 5.5** shows the calculated reaction frequency by incompatibility type.

Table 5.4 Pre and at transplant antibody level group for all adult HLAi transplants, 1 April 2013 - 31 March 2023												
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 neg		CDC NT, Flow pos, DSA SPA pos		Unknown			
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)		
CDC NT, Flow pos, DSA SPA pos	-		-		9	(5.4)	-		8	(4.8)	-	
CDC neg, Flow neg, DSA SPA pos	-		-		46	(27.4)	5	(3.0)	-		1	(0.6)
CDC neg, Flow pos, DSA SPA pos	-		26	(15.5)	18	(10.7)	15	(8.9)	-		12	(7.1)
CDC pos, Flow pos, DSA SPA pos	1	(0.6)	3	(1.8)	3	(1.8)	2	(1.2)	-		-	
Unknown	-		2	(1.2)	-		2	(1.2)	-		15	(8.9)

Table 5.5 At transplant calculated reaction frequency by incompatibility type, 1 April 2013 - 31 March 2023						
Calculated Reaction Frequency	ABOi		HLAi		HLAi and ABOi	
	N	%	N	%	N	%
0-9	283	(71.3)	32	(23.0)	2	(13.3)
10-84	90	(22.7)	41	(29.5)	3	(20.0)
85-94	15	(3.8)	20	(14.4)	4	(26.7)
95-100	9	(2.3)	46	(33.1)	6	(40.0)

PAEDIATRIC

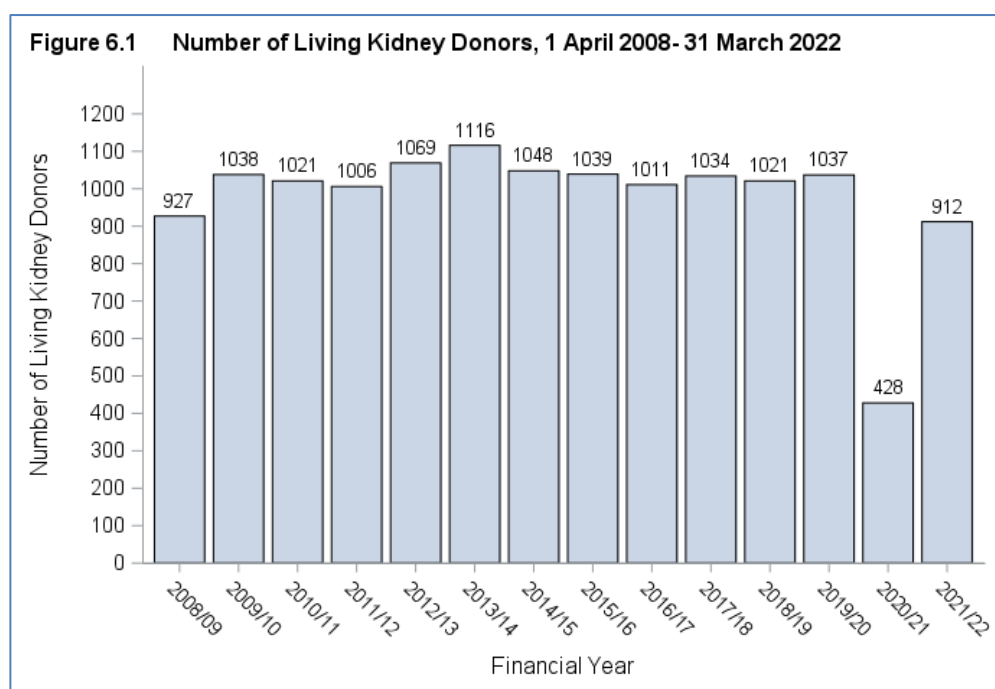
Figures 5.4 and 5.5 show the number of living donor antibody incompatible kidney transplants by financial year and centre respectively.



Living Donor Follow-Up

This section contains information on all living donors who have donated to both adult and paediatric recipients from 2008/09 to 2021/22. 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 2008/09 to 2021/22.



Of the living donors over this period, 104 deaths have been recorded. The causes of death are shown in **Table 6.1**. One donor 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 2008 – 31 March 2022		
Cause of Death	N	%
Cancer	38	37
Bowel	2	2
Breast	1	1
Colonic	2	2
Liver	3	3
Lung	4	4
Oesophagus	1	1
Pancreatic	6	6
Prostate	2	2
Testicular	1	1
Other	16	15
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	18	17
Unknown	31	30
TOTAL	104	100

6.1 Prescription of Antihypertensive drugs, 1 April 2008– 31 March 2022

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.

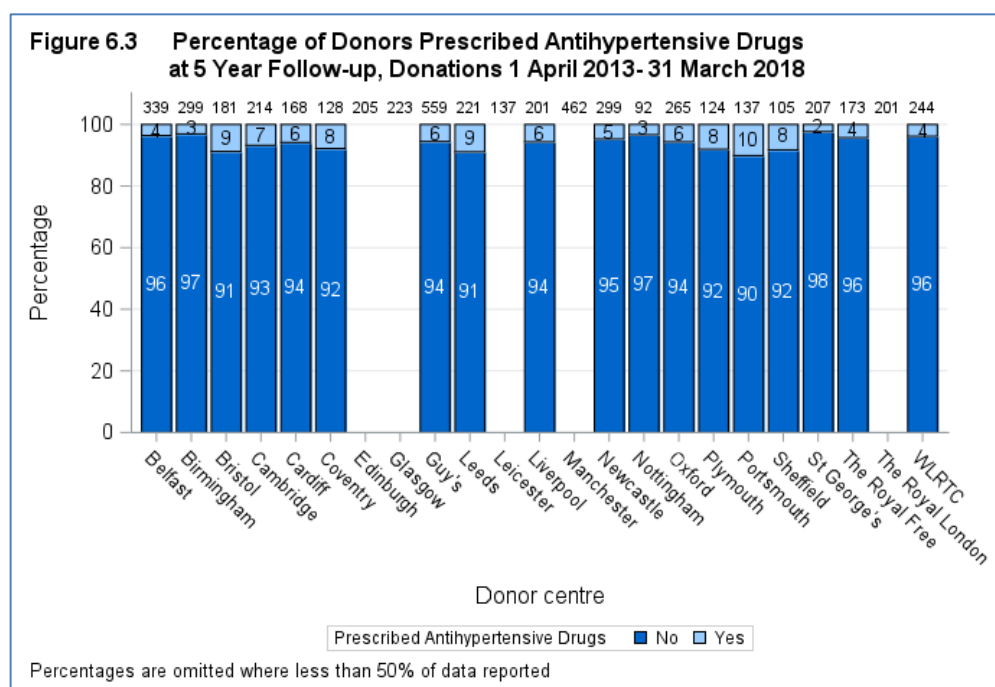
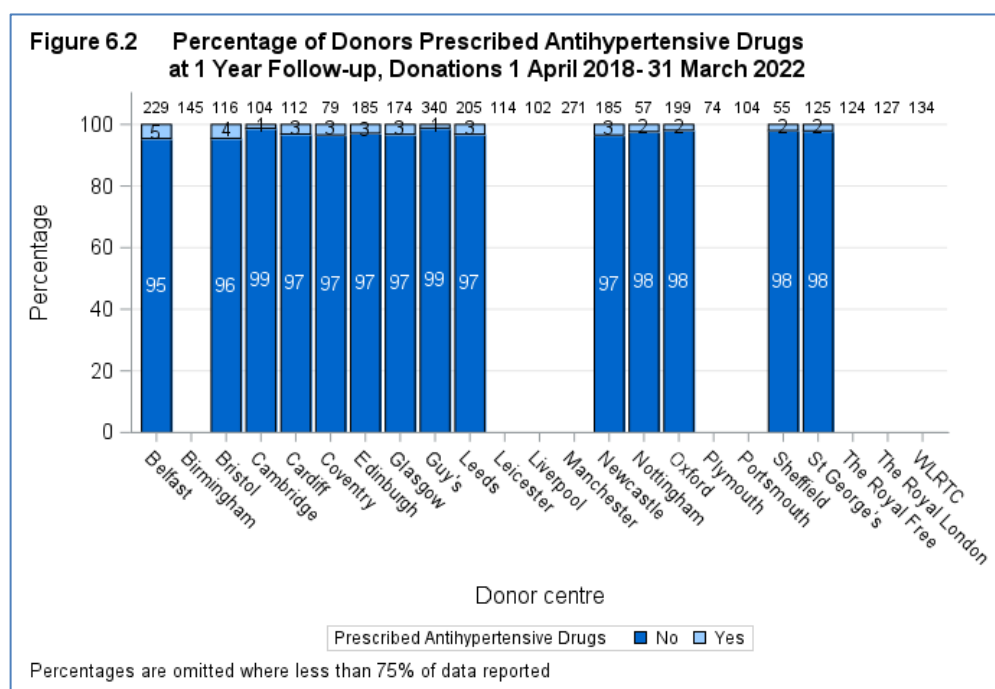


Figure 6.4 Percentage of Donors Prescribed Antihypertensive Drugs at 10 Year Follow-up, Donations 1 April 2008- 31 March 2013

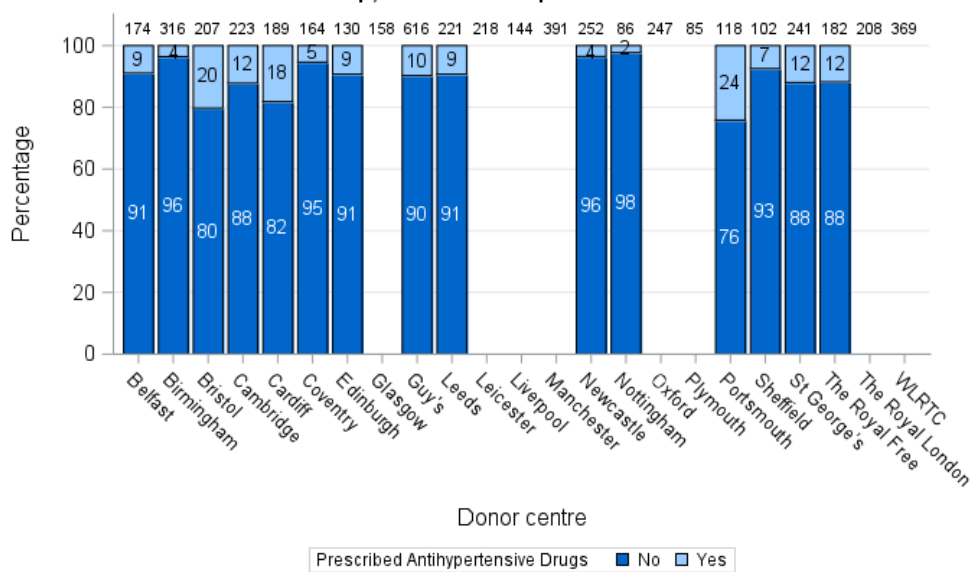


Table 6.2 Percentage of Donors Prescribed Antihypertensive Drugs by Centre, Donations April 2008 - March 2022

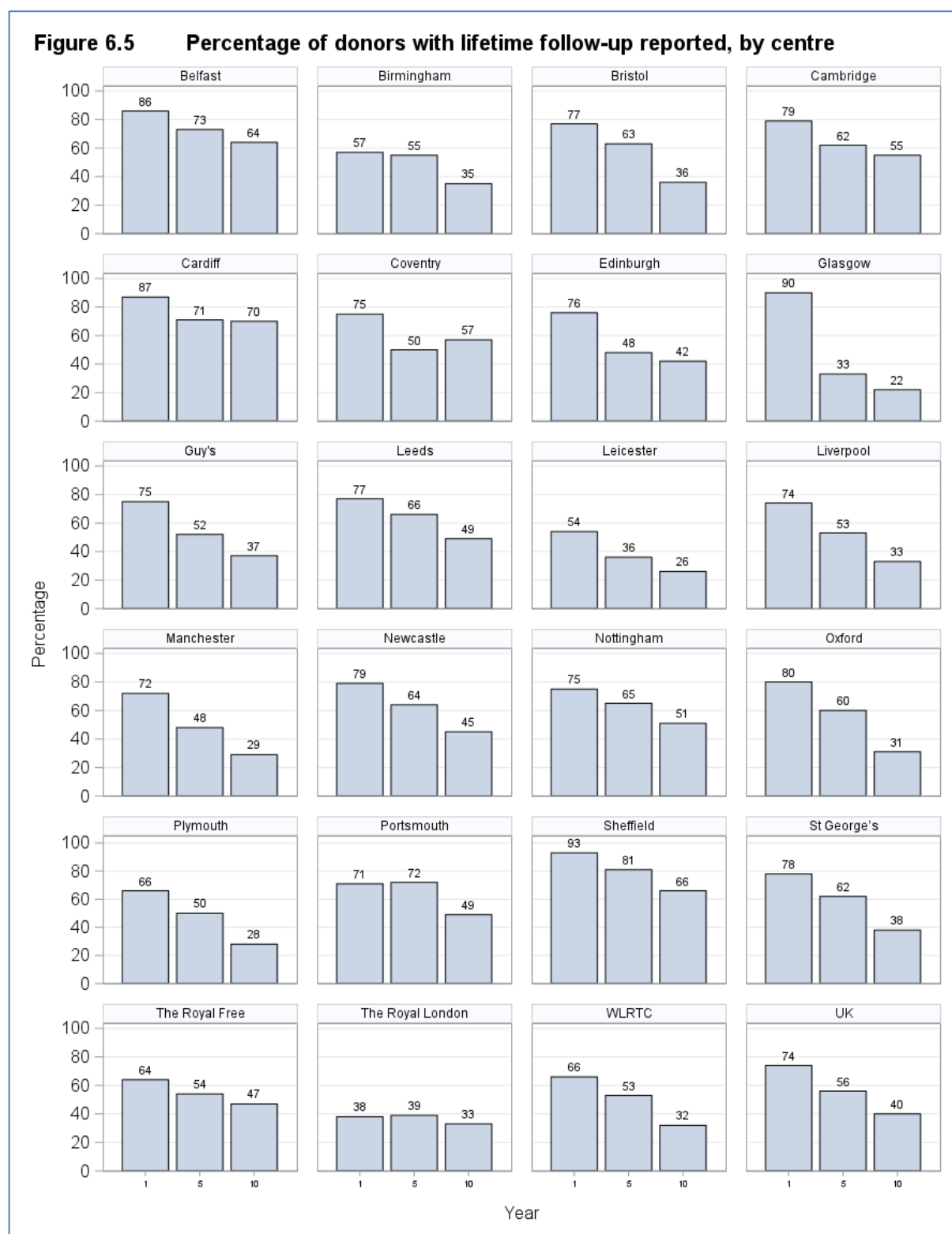
Centre	1 Year			5 Year			10 Year		
	N	% ¹	% ²	N	% ¹	% ²	N	% ¹	% ²
Belfast	229	86	5	339	73	4	174	64	9
Birmingham	145	57	-	299	55	3	316	35	4
Bristol	116	77	4	181	63	9	207	36	20
Cambridge	104	79	1	214	62	7	223	55	12
Cardiff	112	87	3	168	71	6	189	70	18
Coventry	79	75	3	128	50	8	164	57	5
Edinburgh	185	76	3	205	48	-	130	42	9
Glasgow	174	90	3	223	33	-	158	22	-
Guy's	340	75	1	559	52	6	616	37	10
Leeds	205	77	3	221	66	9	221	49	9
Leicester	114	54	-	137	36	-	218	26	-
Liverpool	102	74	-	201	53	6	144	33	-
Manchester	271	72	-	462	48	-	391	29	-
Newcastle	185	79	3	299	64	5	252	45	4
Nottingham	57	75	2	92	65	3	86	51	2
Oxford	199	80	2	265	60	6	247	31	-
Plymouth	74	66	-	124	50	8	85	28	-
Portsmouth	104	71	-	137	72	10	118	49	24
Sheffield	55	93	2	105	81	8	102	66	7
St George's	125	78	2	207	62	2	241	38	12
The Royal Free	124	64	-	173	54	4	182	47	12
The Royal London	127	38	-	201	39	-	208	33	-
WLRTC	134	66	-	244	53	4	369	32	-
UK	3360	74	-	5184	56	6	5041	40	11

¹% of donors with follow-up reported

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

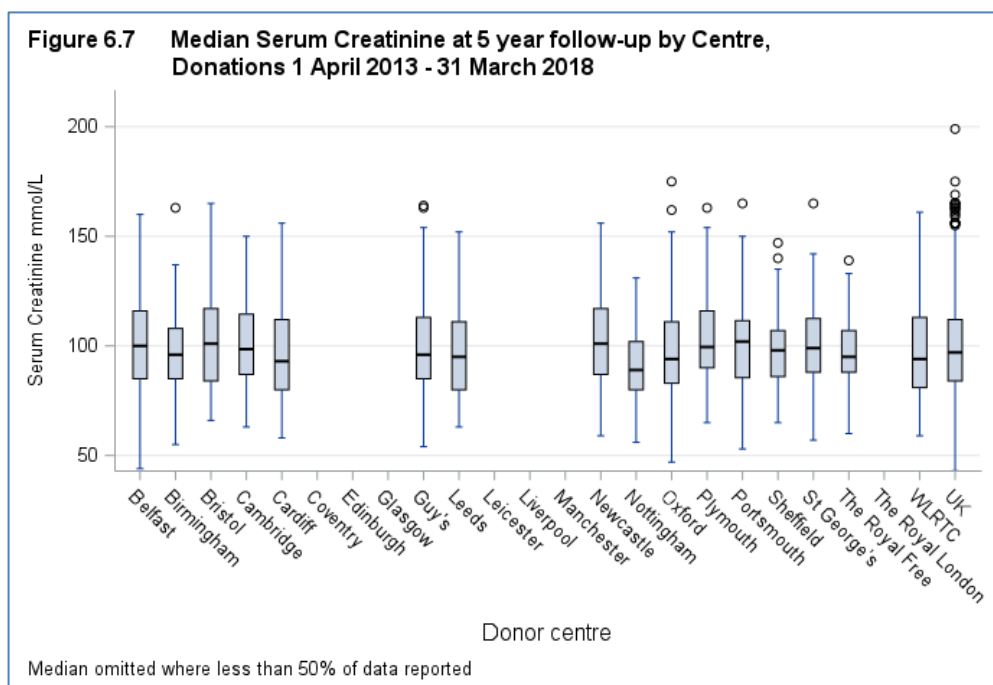
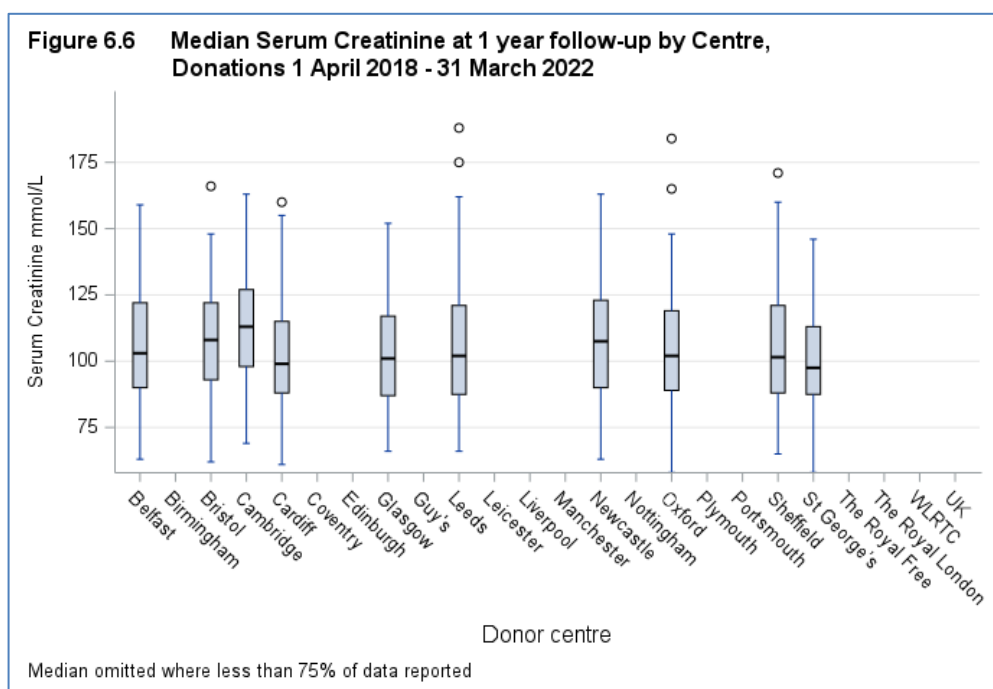
- Percentages are omitted where less than 75%, 50% or 35% of data reported at 1yr, 5yrs or 10yrs

Figure 6.5 shows the percentage of donors with follow-up reported by centre, for donations between April 2008 - March 2022.

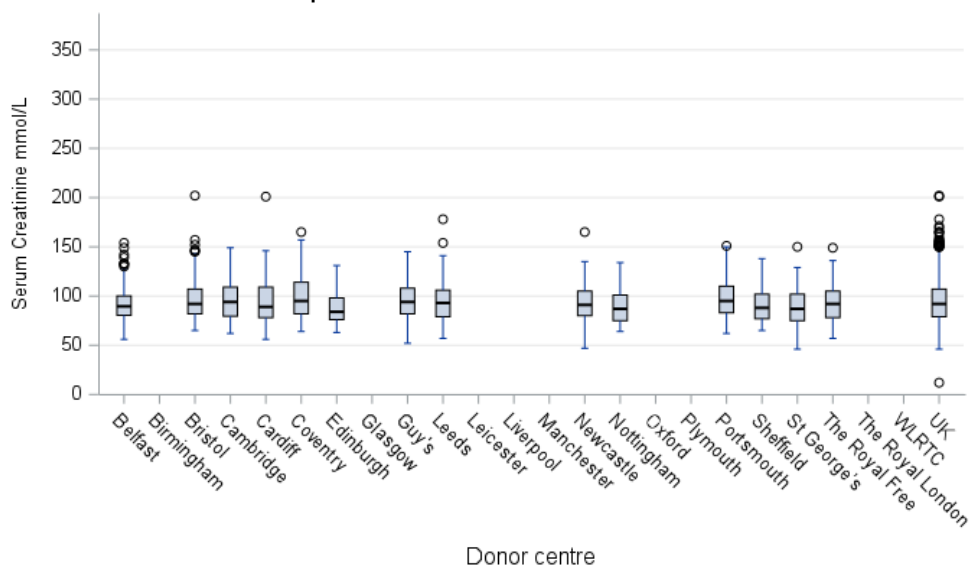


6.2 Serum creatinine, 1 April 2008 – 31 March 2022

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 2008 - 31 March 2013**



Median omitted where less than 35% of data reported

Table 6.3 Median serum creatinine at 1, 5 and 10 year follow up by centre, donations 1 April 2008 - 31 March 2022									
Centre	1 Year			5 Year			10 Year		
	N	% ¹	Median (IQ range)	N	% ¹	Median (IQ range)	N	% ¹	Median (IQ range)
Belfast	229	86	103 (90-122)	339	73	100 (85-116)	174	64	89.5 (80.5-100)
Birmingham	145	57	- (---)	299	54	96 (85-108)	316	34	(-)
Bristol	116	75	108 (93-122)	181	61	101 (84-117)	207	36	92 (82-107)
Cambridge	104	78	113 (98-127)	214	62	98.5 (87-114.5)	223	54	94 (79.5-109)
Cardiff	112	87	99 (88-115)	168	71	93 (80-112)	189	70	89 (78-109)
Coventry	79	73	- (---)	128	48	(-)	164	56	95 (82-114)
Edinburgh	185	73	- (---)	205	46	(-)	130	41	84 (76-98)
Glasgow	174	90	101 (87-117)	223	33	(-)	158	22	(-)
Guy's	340	75	105 (89-120)	559	51	96 (85-113)	616	36	94 (82-108)
Leeds	205	76	102 (87.5-121)	221	66	95 (80-111)	221	48	93 (79-106)
Leicester	114	54	- (---)	137	36	(-)	218	25	(-)
Liverpool	102	66	- (---)	201	49	(-)	144	33	(-)
Manchester	271	64	- (---)	462	46	(-)	391	29	(-)
Newcastle	185	79	107.5 (90-123)	299	63	101 (87-117)	252	45	91 (80-105)
Nottingham	57	74	- (---)	92	65	89 (80-102)	86	50	87 (75-101)
Oxford	199	80	102 (89-119)	265	58	94 (83-111)	247	30	(-)
Plymouth	74	66	- (---)	124	50	99.5 (90-116)	85	28	(-)
Portsmouth	104	67	- (---)	137	70	102 (85.5-111.5)	118	46	95 (83-110)
Sheffield	55	91	101.5 (88-121)	105	81	98 (86-107)	102	66	88 (77-102)
St George's	125	77	97.5 (87.5-113)	207	62	99 (88-112.5)	241	37	87 (75-102)
The Royal Free	124	64	- (---)	173	54	95 (88-107)	182	47	92 (78-105)
The Royal London	127	37	- (---)	201	38	(-)	208	33	(-)
WLRTC	134	66	- (---)	244	53	94 (81-113)	369	32	(-)
UK	3360	72	- (---)	5184	55	97 (84-112)	5041	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 2008 – 31 March 2022

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.

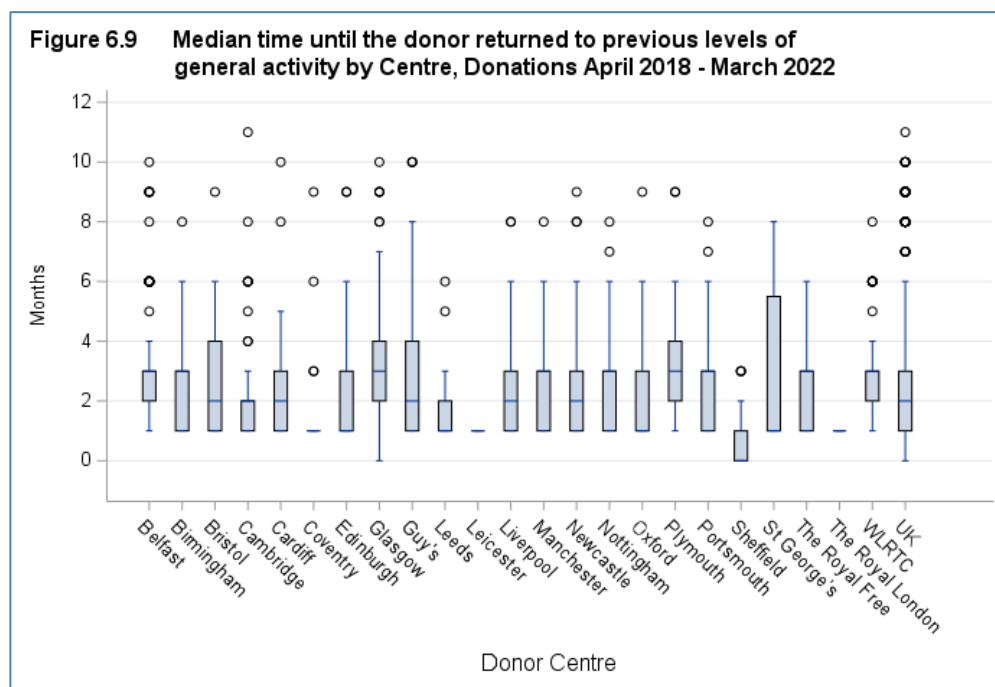
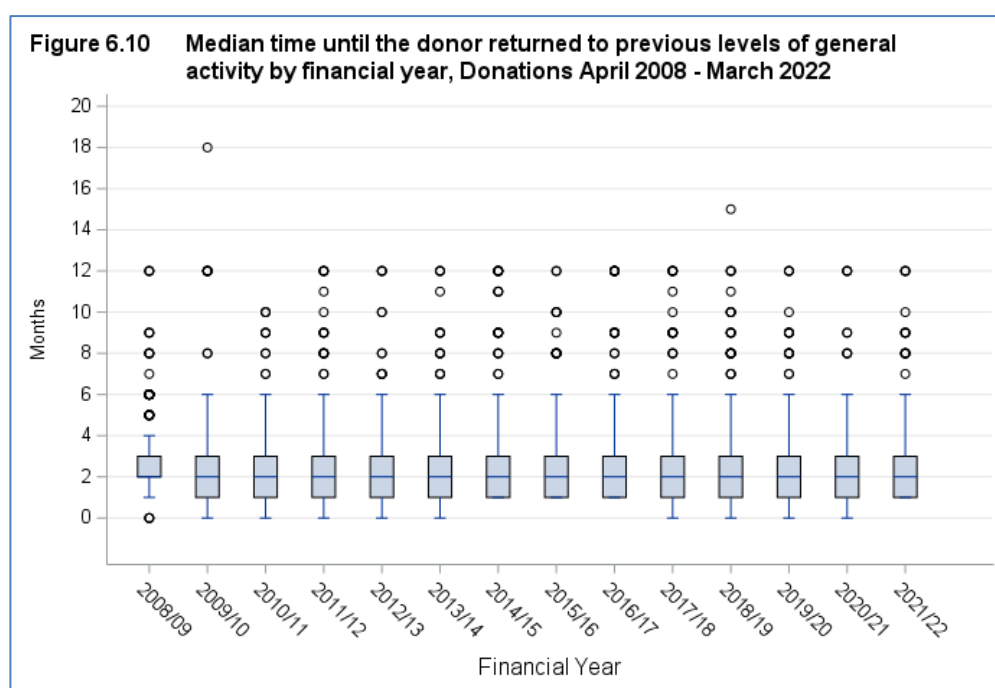


Figure 6.10 shows the median time (in months) to return to normal activity after donation in the UK, by financial year.



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.

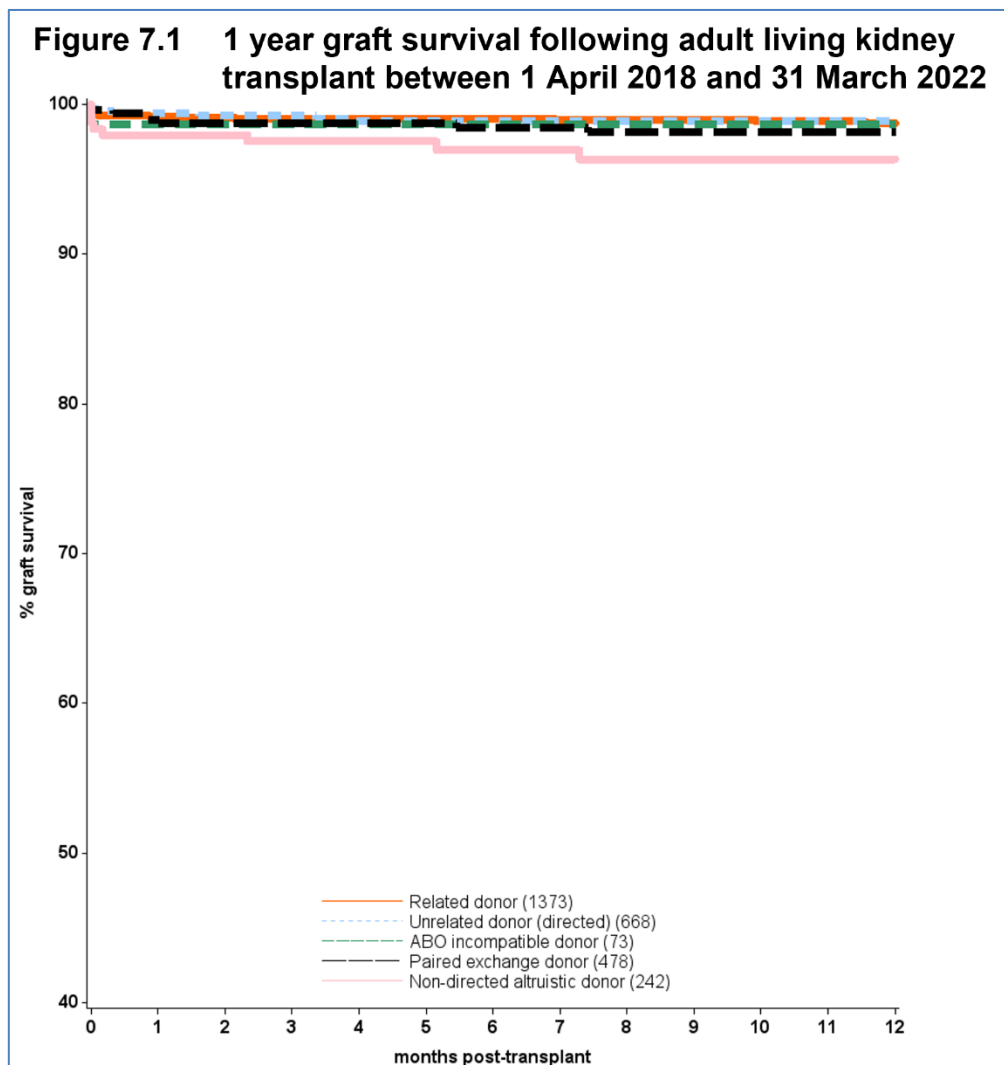


Table 7.1 1 year graft survival following living kidney transplant between 1 April 2018 and 31 March 2022 (p=0.0963)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Unrelated donor (directed)	668	98.8	(98-99)
Related donor	1373	98.7	(98-99)
ABO incompatible donor	73	98.6	(91-100)
Paired exchange donor	478	98.1	(96-99)
Non-directed altruistic donor	242	96.3	(93-98)
HLA incompatible donor*	20	-	-

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

Figure 7.2 5 year graft survival following adult living kidney transplant between 1 April 2014 and 31 March 2018

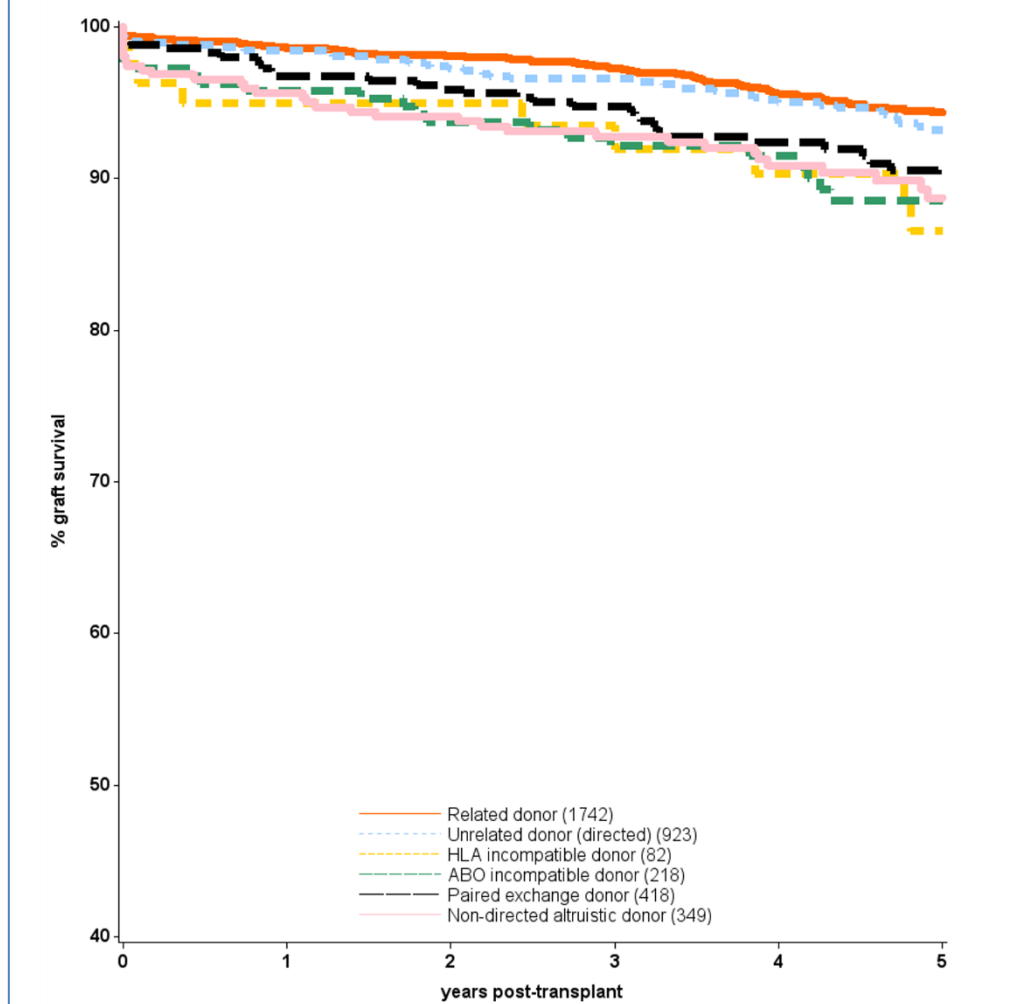


Table 7.2 5 year graft survival following living kidney transplant between 1 April 2014 and 31 March 2018 (p<0.0001)

Living Donors	No. at risk on day 0	% Graft survival (95% confidence interval)	
Related donor	1742	94.4	(93-95)
Unrelated donor (directed)	923	93.2	(91-95)
Paired exchange donor	418	89.9	(86-93)
Non-directed altruistic donor	349	88.7	(84-92)
ABO incompatible donor	218	88.6	(83-92)
HLA incompatible donor	82	86.5	(75-93)

Figure 7.3 1 year patient survival following adult living kidney transplant between 1 April 2018 and 31 March 2022

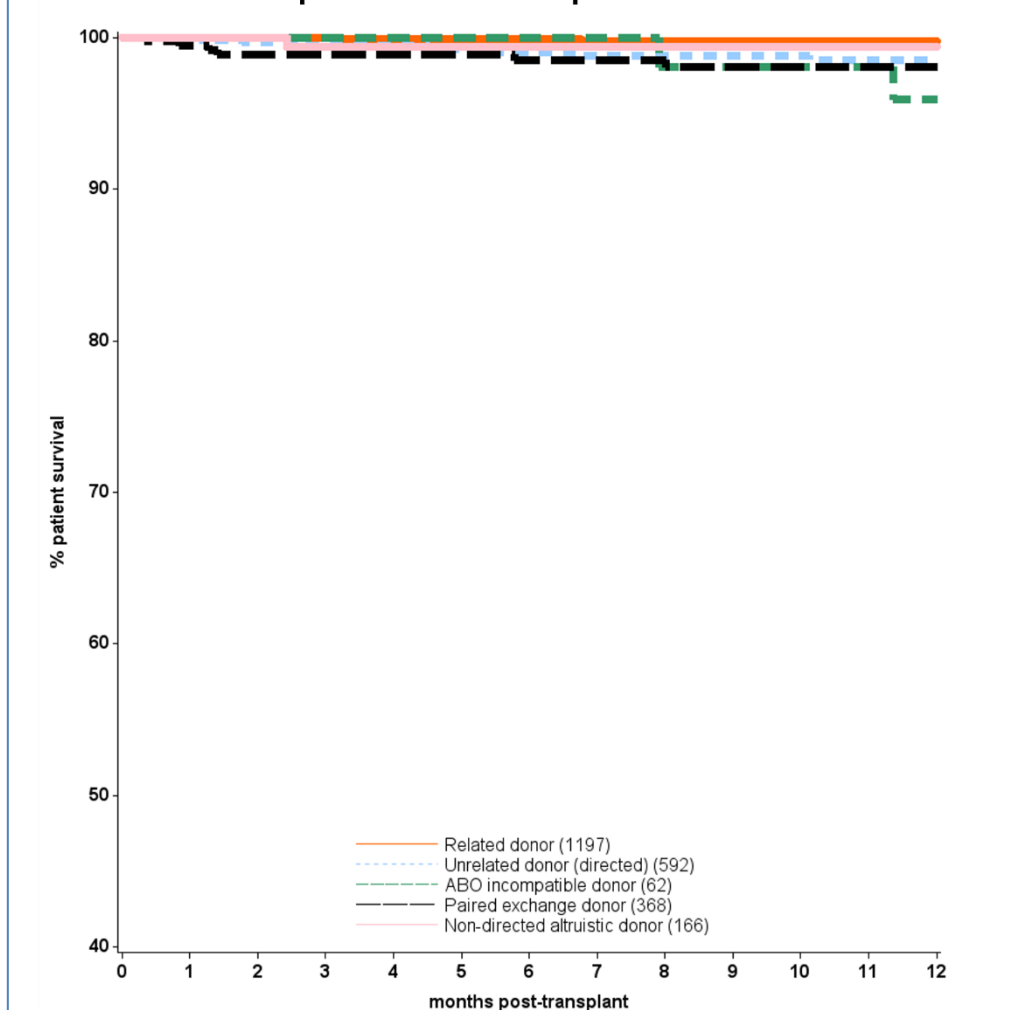


Table 7.3 1 year patient survival following living kidney transplant between 1 April 2018 and 31 March 2022 (p=0.0044)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1197	99.8	(99-100)
Non-directed altruistic donor	166	99.4	(96-100)
Unrelated donor (directed)	592	98.5	(97-99)
Paired exchange donor	368	98.1	(96-99)
ABO incompatible donor	62	95.9	(85-99)
HLA incompatible donor*	9	-	-

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

Figure 7.4 5 year patient survival following adult living kidney transplant between 1 April 2014 and 31 March 2018

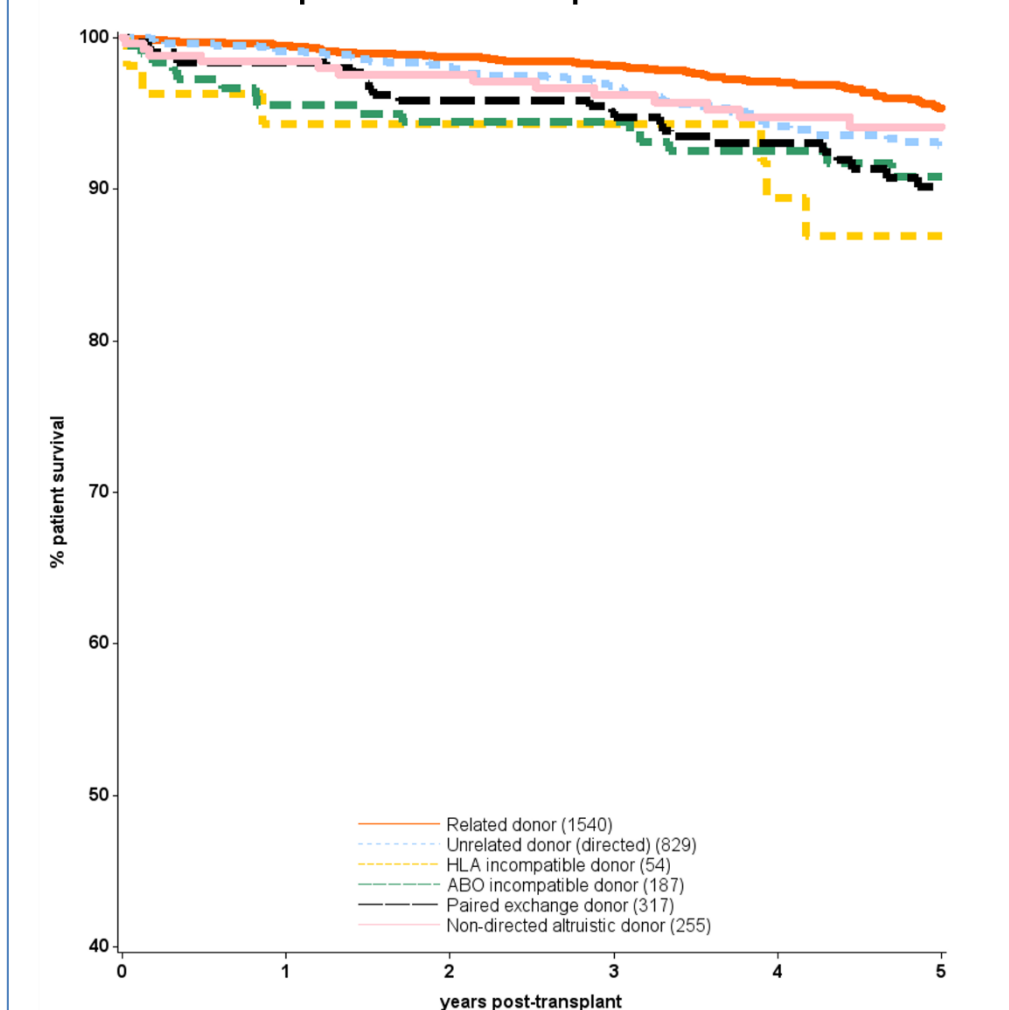


Table 7.4 5 year patient survival following living kidney transplant between 1 April 2014 and 31 March 2018 (p=0.0008)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1540	95.4	(94-96)
Non-directed altruistic donor	255	94.1	(90-97)
Unrelated donor (directed)	829	92.9	(91-95)
ABO incompatible donor	187	90.8	(85-94)
Paired exchange donor	317	90.1	(85-93)
HLA incompatible donor	54	86.9	(73-94)

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, Monroe 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.

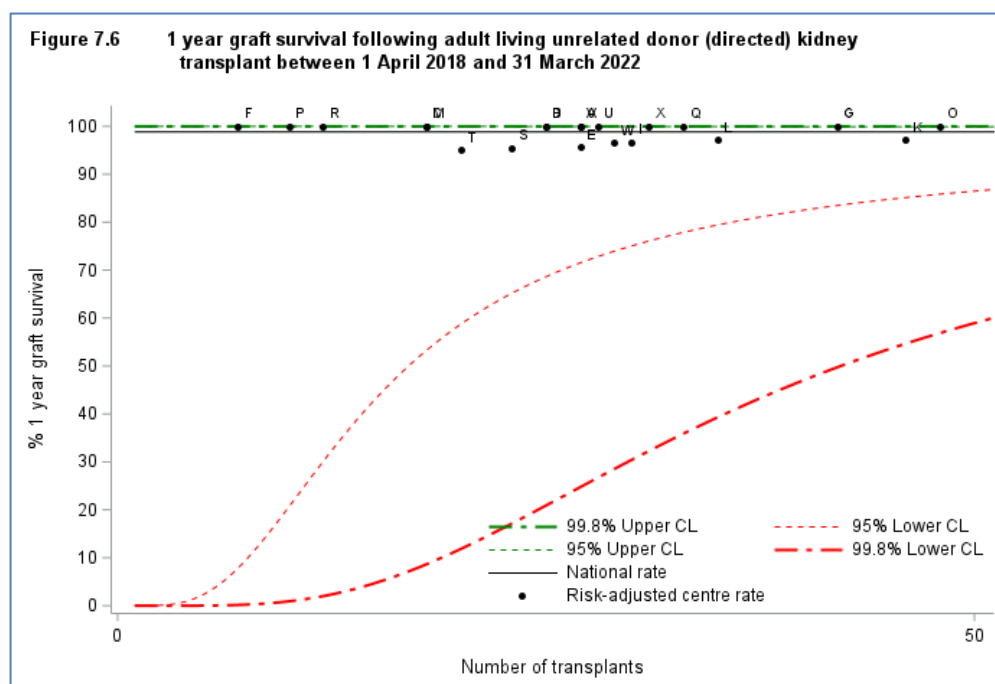
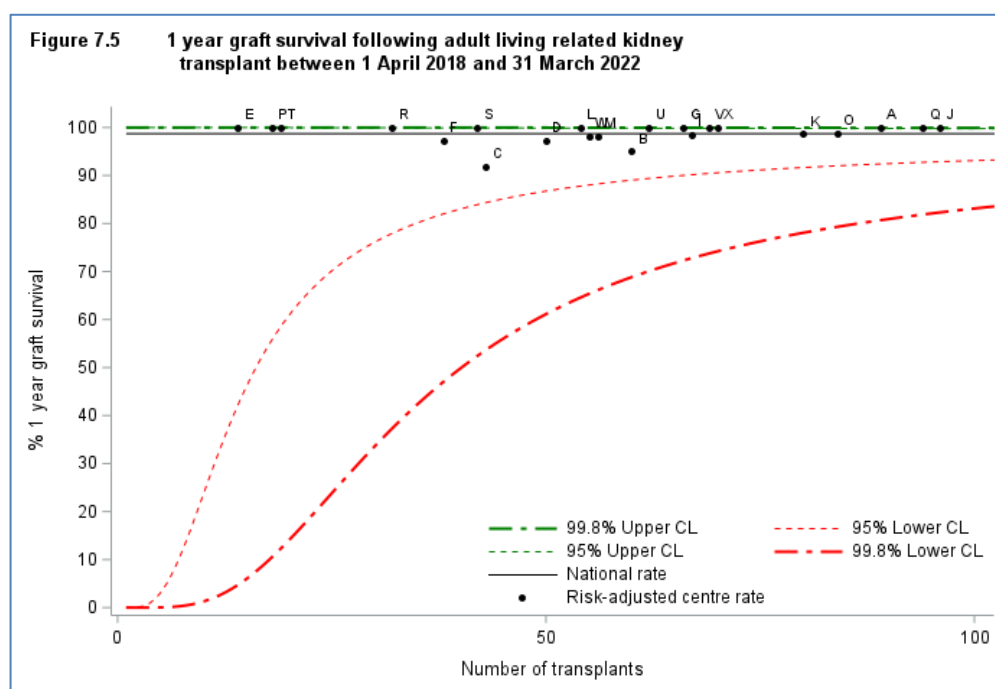


Figure 7.7 1 year graft survival following adult living ABOi donor kidney transplant between 1 April 2018 and 31 March 2022

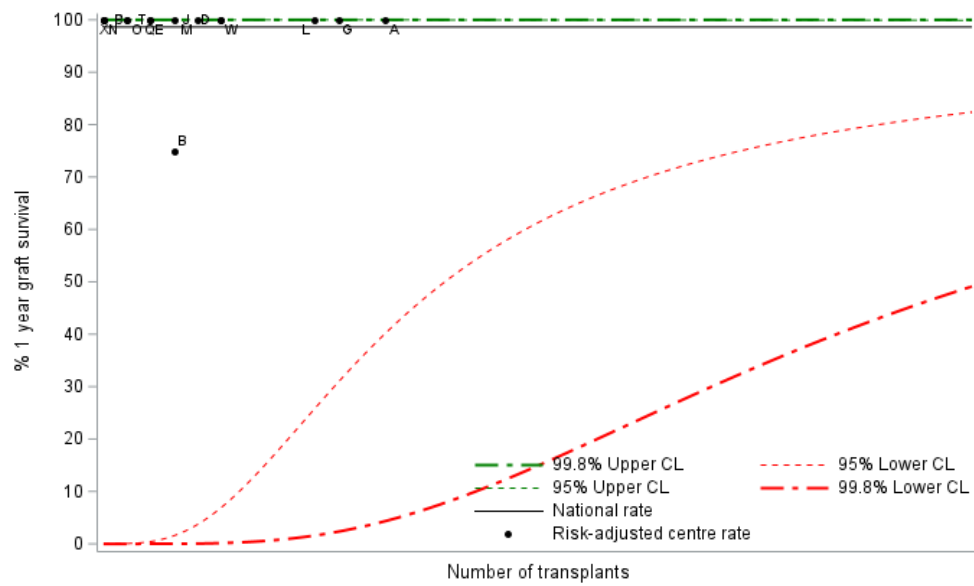


Figure 7.8 1 year graft survival following adult living paired exchange donor kidney transplant between 1 April 2018 and 31 March 2022

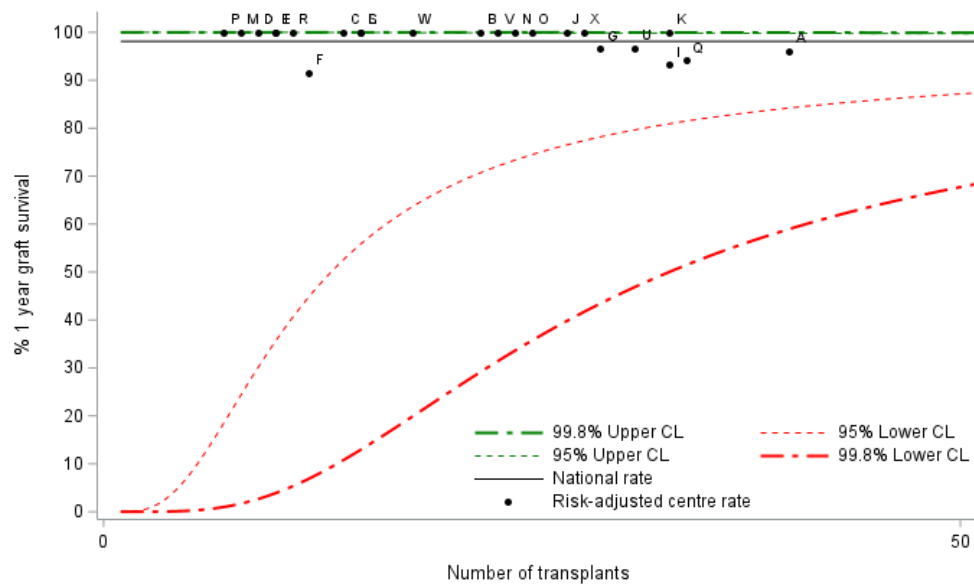


Figure 7.9 1 year graft survival following adult living non-directed altruistic donor kidney transplant between 1 April 2018 and 31 March 2022

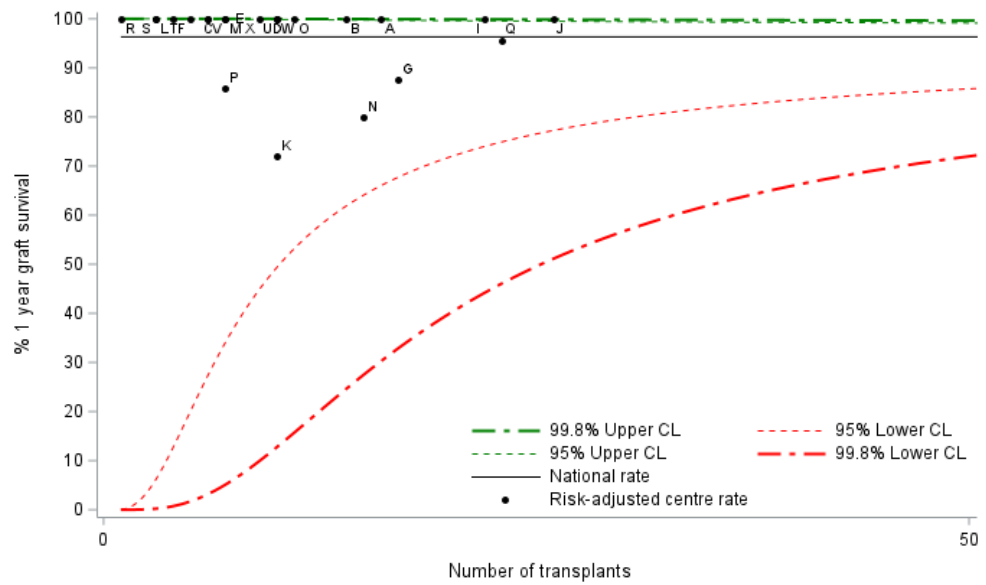


Table 7.5 1 year graft survival following adult living donor kidney transplant between 1 April 2018 and 31 March 2022, by donor type and centre

Centre	Code	Related		Unrelated		HLAi		ABOi		Paired		Non-directed altruistic	
		N	% ¹	N	% ¹	N	% ¹	N	% ¹	N	% ¹	N	% ¹
Belfast	A	89	100	27	100			13	100	40	96	16	100
Birmingham	B	60	95	25	100			4	75	22	100	14	100
Bristol	C	43	92	18	100			1	100	14	100	6	100
Cambridge	D	50	97	25	100	4	100	6	100	9	100	10	100
Cardiff	E	14	100	27	96	1	100	3	100	10	100	7	100
Coventry	F	38	97	7	100	2	100			12	92	5	100
Edinburgh	G	66	100	42	100			11	100	29	97	17	88
Glasgow	I	67	99	30	97					33	93	22	100
Guy's	J	96	100	52	100	1	100	4	100	27	100	26	100
Leeds	K	80	99	46	97	1	100			33	100	10	72
Leicester	L	54	100	35	97			10	100	15	100	3	100
Liverpool	M	56	98	18	100	4	100	5	100	8	100	7	100
Manchester	N	115	97	55	100			1	100	24	100	15	80
Newcastle	O	84	99	48	100	5	100	2	100	25	100	11	100
Nottingham	P	18	100	10	100			1	100	7	100	7	86
Oxford	Q	94	100	33	100	2	100	3	100	34	94	23	96
Plymouth	R	32	100	12	100					11	100	1	100
Portsmouth	S	42	100	23	95					15	100	3	100
Sheffield	T	19	100	20	95			2	100	10	100	4	100
St George's	U	62	100	28	100					31	97	10	100
The Royal Free	V	69	100	27	100					23	100	6	100
The Royal London	W	55	98	29	97			6	100	18	100	10	100
WLRTC	X	70	100	31	100			1	100	28	100	9	100
UK		1373	99	668	99	20	100	73	99	478	98	242	96

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.

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