



Blood and Transplant

**ANNUAL REPORT ON LIVING DONOR KIDNEY
TRANSPLANTATION**

**REPORT FOR 2021/2022
(1 APRIL 2007 – 31 MARCH 2022)**

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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 2007. 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 789 adult living donor kidney transplants performed in the UK in 2020/22, an increase of 417 transplants compared to 2020/21. Of these, 389 (189 in 2020/21) were genetically related, 171 (93 in 2020/21) were unrelated, 3 (1 in 2020/21) was HLAi, 9 (4 in 2020/21) were ABOi, 153 (51 in 2020/21) were paired/pooled and 64 (34 in 2020/21) were non-directed altruistic donor transplants. The equivalent number of paediatric transplants was 97, a 94% increase from the previous year.
- The proportion of living donors across the UK being prescribed anti-hypertensive drugs is 4% at one year, 6% at five years and 12% at ten years post donation.
- Serum creatinine for living donors in the UK is 103 (IQ-range 89-119) at one year, 97 (84-113) at five years and 92 (80-106) 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 89%, ABOi 86% and HLAi 86%.
- 46% of registered recipients in the UK Living Kidney Sharing Scheme have been transplanted and 66% of identified transplants proceed.

Use of the contents of this report should be acknowledged as follows:
Annual Report on Living Donor Kidney Transplantation 2021/22. NHS Blood and Transplant

Introduction

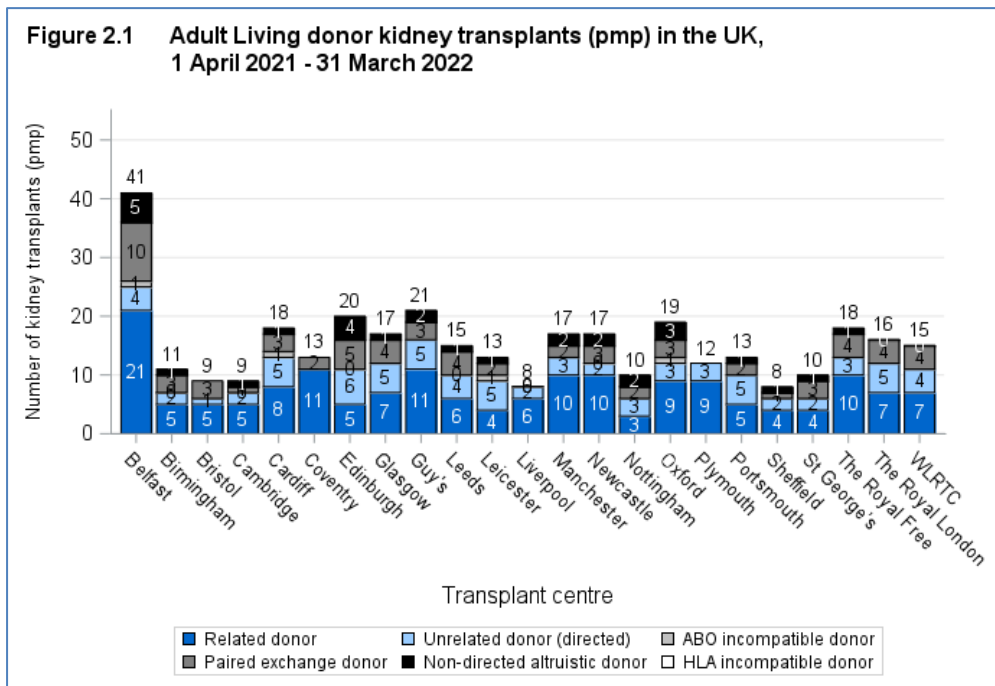
This report presents information on transplant activity between 1 April 2007 and 31 March 2022, for all 24 centres performing living donor kidney transplantation in the UK. Data were obtained from the UK Transplant Registry, at NHS Blood & Transplant, that holds information relating to donors, recipients 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 2017 to 31 March 2021 and five-year post-transplant for the period 1 April 2013 to 31 March 2017. 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 2021/22 in each transplant centre. WLRTC had the highest rate of adult living donor kidney transplants per million population.



ADULT

Figure 2.2 shows the number of adult living donor kidney transplants performed in the UK between 1 April 2006 and 31 March 2021. The number of transplants has increased from 777 in 2007/08 to 789 in 2021/22, also an increase from 372 in 2020/21.

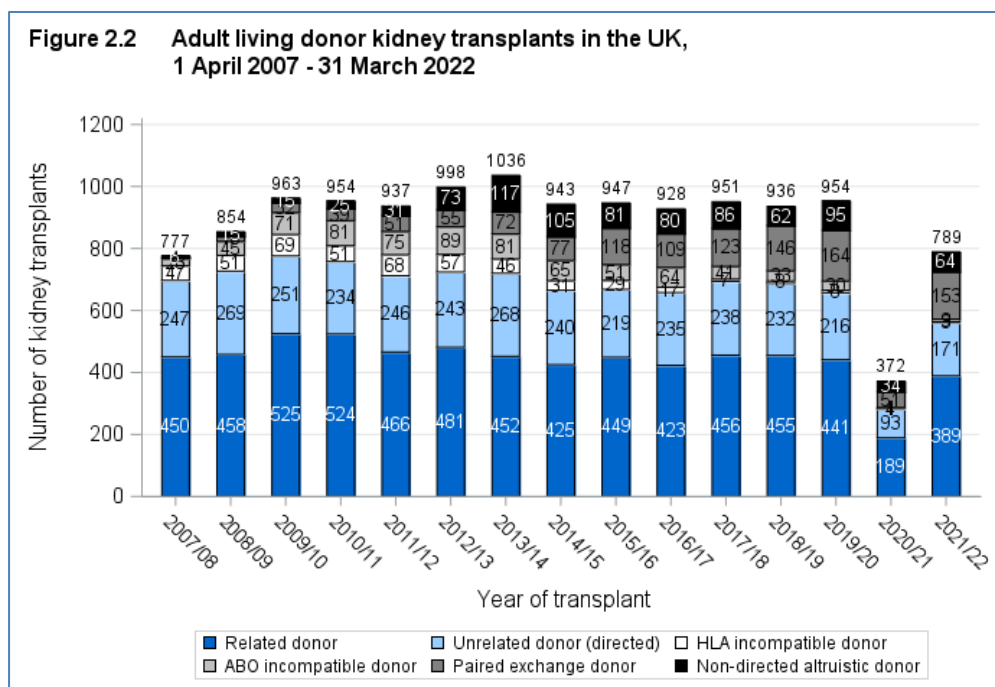


Figure 2.3 and **Table 2.1** show the number of adult living donor kidney transplants performed in 2021/22 in each transplant centre. Guy's performed the most adult living donor kidney transplants last year with 73 recipients receiving a transplant. All centres perform non-directed altruistic kidney donation and participate in the UK Living Kidney Sharing Scheme. 7 centres (2 centres in 2020/21) performed ABO incompatible (ABOi) transplants and 3 centres (1 centre in 2020/21) performed HLA incompatible (HLAi) transplants in 2021/22.

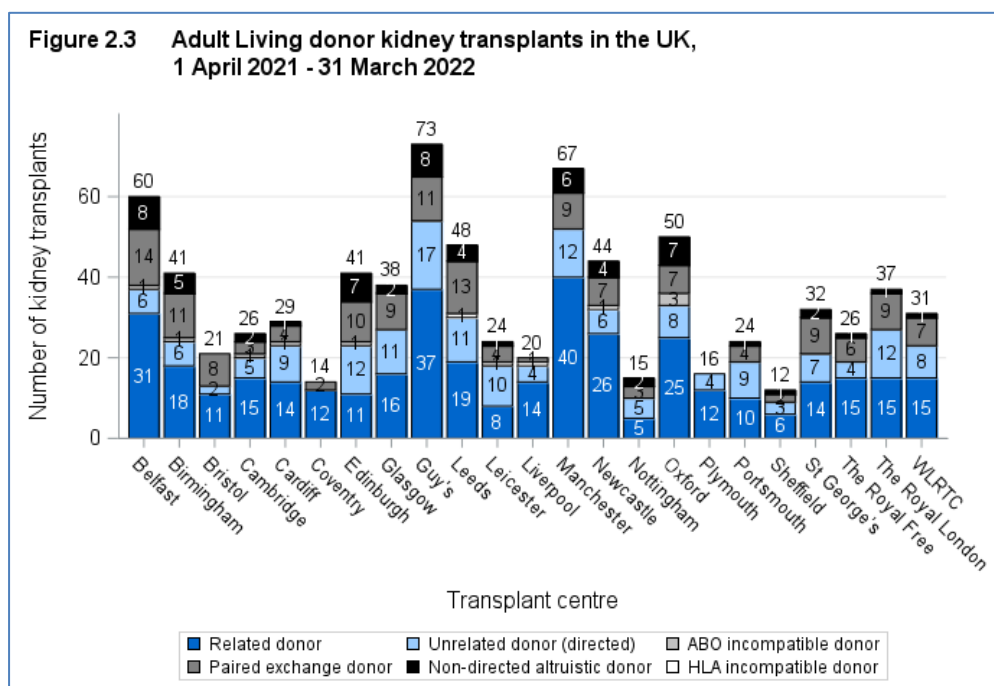


Table 2.1 Adult living donor kidney transplants in the UK, 1 April 2021 - 31 March 2022

Transplant Centre	Donor type					
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	Non-directed altruistic donor
Belfast	31	6	0	1	14	8
Birmingham	18	6	0	1	11	5
Bristol	11	2	0	0	8	0
Cambridge	15	5	0	1	3	2
Cardiff	14	9	0	1	4	1
Coventry	12	0	0	0	2	0
Edinburgh	11	12	0	1	10	7
Glasgow	16	11	0	0	9	2
Guy's	37	17	0	0	11	8
Leeds	19	11	1	0	13	4
Leicester	8	10	0	1	4	1
Liverpool	14	4	1	0	1	0
Manchester	40	12	0	0	9	6
Newcastle	26	6	1	0	7	4
Nottingham	5	5	0	0	3	2
Oxford	25	8	0	3	7	7
Plymouth	12	4	0	0	0	0
Portsmouth	10	9	0	0	4	1
Sheffield	6	3	0	0	2	1
St George's	14	7	0	0	9	2
The Royal Free	15	4	0	0	6	1
The Royal London	15	12	0	0	9	1
WLRTC	15	8	0	0	7	1

Figure 2.4 shows the proportion of adult living donor kidney transplants by donor type and centre in 2021/2022.

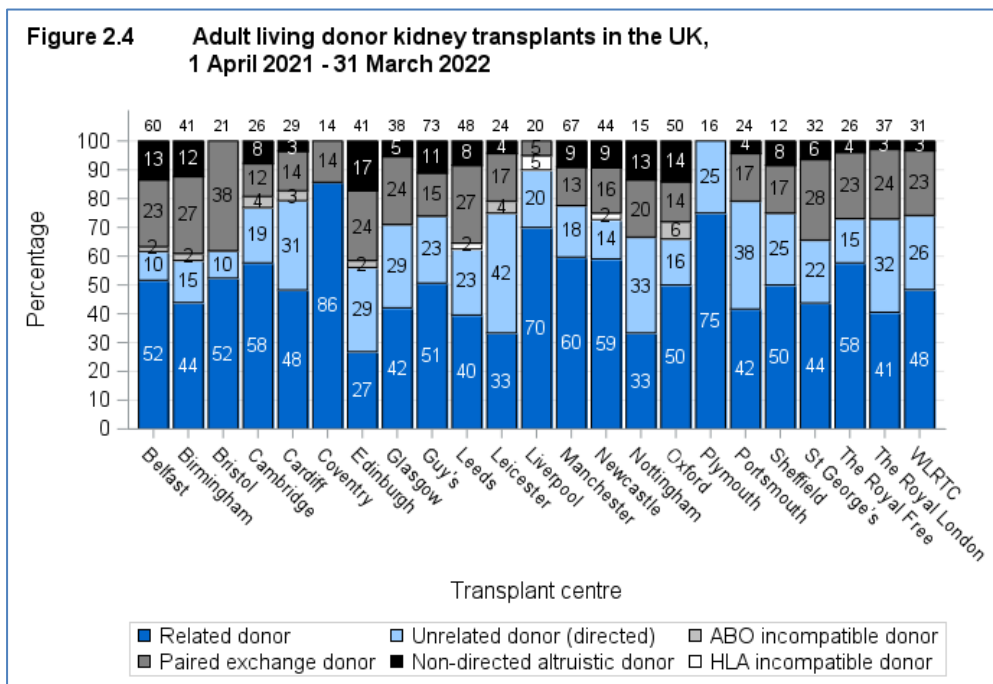
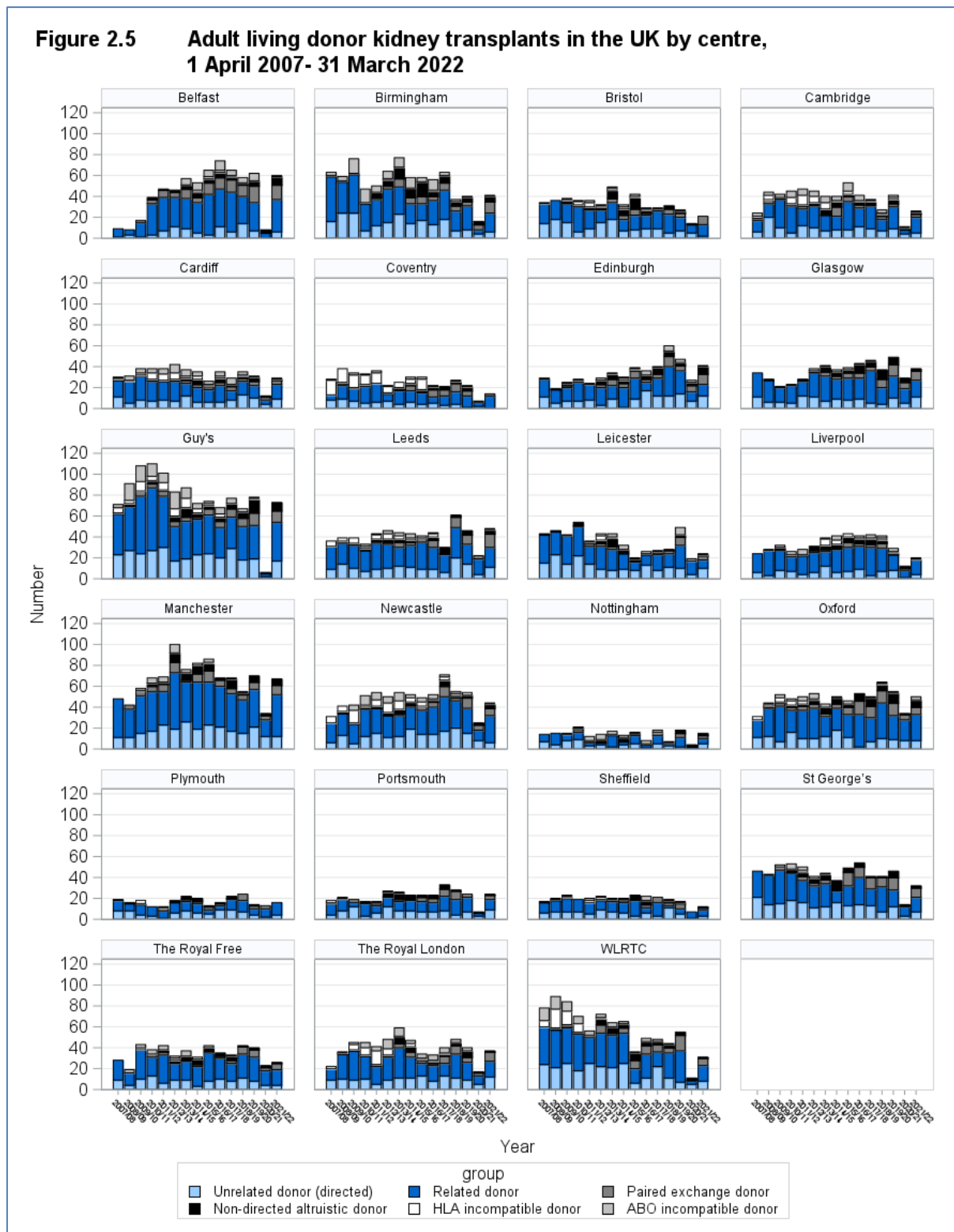


Figure 2.5 shows the number of adult living donor kidney transplants by donor type and centre between 1 April 2007 and 31 March 2022.



PAEDIATRIC

Figure 2.6 shows the number of paediatric living donor kidney transplants performed in the UK between 1 April 2007 and 31 March 2022. The number of transplants increased from 51 in 2007/08 to 97 in 2021/22, which is also an increase from 50 in 2020/21.

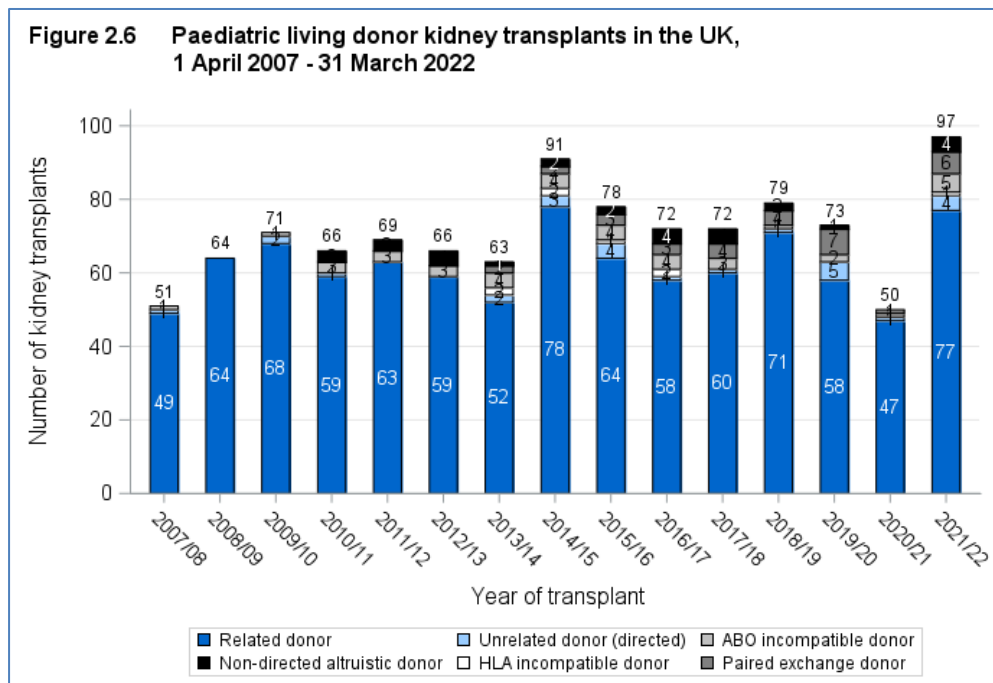


Figure 2.7 and **Table 2.2** show the number of paediatric living donor kidney transplants performed in 2021/22 in each transplant centre. Guy's transplant team performed the most living donor kidney transplants last year with 47 recipients receiving a transplant (28 at GOSH and 19 at Guy's). Children are also benefitting from the UKLKS and antibody removal programmes to facilitate living donor transplants.

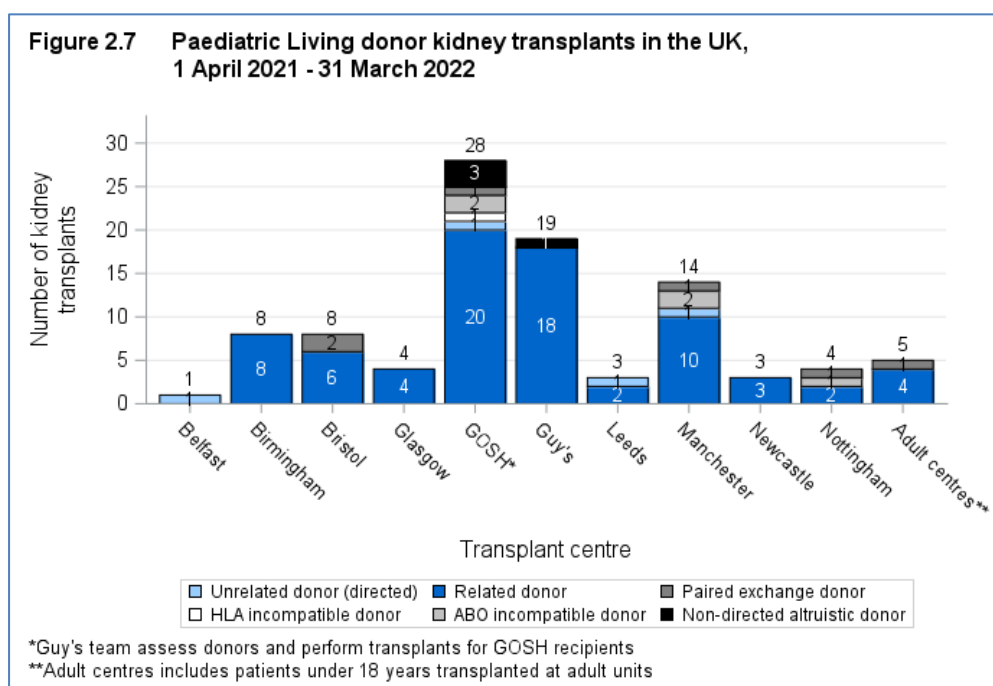


Table 2.2 Paediatric living donor kidney transplants in the UK, 1 April 2021 - 31 March 2022

Transplant Centre	Donor type					
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	Non-directed altruistic donor
Belfast	0	1	0	0	0	0
Birmingham	8	0	0	0	0	0
Bristol	6	0	0	0	2	0
GOSH*	20	1	1	2	1	3
Glasgow	4	0	0	0	0	0
Guy's	18	0	0	0	0	1
Leeds	2	1	0	0	0	0
Manchester	10	1	0	2	1	0
Newcastle	3	0	0	0	0	0
Nottingham	2	0	0	1	1	0
Adult centres**	4	0	0	0	1	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 2021/22.

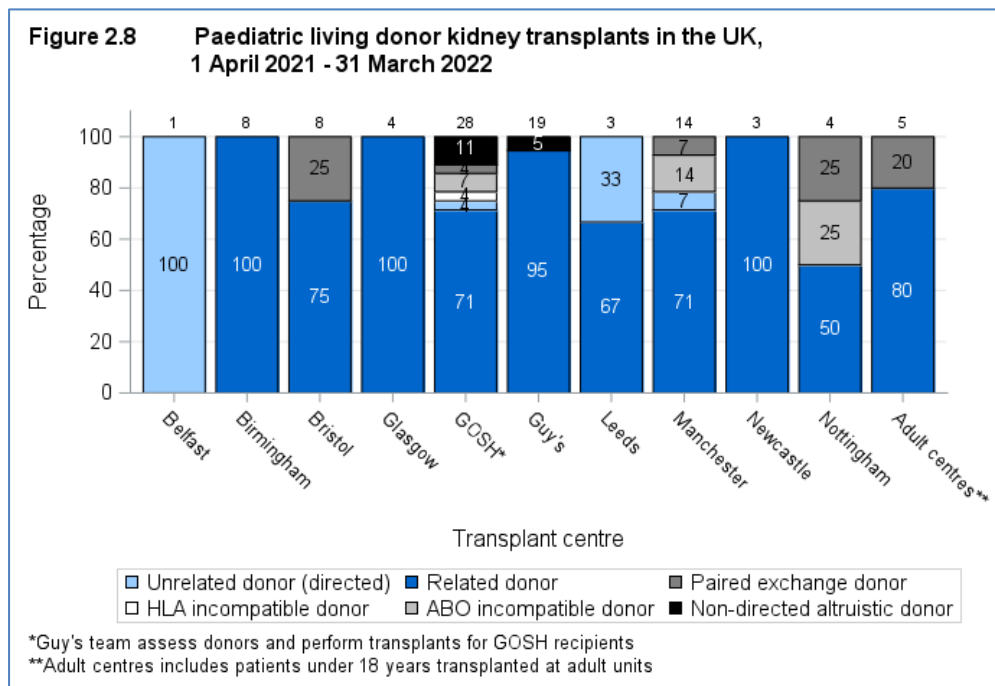
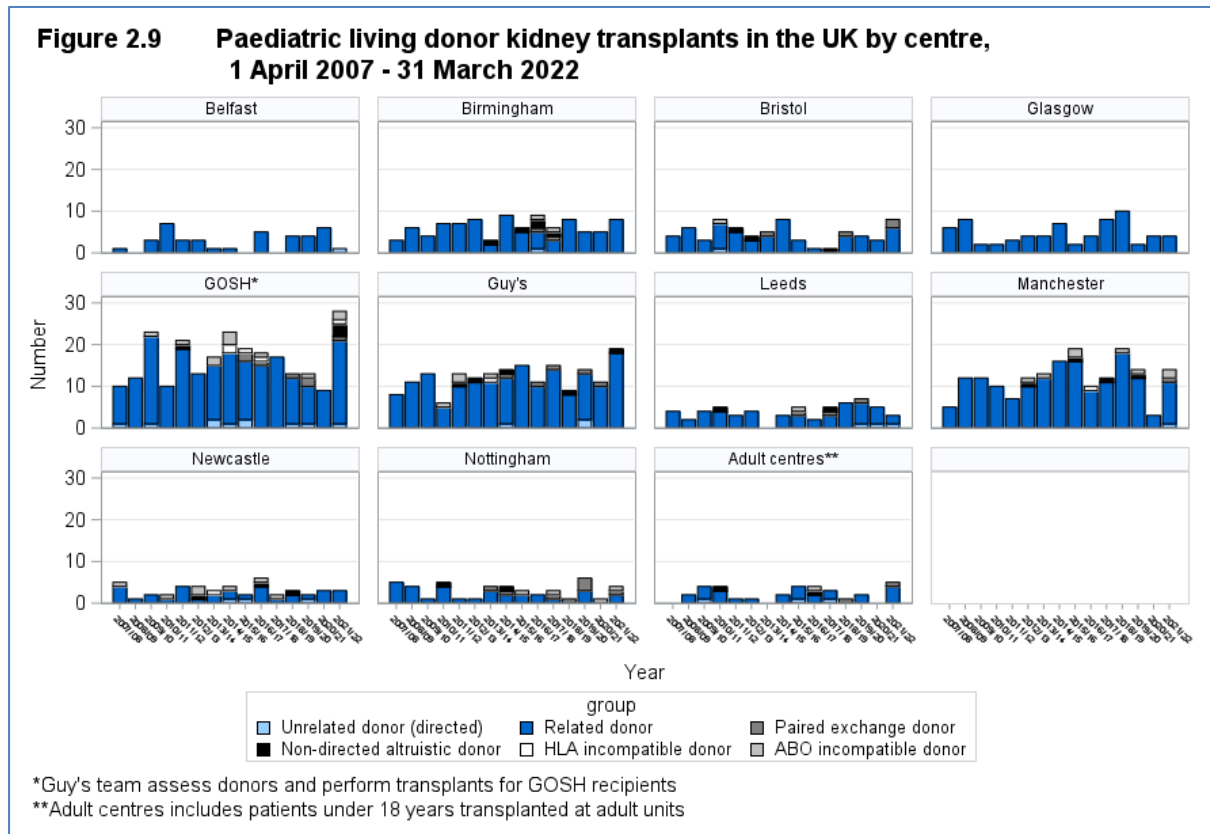


Figure 2.9 shows the number of paediatric living donor kidney transplants by donor type and centre between 1 April 2007 and 31 March 2022.



Demographic Characteristics

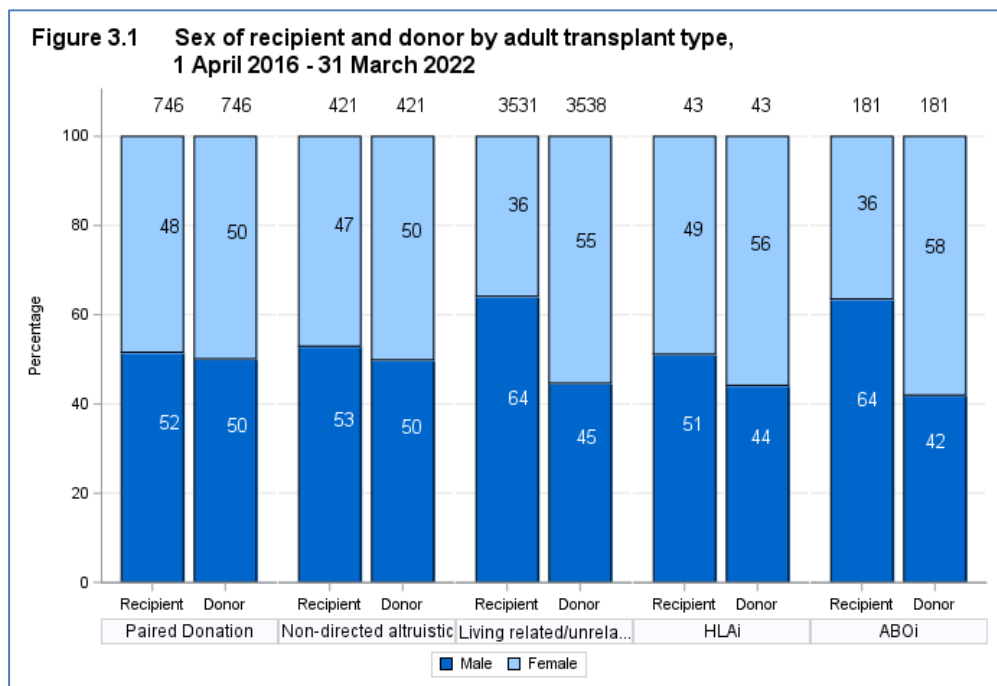
ADULT

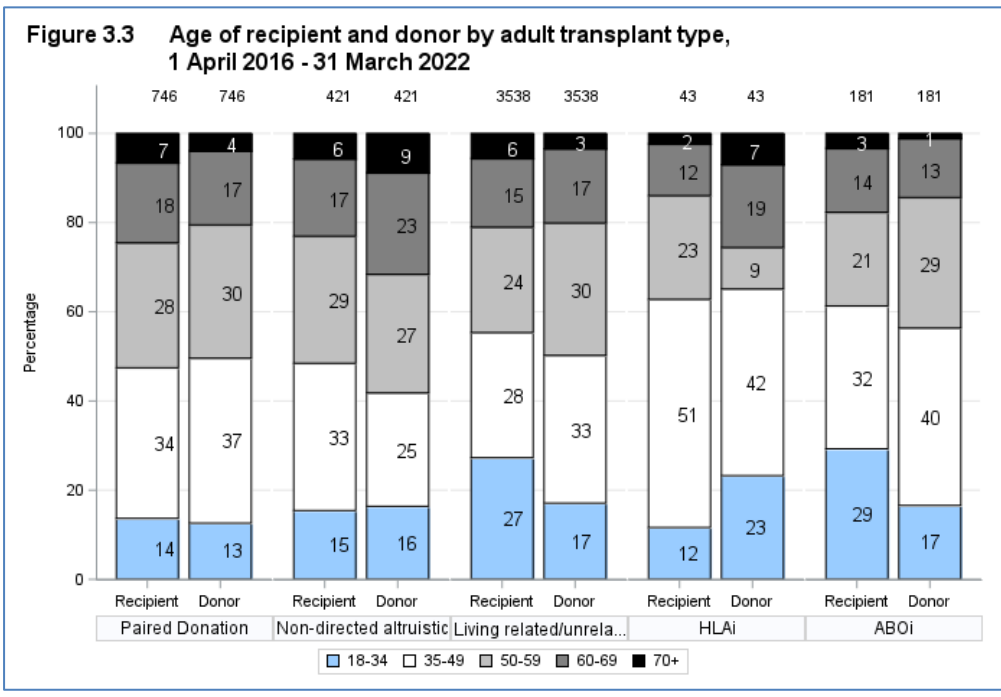
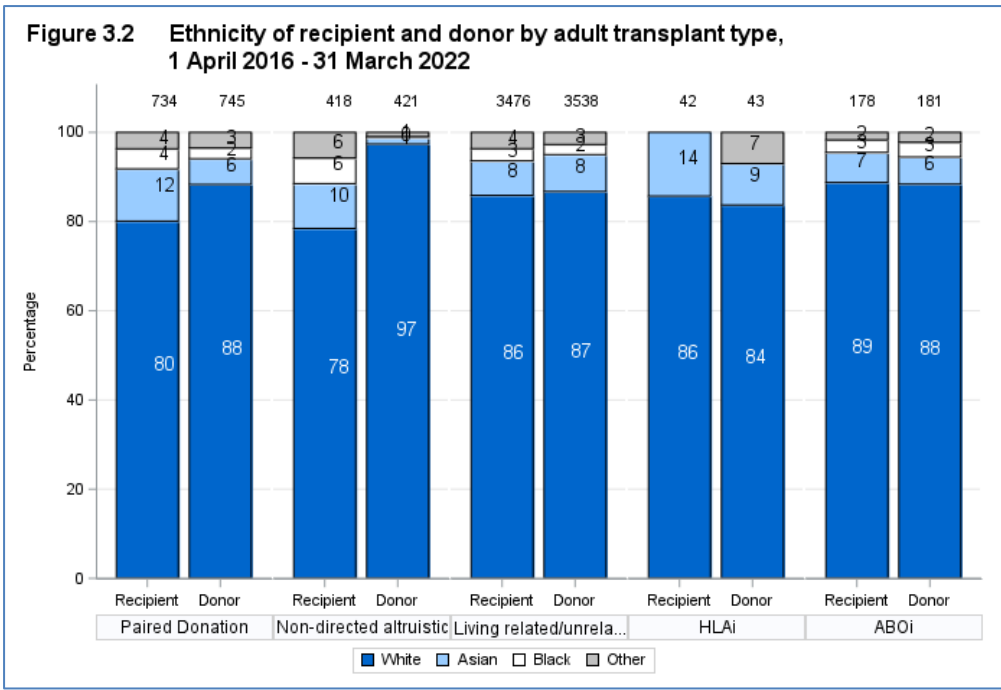
The sex, ethnicity, age group, sensitisation (cRF), cRF by transplant type for HSP, blood group, dialysis status of donors and recipients of adult living donor kidney transplants and pre-emptive transplant rates are shown by centre in **Figure 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7** and **3.8** respectively.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

86% of adult recipients of direct living donor kidney transplants are White and 14% are from Black, Asian or other minority ethnic groups (BAME). 3% of non-directed altruistic and 12% of paired/pooled donors are BAME donors but 22% of adult recipients receiving a kidney from a non-directed altruistic donor and 20% of recipients from a paired/pooled donor are BAME.

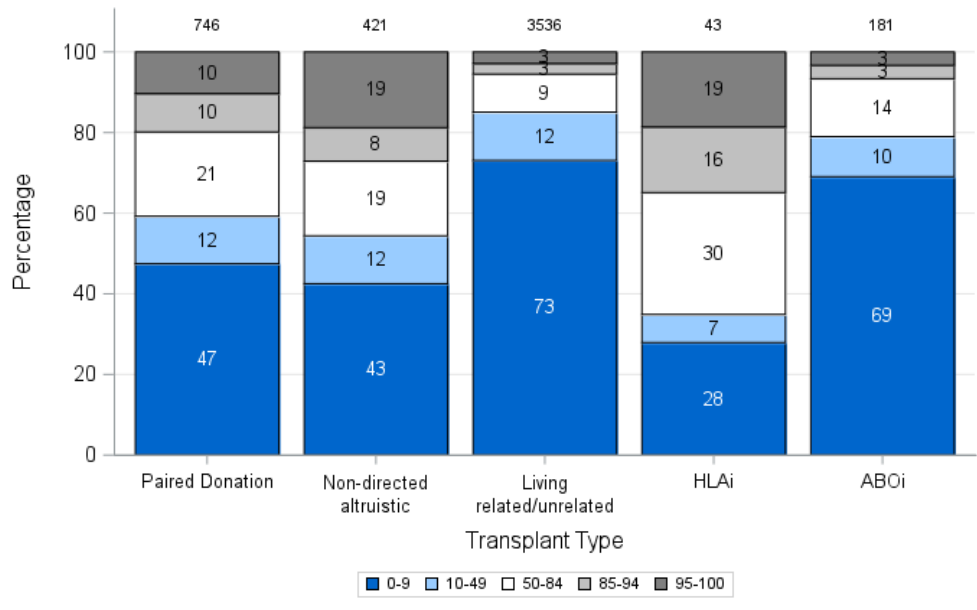
There is a higher proportion of non-directed altruistic kidney donors > 50 years of age in comparison with other donor groups.

The adult living donor pre-emptive transplant rates ranged from 52% at Cardiff to 10% at Bristol.

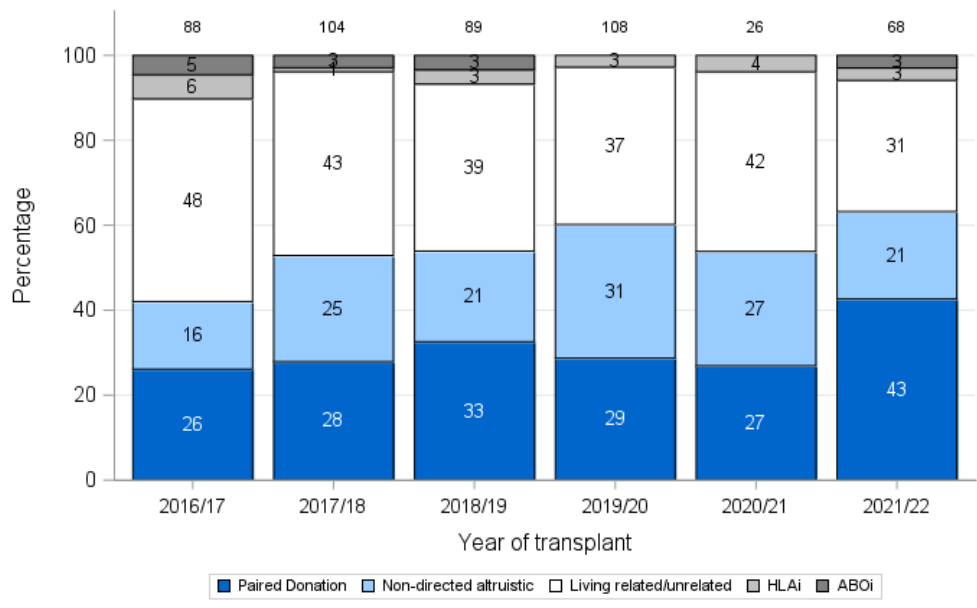




**Figure 3.4 Recipient Calculated Reaction Frequency by adult transplant type
1 April 2016 - 31 March 2022**



**Figure 3.5 Adult HSP by transplant type and year of transplant,
1 April 2016 - 31 March 2022**



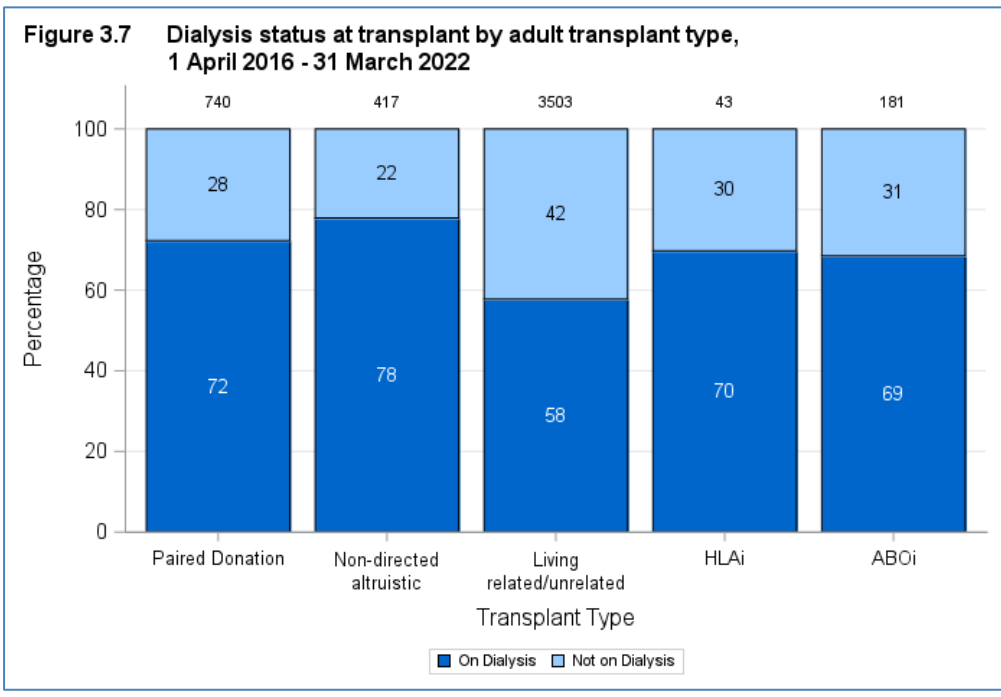
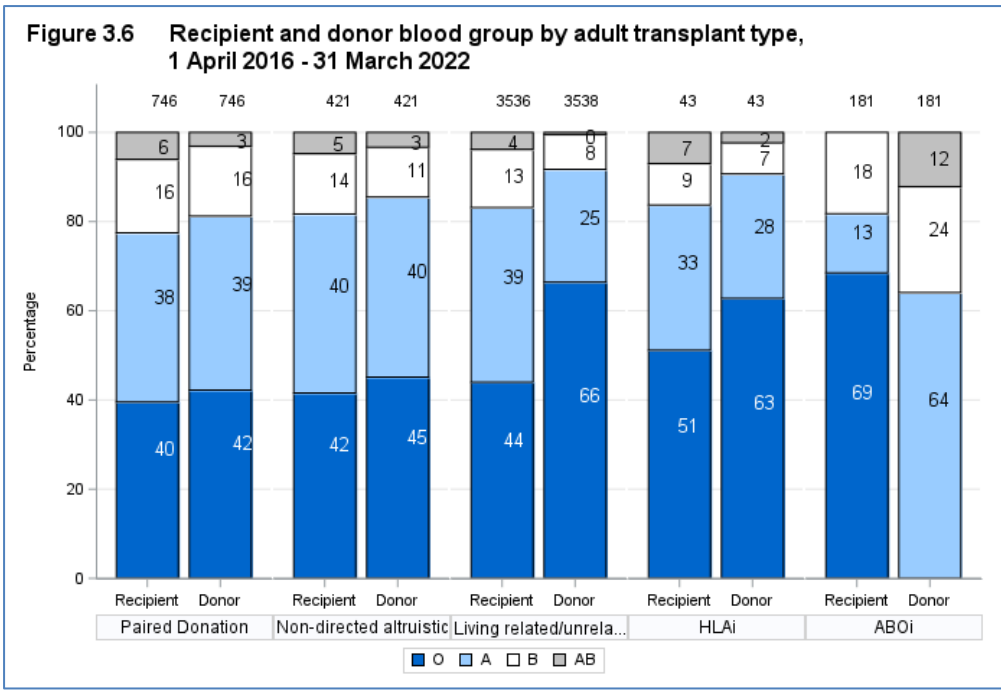
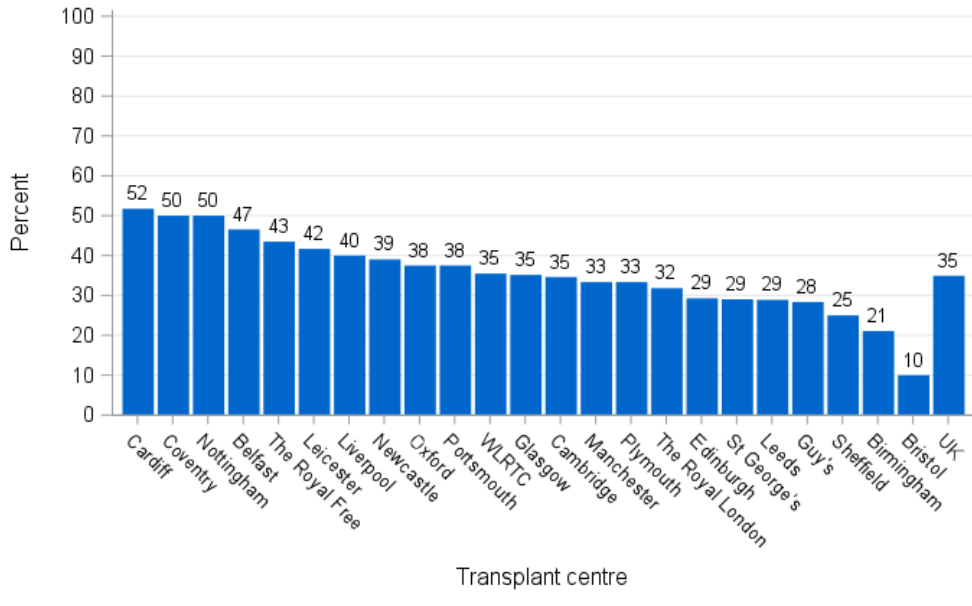


Figure 3.8 Adult living donor pre-emptive transplant rates by centre, 1 April 2021 - 31 March 2022



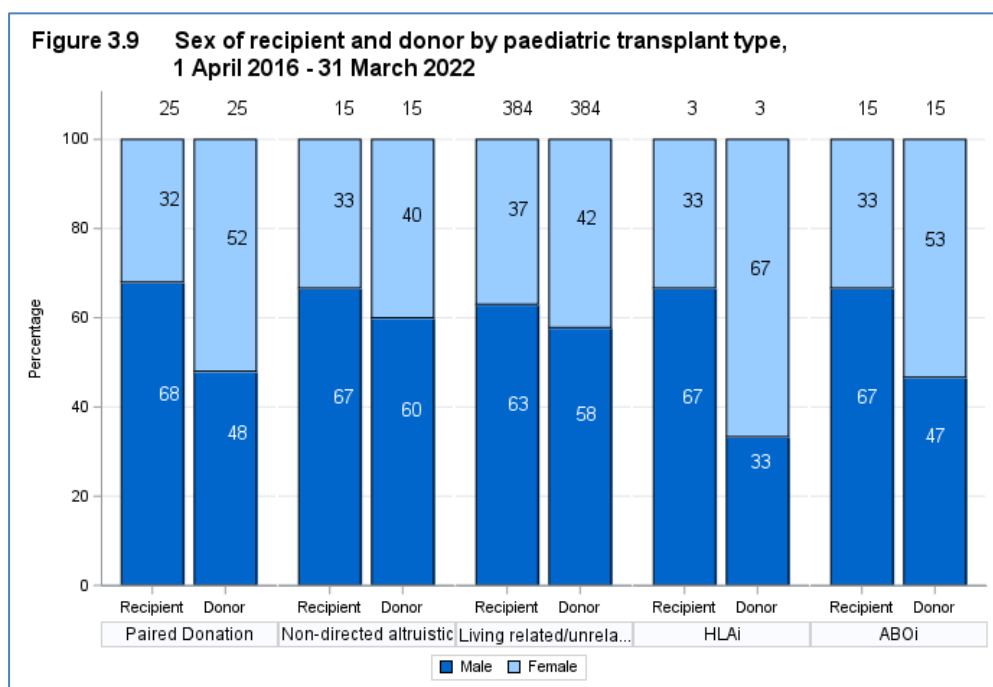
PAEDIATRIC

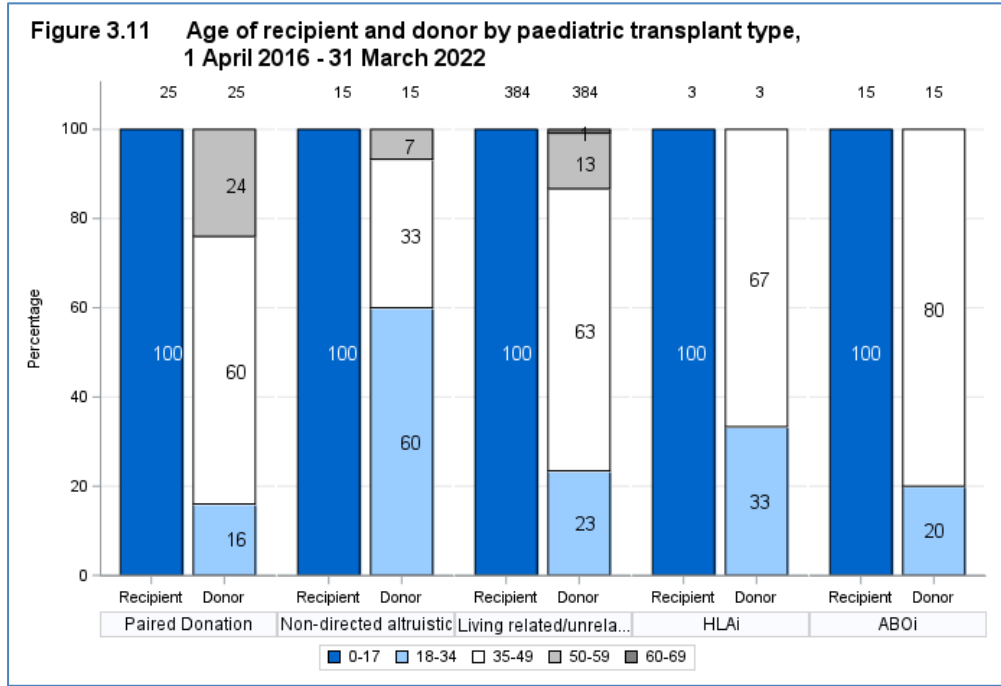
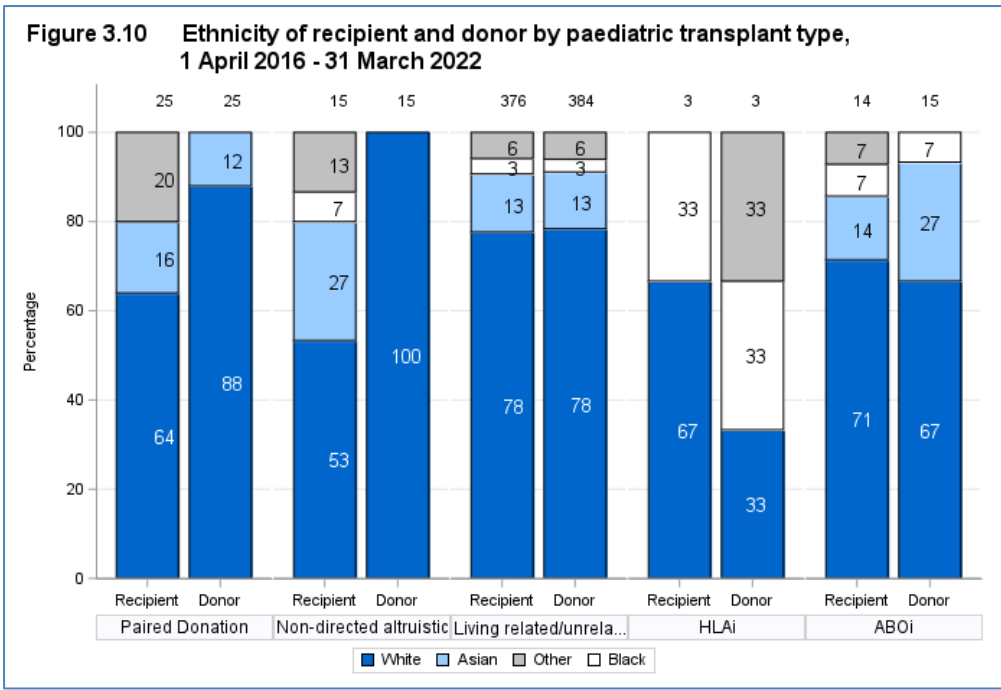
The sex, ethnicity, age group, sensitisation (cRF), cRF by transplant type for HSP, blood group and dialysis status of donors and recipients of paediatric living donor kidney transplants and pre-emptive transplant rates are shown by centre in **Figure 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15** and **3.16**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

78% of paediatric recipients of direct living donor kidney transplants are White and 22% are from Black, Asian or other minority ethnic groups (BAME). 12% of paired/pooled donors are from BAME donors but 47% of paediatric recipients receiving a kidney from a non-directed altruistic donor and 36% from paired/pooled donors were BAME.

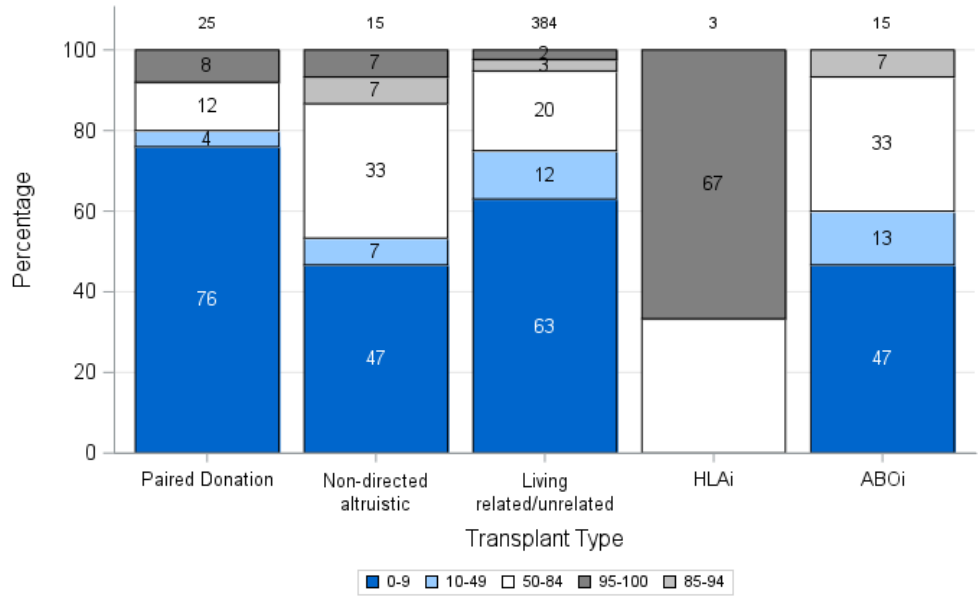
47% of children transplanted from a non-directed altruistic donor have a cRF ≥ 50 and 20% of children transplanted through the paired/pooled scheme have cRF ≥ 50 .

The paediatric living donor pre-emptive transplant rates ranged from 38% at Birmingham to 0% at Belfast, Glasgow and Nottingham.

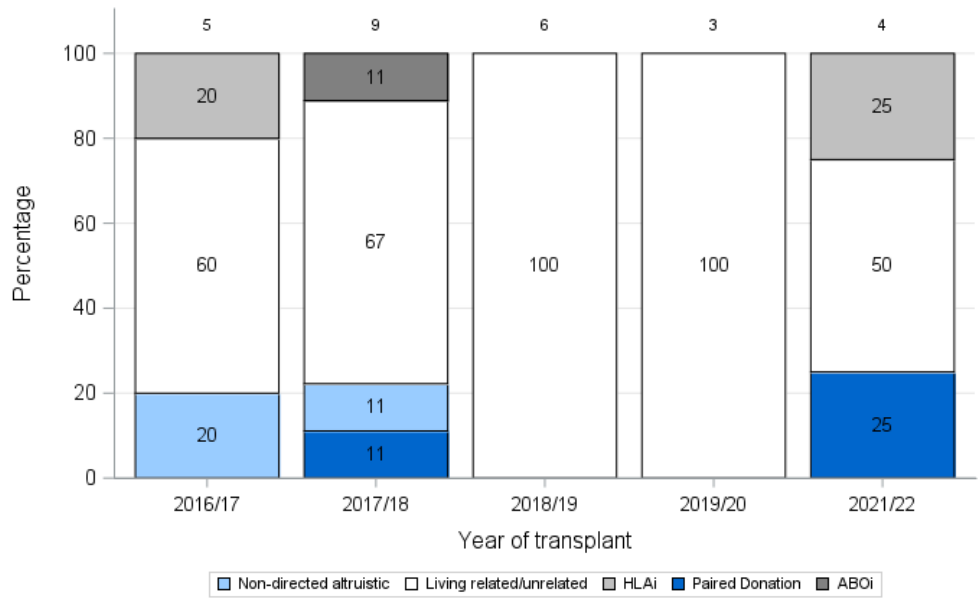




**Figure 3.12 Recipient Calculated Reaction Frequency by paediatric transplant type
1 April 2016 - 31 March 2022**



**Figure 3.13 Paediatric HSP by transplant type and year of transplant,
1 April 2016 - 31 March 2022**



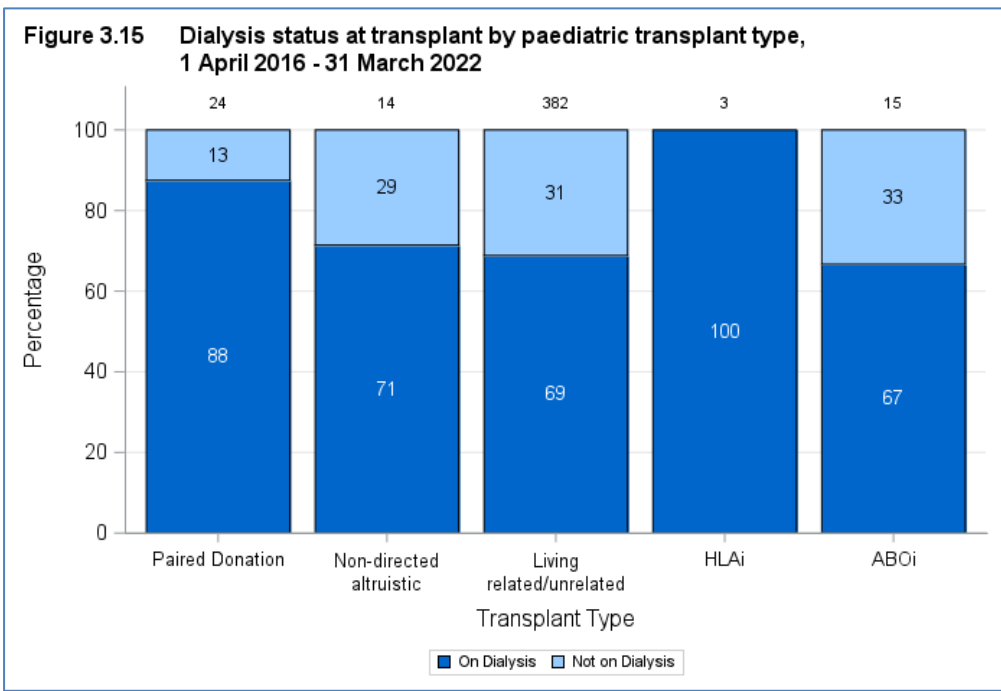
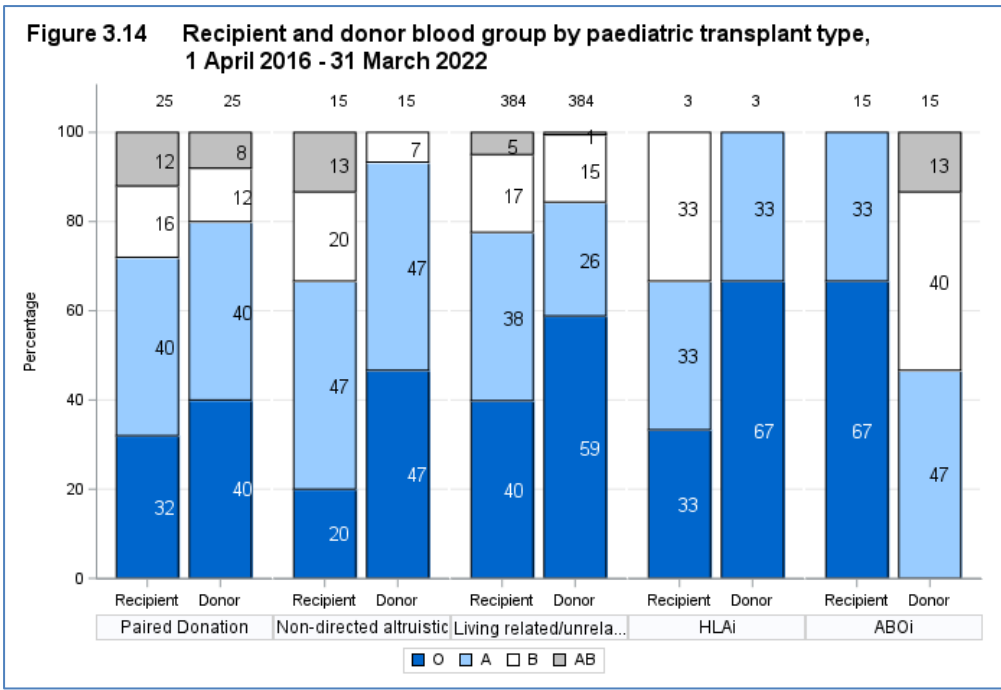
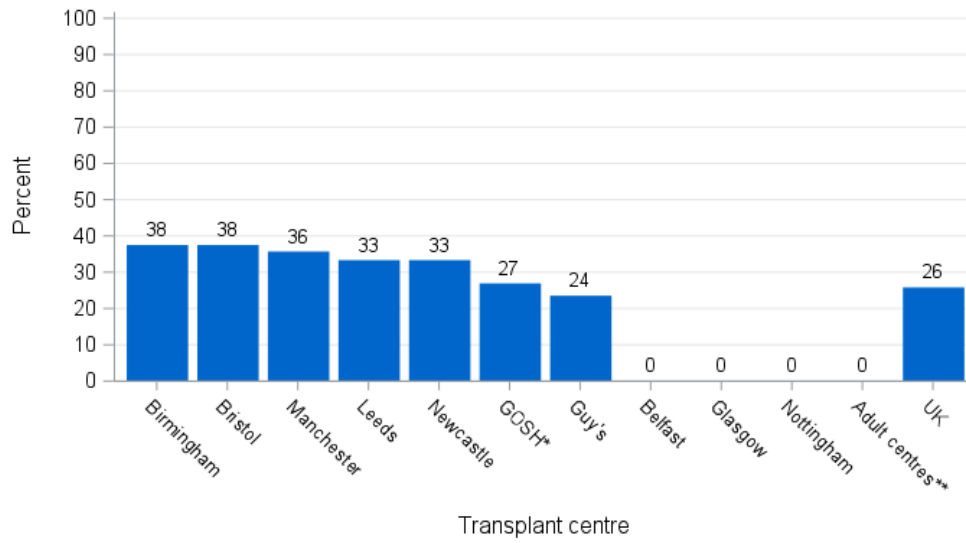


Figure 3.16 Paediatric living donor pre-emptive transplant rates by centre, 1 April 2021 - 31 March 2022



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

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

UK Living Kidney Sharing Scheme

4.1 Paired Donation Scheme

4.1.1 Registrations: Matching Runs, 1 April 2016 – 31 March 2022

Figure 4.1 shows the number of recipients included in matching runs from 1 April 2016 to 31 March 2022. The number of recipients included has increased to 277 in January 2020, but decreased in the period since with 213 in January 2022. Overall, there were 1,697 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.

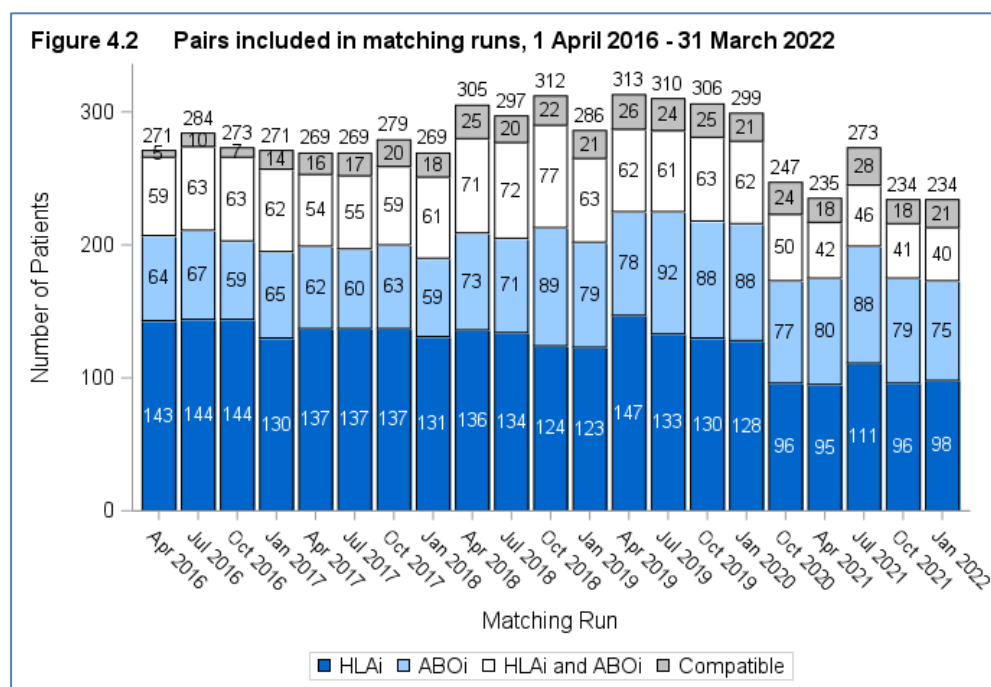
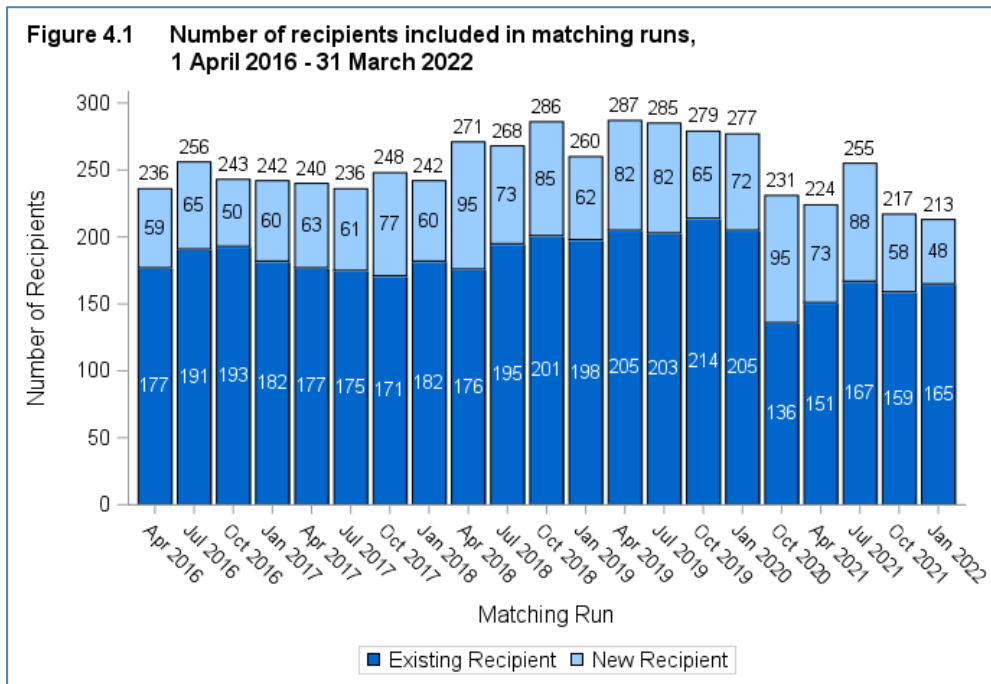


Figure 4.3 shows the number of pairs included in matching runs from 1 April 2016 to 31 March 2022 by centre. This is broken down further by the nature of the incompatibility between the pair. It can be seen that Oxford has had the highest number of pairs registered over this time period. Most pairs registered over this period were HLA incompatible (39%). This information is also shown in **Table 4.1**.

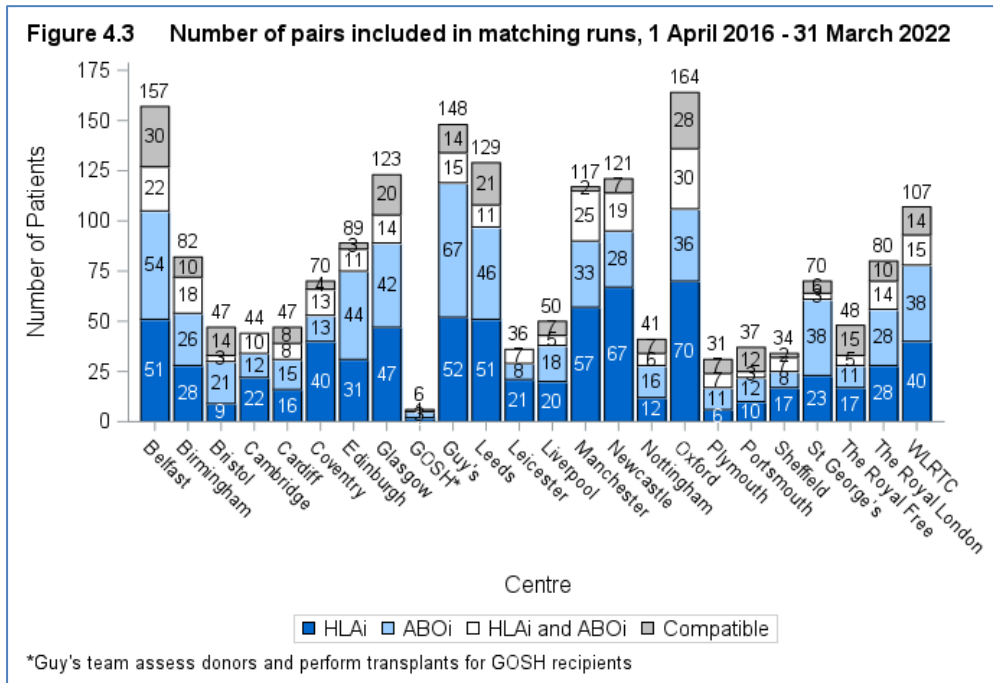


Table 4.1 Pairs included in matching runs by compatibility and Centre, April 2016 - March 2022					
Centre	Number of pairs	HLAi	ABOi	HLAi and ABOi	Compatible
Belfast	157	51	54	22	30
Birmingham	82	28	26	18	10
Bristol	47	9	21	3	14
Cambridge	44	22	12	10	0
Cardiff	47	16	15	8	8
Coventry	70	40	13	13	4
Edinburgh	89	31	44	11	3
Glasgow	123	47	42	14	20
GOSH*	6	2	3	0	1
Guy's	148	52	67	15	14
Leeds	129	51	46	11	21
Leicester	36	21	8	7	0
Liverpool	50	20	18	5	7
Manchester	117	57	33	25	2
Newcastle	121	67	28	19	7
Nottingham	41	12	16	6	7
Oxford	164	70	36	30	28
Plymouth	31	6	11	7	7
Portsmouth	37	10	12	3	12
Sheffield	34	17	8	7	2
St George's	70	23	38	3	6
The Royal Free	48	17	11	5	15
The Royal London	80	28	28	14	10
WLRTC	107	40	38	15	14
UK	1878	737	628	271	242

*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 2016 - 31 March 2022					
Year	Registered with different blood groups		Registered with unacceptable antigens		Total number of recipients registered
	N	%	N	%	
16/17	5	2.1	50	20.7	242
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	-	-	5	5.5	91
21/22	5	1.9	2	0.8	266

4.1.2 Outcomes: Matching Runs, 1 April 2018 – 31 March 2022

Figure 4.4 shows the outcomes of recipients included in matching runs from 1 April 2018 to 31 March 2022, split by centre. Overall, 46% of recipients registered have had a transplant through the paired donation scheme.

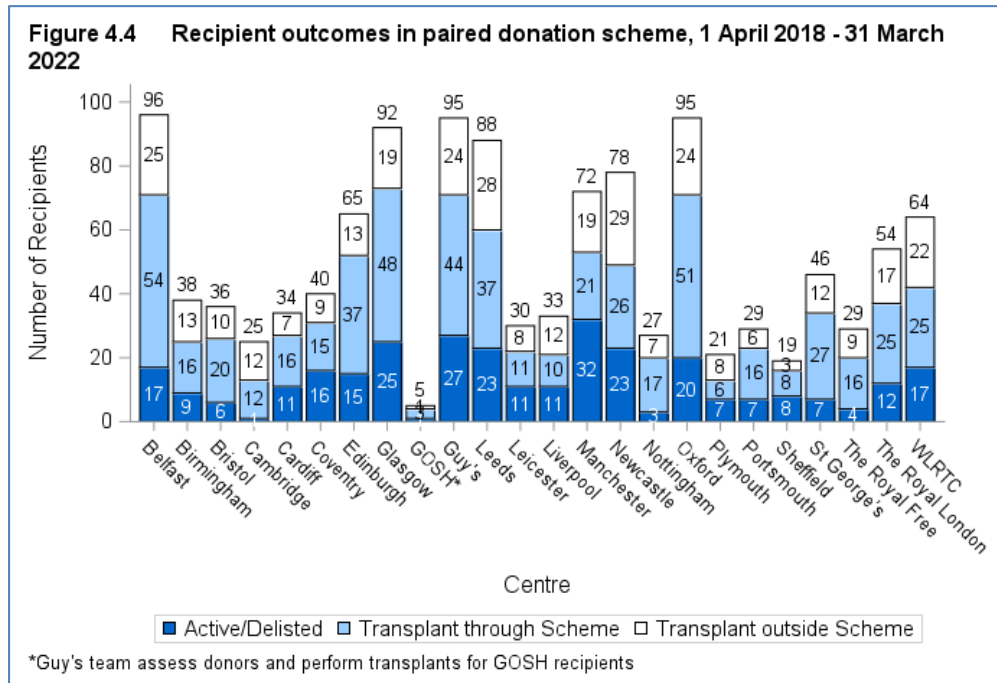
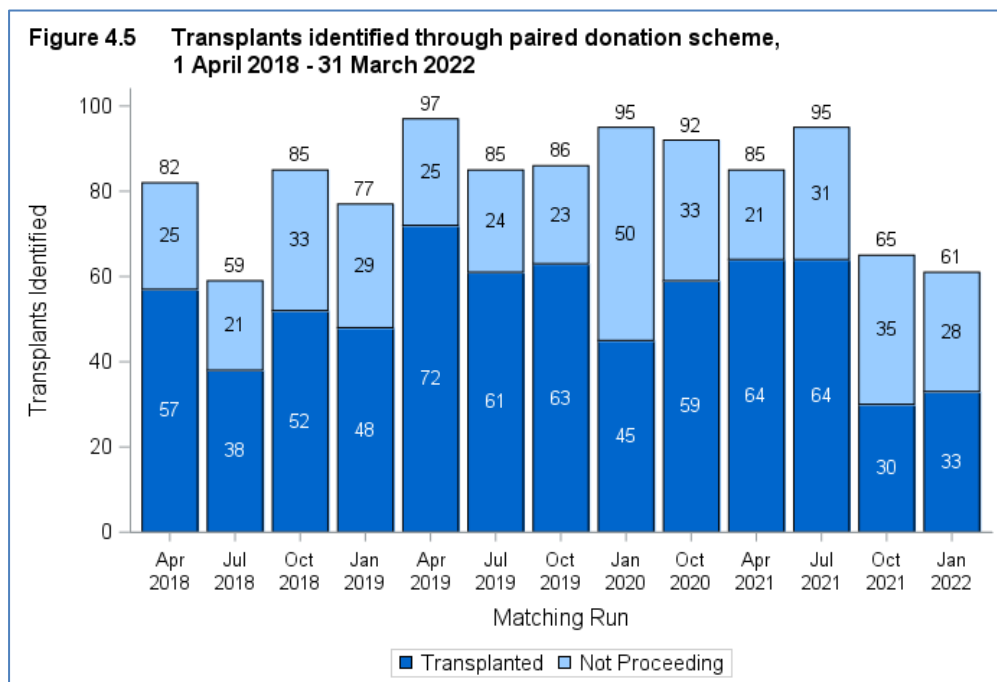


Figure 4.5 shows the transplants identified in each matching run from 1 April 2018 to 31 March 2022. The number of those that proceeded to transplant is also shown. Overall, 66% of transplants identified through the paired donation scheme have proceeded to transplant over this period.



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 2018 - 31 March 2022			
Calculated Reaction Frequency	Recipients Registered	Recipients Transplanted	
		N	(%)
0-9%	456	239	(52)
10-84%	336	195	(58)
85-94%	111	54	(49)
95-99%	193	53	(27)
100%	114	4	(4)

Table 4.4 Transplants as a proportion of registered pairs by blood group, 1 April 2018 - 31 March 2022										
Donor Blood Group	Recipient Blood Group (Recipients Transplanted/Pairs Registered (%))									
	O			A			B			AB
O	145/ 306	(47%)	63/ 116	(54%)	28/ 53	(53%)	5/ 11	(45%)		
A	97/ 371	(26%)	59/ 144	(41%)	41/ 68	(60%)	6/ 16	(38%)		
B	40/ 97	(41%)	33/ 48	(69%)	10/ 30	(33%)	2/ 3	(67%)		
AB	4/ 18	(22%)	7/ 21	(33%)	5/ 17	(29%)	0/ 4	(0%)		

Figure 4.6 shows the number of recipients transplanted from matching runs between 1 April 2018 and 31 March 2022. This is split by centre and exchange type.

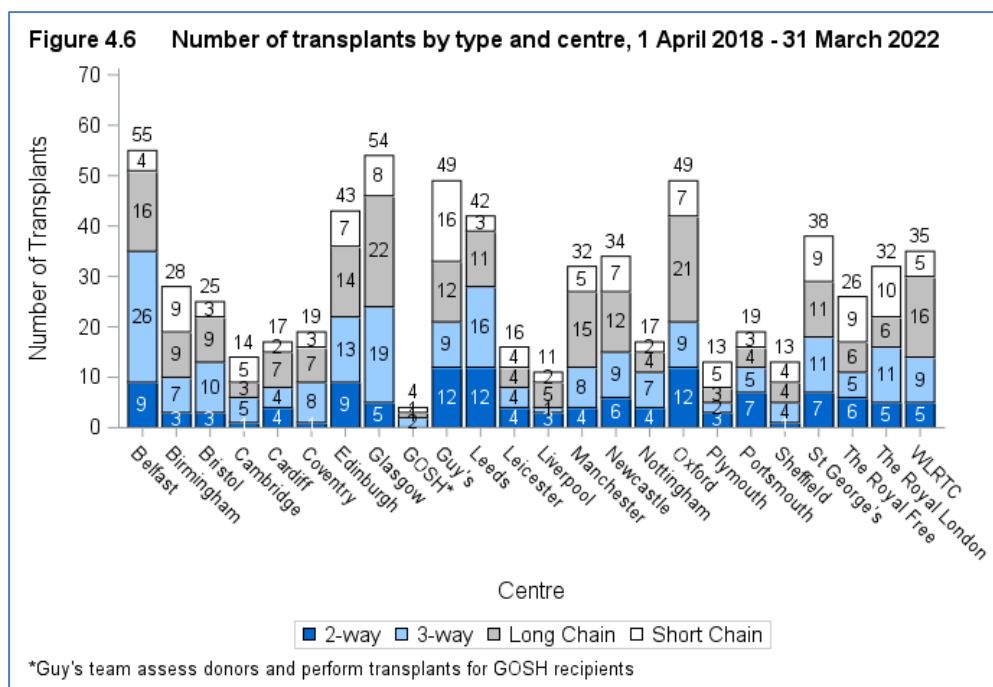
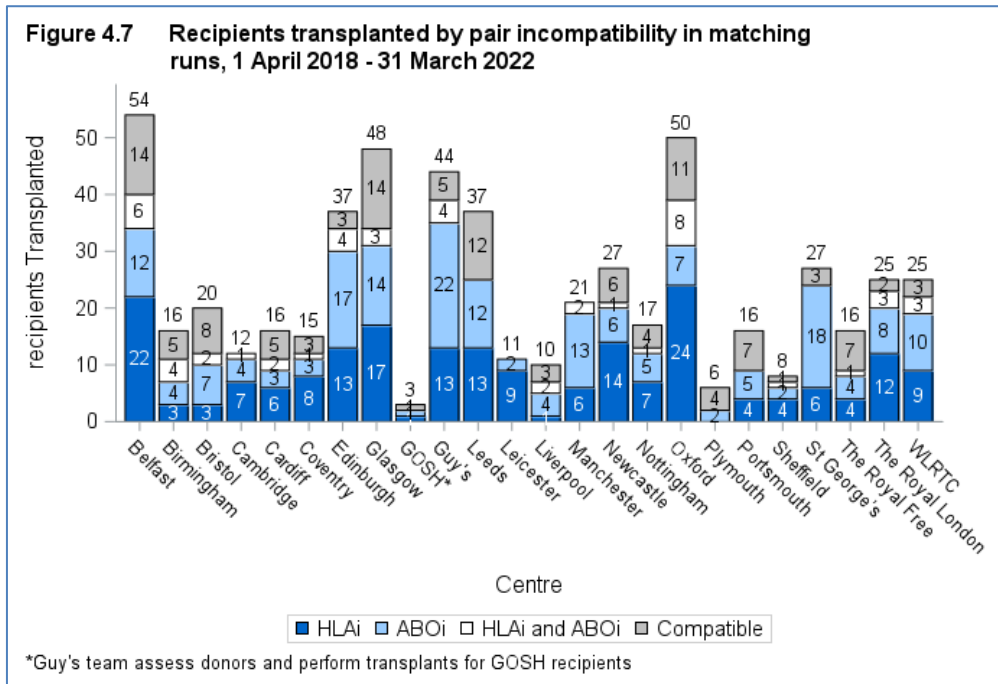


Figure 4.7 shows the recipients transplanted from matching runs between 1 April 2018 and 31 March 2022. This is split by centre and the incompatibility of the recipient with their registered donor. **Table 4.5** shows the percentage of pairs transplanted through paired donation given that they have been included in 1 or more, 2 or more or 5 or more matching runs. **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 2018 - March 2022**

Centre	Number of Transplants	2-way	3-way	Short Chain	Long Chain
Belfast	55	9	26	16	4
Birmingham	28	3	7	9	9
Bristol	25	3	10	9	3
Cambridge	14	1	5	3	5
Cardiff	17	4	4	7	2
Coventry	19	1	8	7	3
Edinburgh	43	9	13	14	7
Glasgow	54	5	19	22	8
GOSH*	4	0	2	1	1
Guy's	49	12	9	12	16
Leeds	42	12	16	11	3
Leicester	16	4	4	4	4
Liverpool	11	3	1	5	2
Manchester	32	4	8	15	5
Newcastle	34	6	9	12	7
Nottingham	17	4	7	4	2
Oxford	49	12	9	21	7
Plymouth	13	3	2	3	5
Portsmouth	19	7	5	4	3
Sheffield	13	1	4	4	4
St George's	38	7	11	11	9
The Royal Free	26	6	5	6	9
The Royal London	32	5	11	6	10
WLRTC	35	5	9	16	5
UK	685	126	204	222	133

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

Table 4.6 Transplants by compatibility and Centre 1 April 2018 - 31 March 2022						
Centre	Number of Transplants	HLAi	ABOi	HLA and ABOi	Compatible	
Belfast	55	0	3	0	52	
Birmingham	28	1	0	0	27	
Bristol	25	1	0	0	24	
Cambridge	14	0	0	0	14	
Cardiff	17	0	0	0	17	
Coventry	19	3	0	1	15	
Edinburgh	43	2	0	0	41	
Glasgow	54	0	0	0	54	
GOSH*	4	0	0	0	4	
Guy's	49	0	0	0	49	
Leeds	42	1	0	0	41	
Leicester	16	0	0	0	16	
Liverpool	11	0	0	0	11	
Manchester	32	1	0	0	31	
Newcastle	34	1	0	0	33	
Nottingham	17	0	0	0	17	
Oxford	49	1	0	0	48	
Plymouth	13	0	0	0	13	
Portsmouth	19	0	0	0	19	
Sheffield	13	0	0	0	13	
St George's	38	0	0	0	38	
The Royal Free	26	0	0	0	26	
The Royal London	32	0	0	0	32	
WLRTC	35	0	0	0	35	
UK	685	11	3	1	670	

*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 2012 - 31 March 2018			
Pair Incompatibility	Number of recipients registered	Waiting time (days)	
		Median	95% Confidence interval
HLAi	540	456	342 - 570
ABOi	428	461	410 - 512
All Pairs	1200	502	439 - 565

4.2 Non-directed Altruistic Donation

4.2.1 Transplants, 1 April 2013 – 31 March 2022

Figure 4.8 shows the number of non-directed altruistic donor kidney transplants from 1 April 2013 to 31 March 2022. This is split by whether the donation was to the deceased donor waiting list or the paired donation scheme. The number of transplants has decreased from 118 in 2013/14 to 68 in 2021/22. In the most recent financial year the number of transplants increased to 68 from 34 in the previous year.

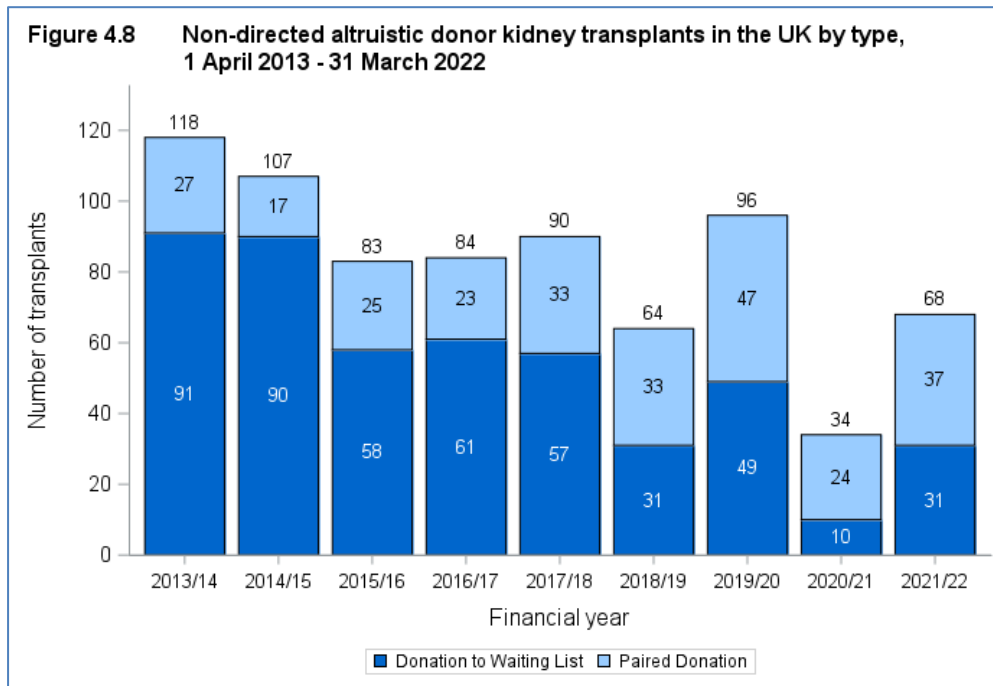
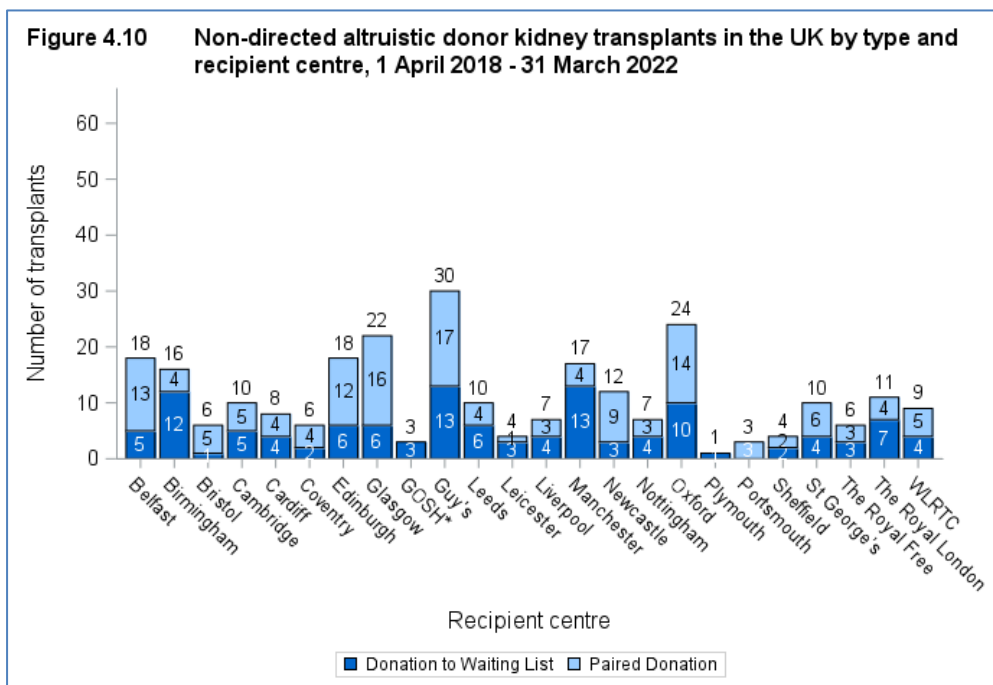
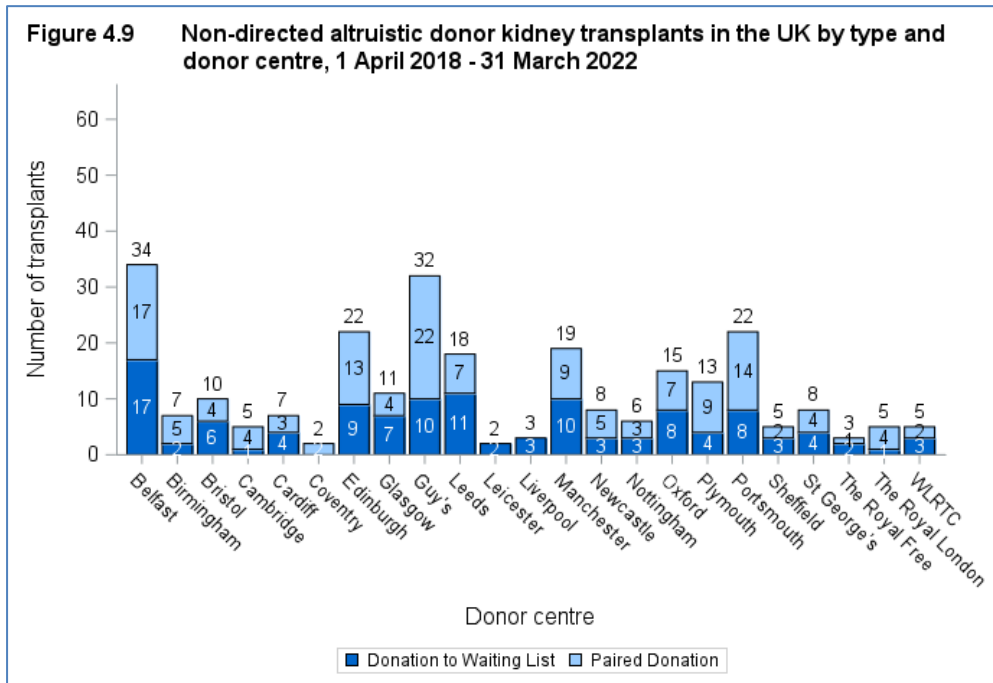


Figure 4.9 shows the number of non-directed altruistic donor kidney transplants from 1 April 2018 to 31 March 2022 by donor centre. Belfast had the highest number of non-directed altruistic donors. **Figure 4.10** shows the number of non-directed altruistic donor kidney transplants from 1 April 2018 to 31 March 2022 by recipient centre. Guy's had the highest number of recipients of non-directed altruistic donors.



4.2.2 Time to donation, 1 April 2018 – 31 March 2022

Figure 4.11 shows the median time in months from notification to donation from 1 April 2018 to 31 March 2022, by centre. This ranged from 1 to 9 months. This data is shown further in **Table 4.7**. 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.

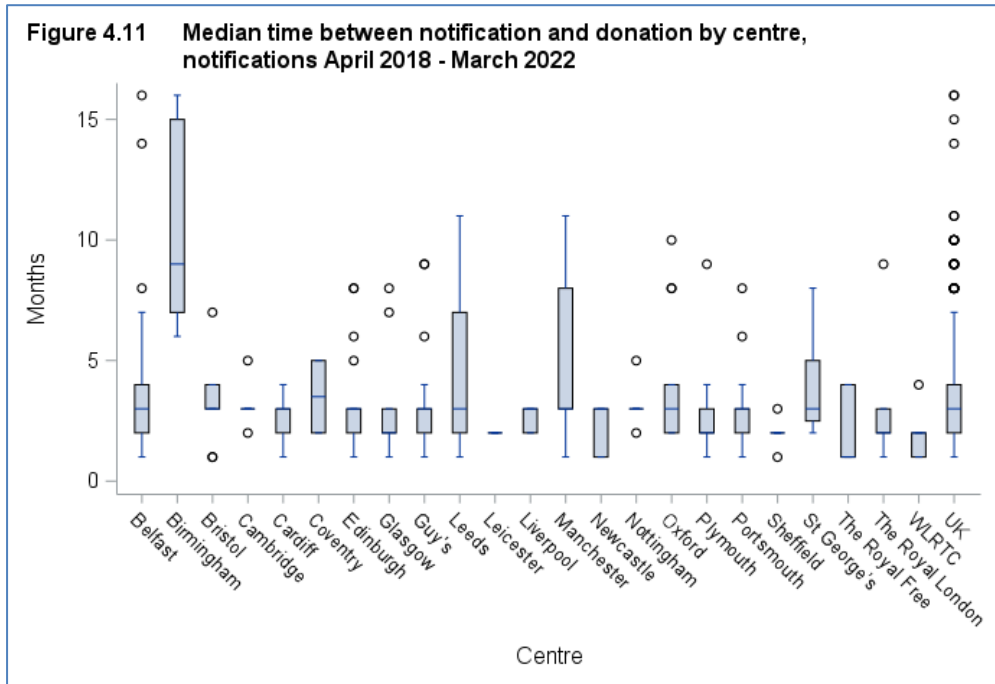


Table 4.7 Median time between notification and donation by Centre, Donations April 2018 - March 2022

Centre	Number of donors	Median	Lower quartile	Upper quartile
Belfast	34	3	2	4
Birmingham	7	9	7	15
Bristol	10	3	3	4
Cambridge	5	3	3	3
Cardiff	7	3	2	3
Coventry	2	4	2	5
Edinburgh	22	3	2	3
Glasgow	11	2	2	3
Guy's	32	3	2	3
Leeds	18	3	2	7
Leicester	2	2	2	2
Liverpool	3	3	2	3
Manchester	19	3	3	8
Newcastle	7	3	1	3
Nottingham	6	3	3	3
Oxford	15	3	2	4
Plymouth	13	2	2	3
Portsmouth	21	3	2	3
Sheffield	5	2	2	2
St George's	8	3	3	5
The Royal Free	3	1	1	4
The Royal London	5	2	2	3
WLRTC	5	2	1	2
UK	260	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.

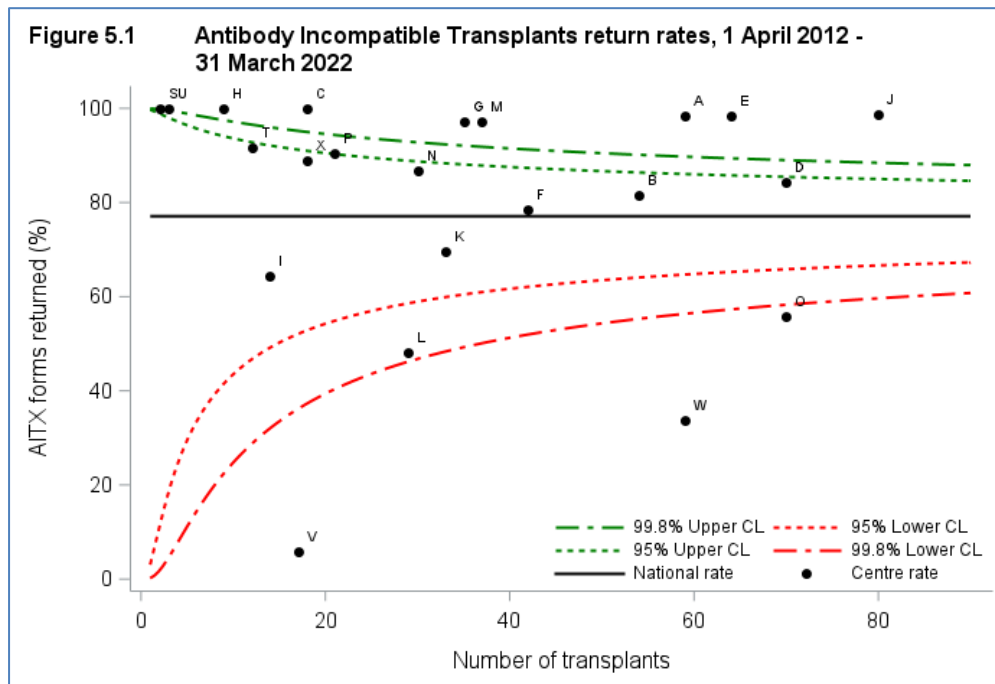


Table 5.1**Antibody incompatible transplant form return rates,
1 April 2011 – 31 March 2021**

Transplant Centre	Code	Number of transplants	AITX forms returned	
			N	%
Belfast	A	59	58	98
Birmingham	B	54	44	81
Bristol	C	18	18	100
Cambridge	D	70	59	84
Cardiff	E	64	63	98
Coventry	F	42	33	79
Edinburgh	G	35	34	97
Glasgow	H	9	9	100
GOSH*	I	14	9	64
Guy's	J	80	79	99
Leeds	K	33	23	70
Leicester	L	29	14	48
Liverpool	M	37	36	97
Manchester	N	30	26	87
Newcastle	O	70	39	56
Nottingham	P	21	19	90
Oxford	Q	23	-	-
Plymouth	R	2	2	100
Portsmouth	S	12	11	92
Sheffield	T	3	3	100
St George's	U	17	1	6
The Royal Free	V	59	20	34
The Royal London	W	18	16	89
WLRTC	X	22	20	91
UK		799	616	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. Activity has reduced from 146 antibody incompatible transplants in 2012/13 to 12 in the latest financial year.

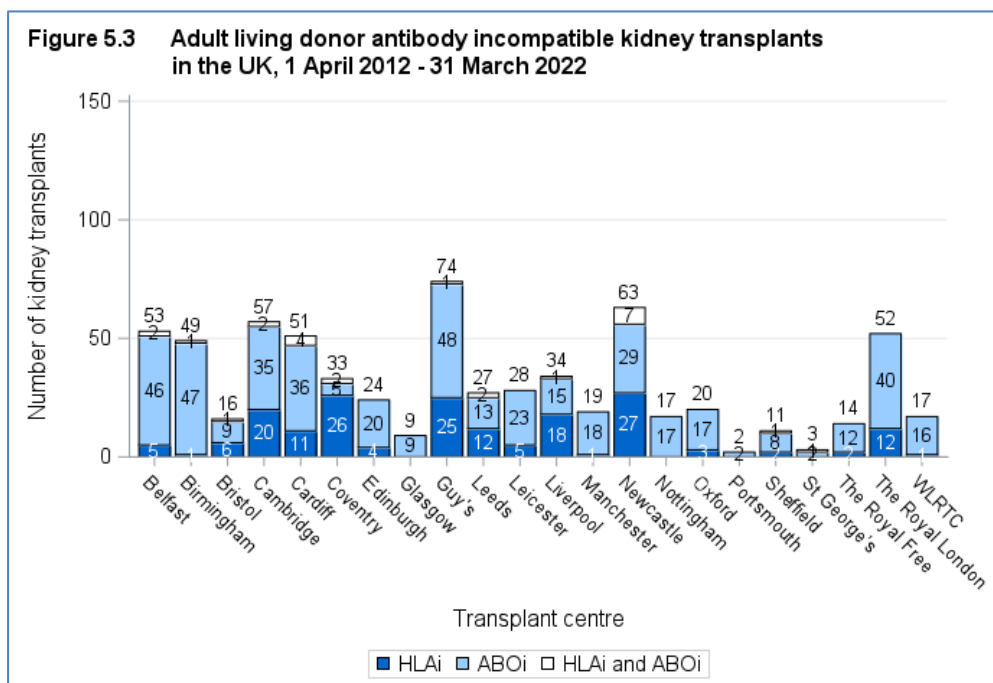
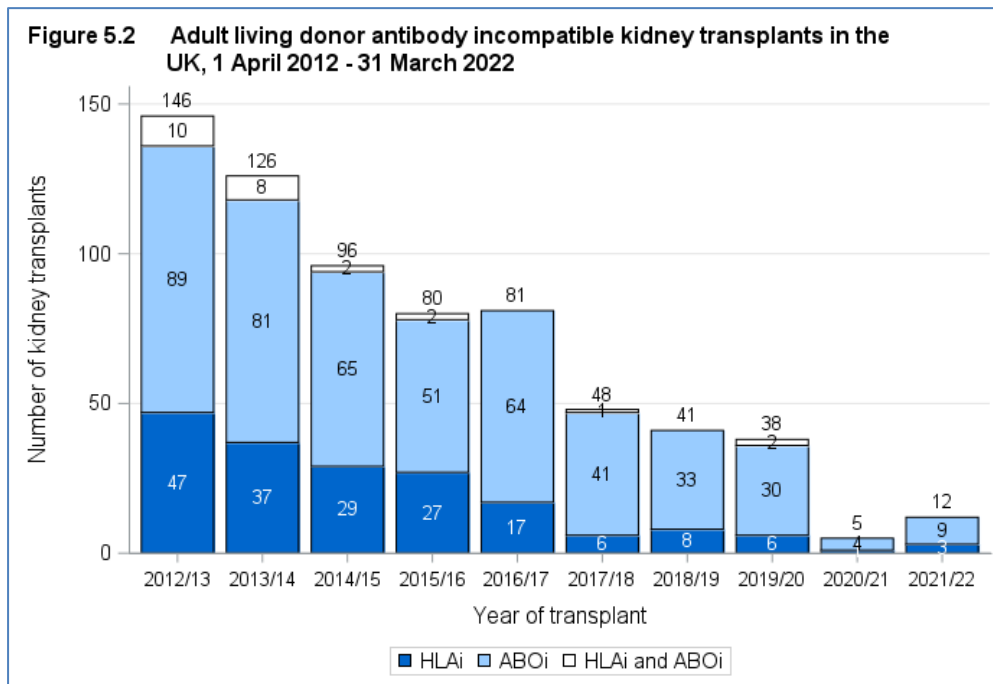


Table 5.2 shows the donor and recipient blood group for all ABOi transplants.

Table 5.2 Donor and recipient blood group for all adult ABOi transplants, 1 April 2012 - 31 March 2022						
Recipient blood group	Donor blood group					
	A		B		AB	
	N	(%)	N	(%)	N	(%)
A	1	(0.2)	38	(7.7)	32	(6.5)
B	60	(12.2)	-		21	(4.3)
O	238	(48.4)	90	(18.3)	9	(1.8)

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 2012 - 31 March 2022								
Donor-Recipient ABO	Recipient CRF at transplant							
	0-9		10-84		85-94		95-100	
	N	(%)	N	(%)	N	(%)	N	(%)
A-A	14	(2.1)	13	(1.9)	7	(1.0)	15	(2.2)
A-AB	1	(<1)	1	(<1)	1	(<1)	-	
A-B	49	(7.3)	6	(0.9)	2	(<1)	3	(<1)
A-O	158	(23.5)	62	(9.2)	7	(1.0)	12	(1.8)
AB-A	21	(3.1)	8	(1.2)	1	(<1)	2	(<1)
AB-AB	-		-		-		2	(<1)
AB-B	18	(2.7)	3	(<1)	-		-	
AB-O	6	(<1)	1	(<1)	2	(<1)	-	
B-A	26	(3.9)	8	(1.2)	1	(<1)	3	(<1)
B-AB	-		-		-		1	(<1)
B-B	2	(<1)	3	(>1)	3	(<1)	5	(<1)
B-O	60	(8.9)	23	(3.4)	5	(<1)	2	(<1)
O-A	12	(1.8)	4	(<1)	3	(<1)	7	(1.0)
O-AB	-		1	(<1)	-		-	
O-B	1	(<1)	2	(<1)	2	(<1)	4	(<1)
O-O	18	(2.7)	21	(3.1)	12	(1.8)	29	(4.3)

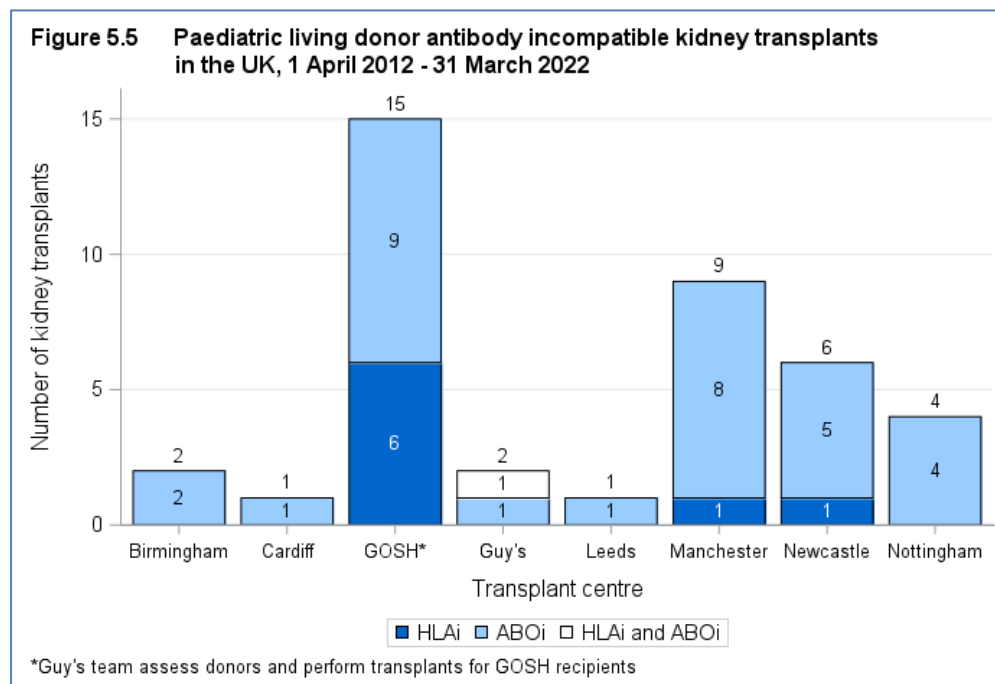
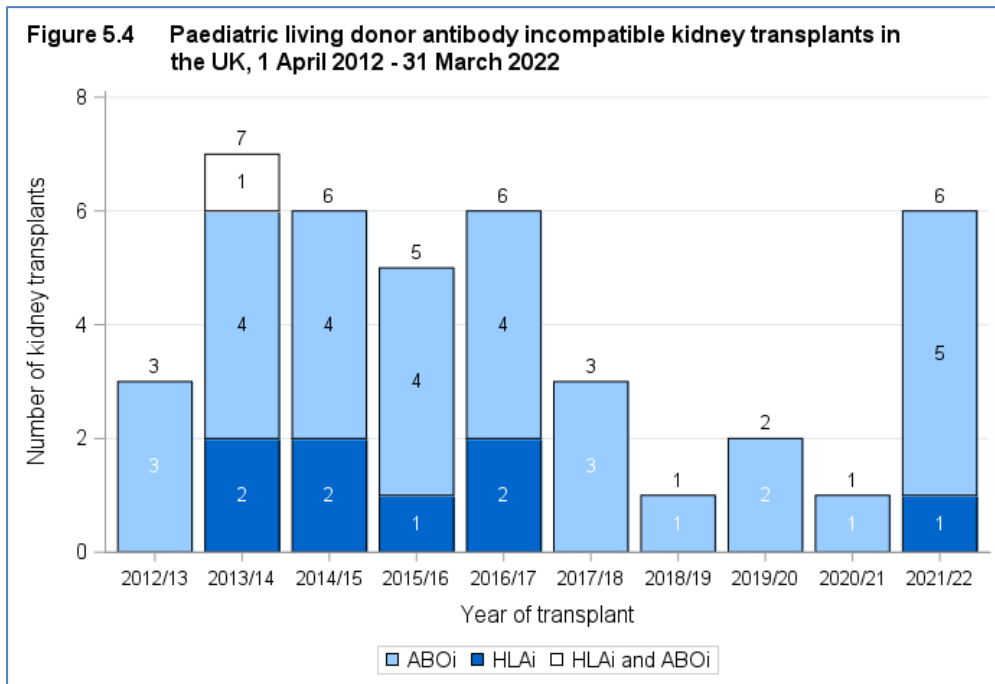
Table 5.4 shows the pre and at transplant level group for all HLAI transplants. Data are only presented for cases where an antibody incompatible form has been completed and returned. **Table 5.5** shows the calculated reaction frequency by incompatibility type.

Table 5.4 Pre and at transplant antibody level group for all adult HLAI transplants, 1 April 2012 - 31 March 2022												
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 neg, Flow pos, DSA SPA pos		Unknown			
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)		
CDC NT, Flow pos, DSA SPA pos	-	-	-	-	12	(5.5)	-	-	8	(3.7)	1	(<1)
CDC neg, Flow neg, DSA SPA pos	-	-	-	-	54	(24.9)	13	(6.0)	-	-	1	(<1)
CDC neg, Flow pos, DSA SPA pos	-	-	34	(15.7)	22	(10.1)	24	(11.1)	-	-	14	(6.5)
CDC pos, Flow pos, DSA SPA pos	2	(<1)	7	(3.2)	5	(2.3)	3	(1.4)	-	-	-	-
Unknown	-	-	2	(<1)	-	-	2	(<1)	-	-	13	(6.0)

Table 5.5 At transplant calculated reaction frequency by incompatibility type, 1 April 2012 - 31 March 2022						
Calculated Reaction Frequency	ABOi		HLAi		HLAi and ABOi	
	N	%	N	%	N	%
0-9	338	(72)	45	(25)	3	(12)
10-84	105	(23)	46	(25)	5	(20)
85-94	14	(3)	28	(16)	4	(16)
95-100	10	(2)	62	(34)	13	(52)

PAEDIATRIC

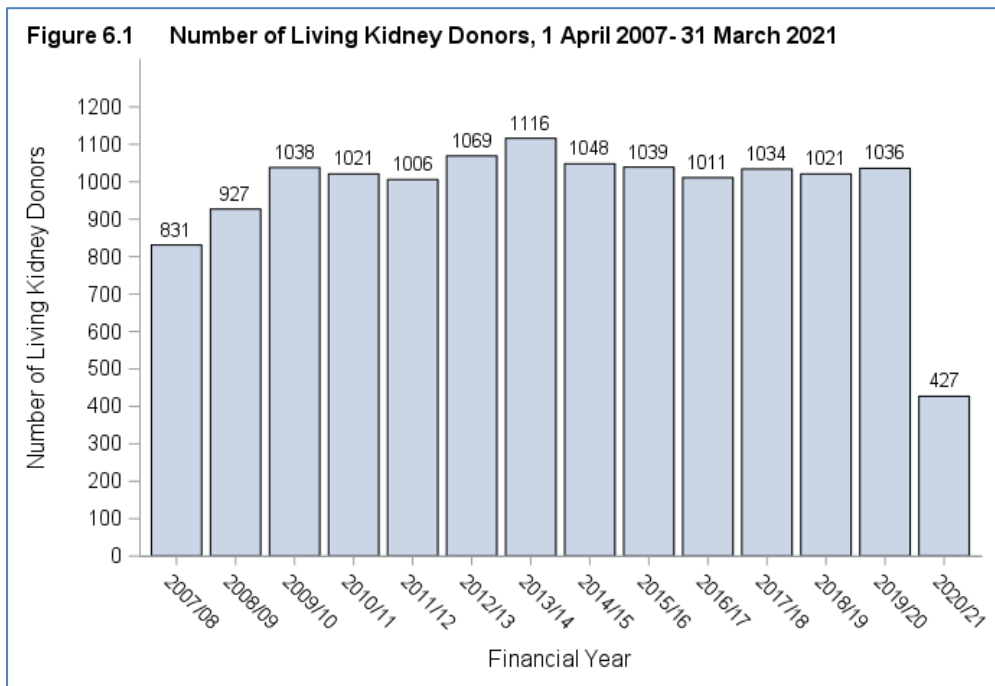
Figures 5.4 and 5.5 show the number of living donor antibody incompatible kidney transplants by financial year and centre respectively.



Living Donor Follow-Up

This section contains information on all living donors who have donated to both adult and paediatric recipients from 2007/08 to 2020/21. 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 2007/08 to 2020/21. The number of living donors has decreased from 831 in 2007/08 to 427 in 2020/21.



Of the living donors over this period, 103 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 2007 – 31 March 2021

Cause of Death	N	%
Cancer	40	38
Bowel	3	3
Breast	2	2
Colonic	2	2
Liver	2	2
Lung	3	3
Oesophagus	2	2
Pancreatic	6	6
Prostate	1	1
Testicular	1	1
Other	18	17
Brain Tumor	3	3
Intracranial hemorrhage	2	2
Seizure	2	2
Parkinson's disease	1	1
RTA	3	3
Suicide	4	4
Bronchopneumonia	3	3
Other	13	13
Unknown	32	31
TOTAL	103	100

6.1 Prescription of Antihypertensive drugs, 1 April 2007– 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. The proportion of living donors across the UK being prescribed anti-hypertensive drugs is 4% at one year, 6% at five years and 12% at ten years post donation.

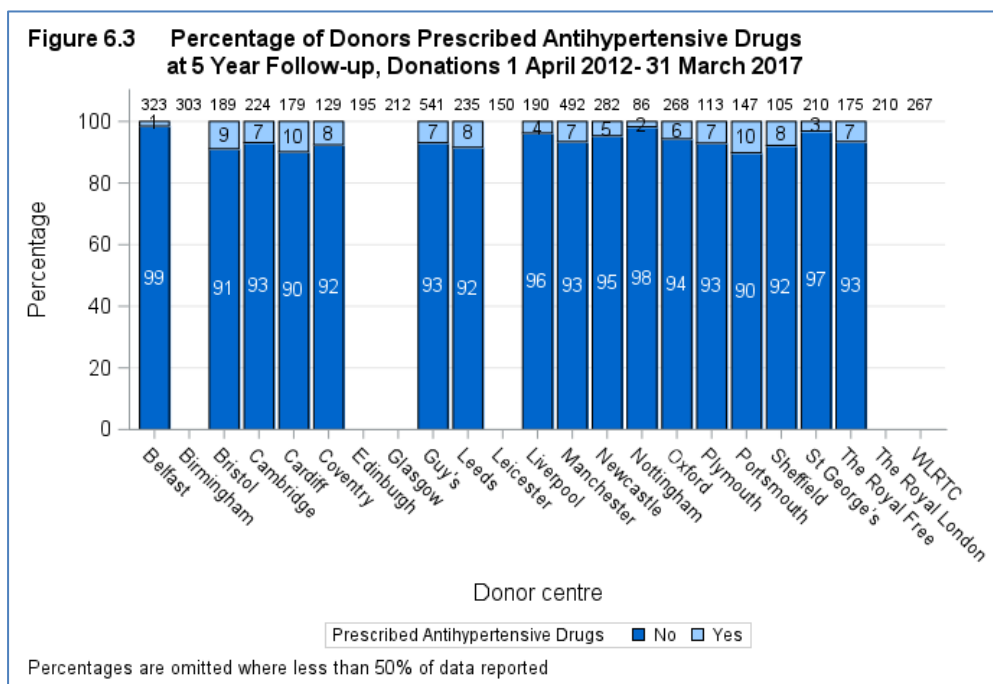
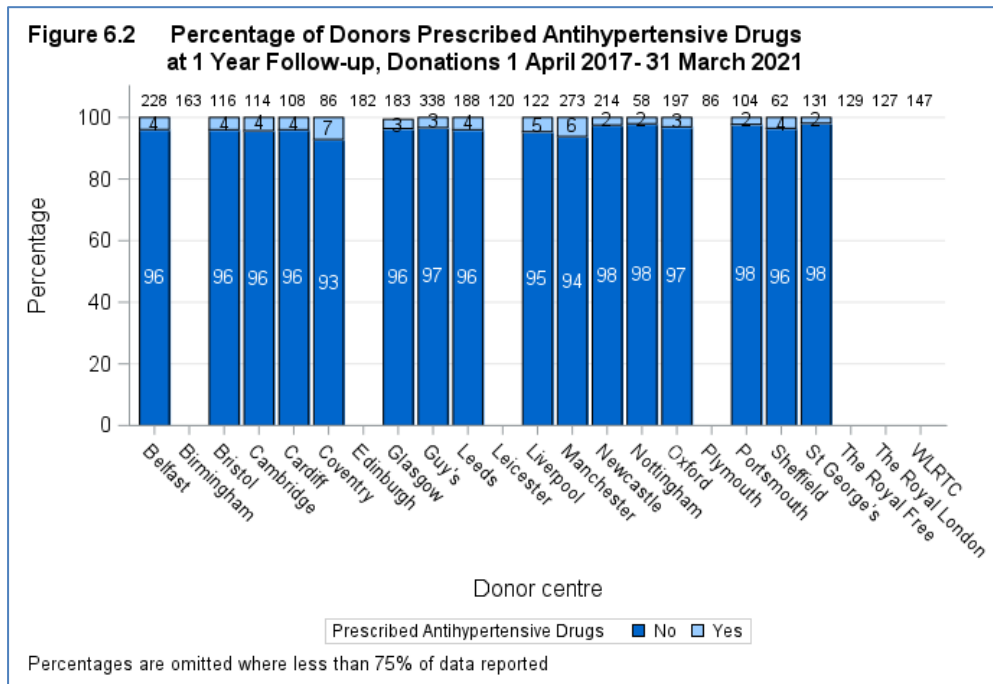


Figure 6.4 Percentage of Donors Prescribed Antihypertensive Drugs at 10 Year Follow-up, Donations 1 April 2007- 31 March 2012

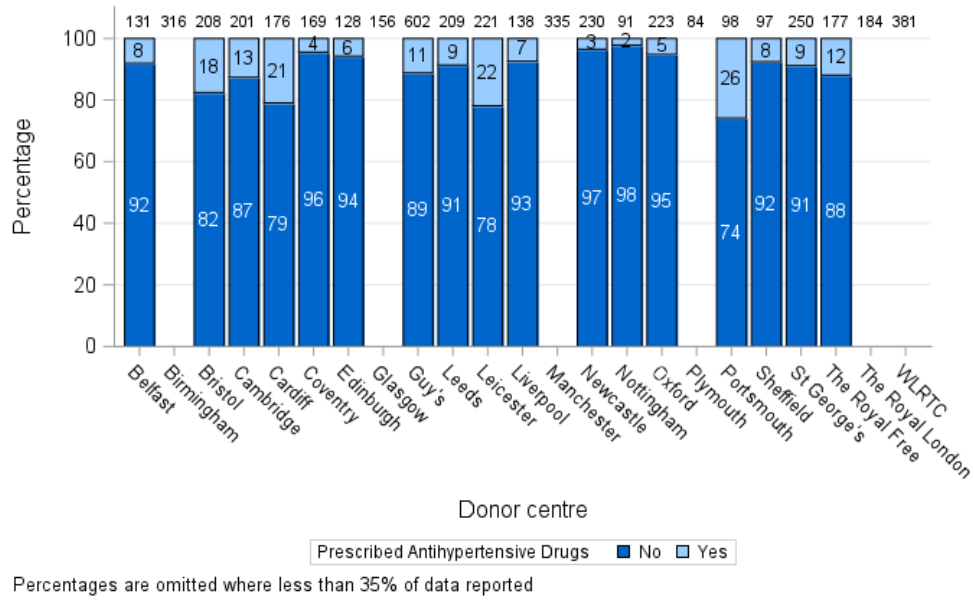


Table 6.2 Percentage of Donors Prescribed Antihypertensive Drugs by Centre, Donations April 2007 - March 2021

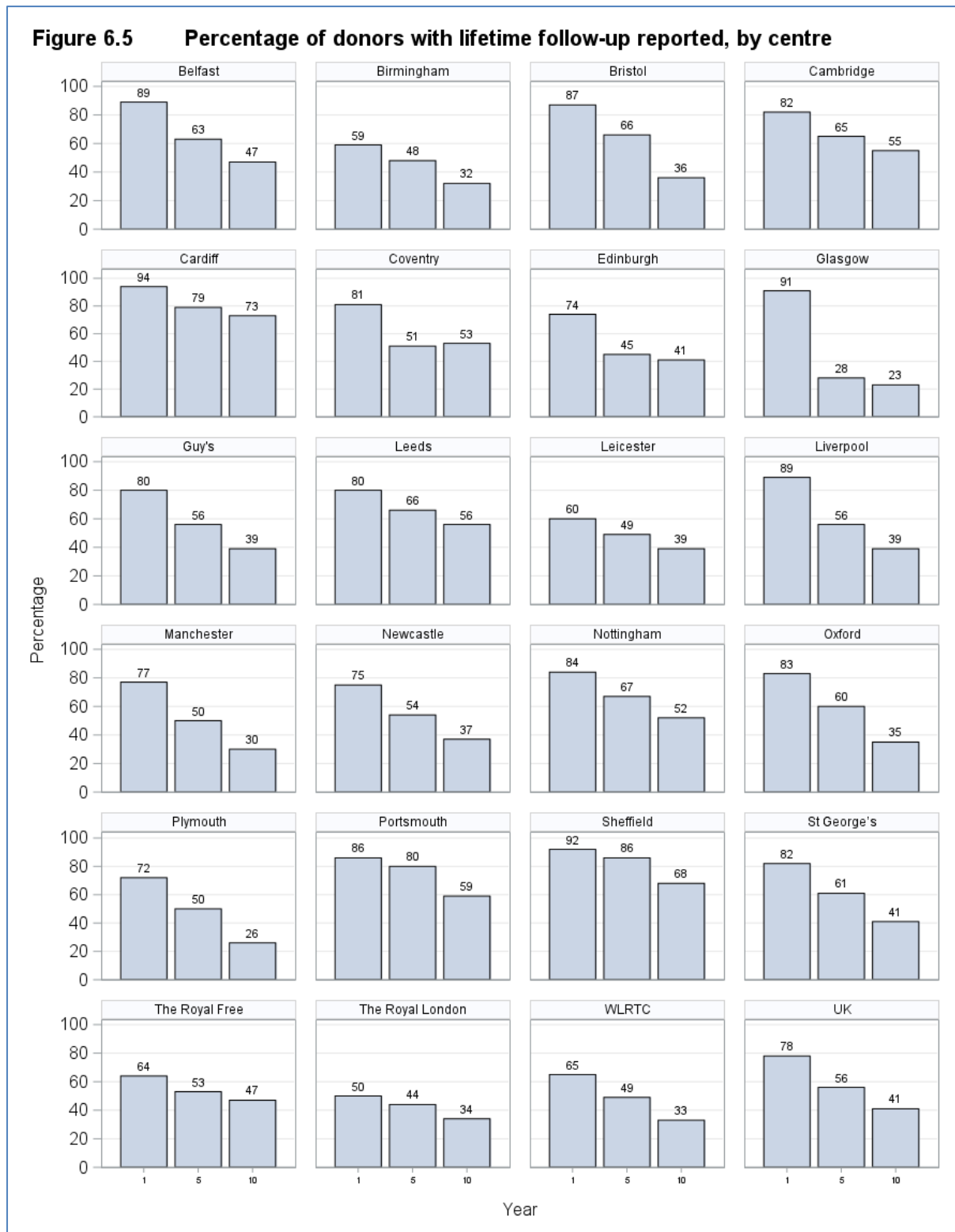
Centre	1 Year			5 Year			10 Year		
	N	% ¹	% ²	N	% ¹	% ²	N	% ¹	% ²
Belfast	228	89	4	323	63	1	131	47	8
Birmingham	163	59	-	303	48	-	316	32	-
Bristol	116	87	4	189	66	9	208	36	18
Cambridge	114	82	4	224	65	7	201	55	13
Cardiff	108	94	4	179	79	10	176	73	21
Coventry	86	81	7	129	51	8	169	53	4
Edinburgh	182	74	-	195	45	-	128	41	6
Glasgow	183	91	3	212	28	-	156	23	-
Guy's	338	80	3	541	56	7	602	39	11
Leeds	188	80	4	235	66	8	209	56	9
Leicester	120	60	-	150	49	-	221	39	22
Liverpool	122	89	5	190	56	4	138	39	7
Manchester	273	77	6	492	50	7	335	30	-
Newcastle	214	75	2	282	54	5	230	37	3
Nottingham	58	84	2	86	67	2	91	52	2
Oxford	197	83	3	268	60	6	223	35	5
Plymouth	86	72	-	113	50	7	84	26	-
Portsmouth	104	86	2	147	80	10	98	59	26
Sheffield	62	92	4	105	86	8	97	68	8
St George's	131	82	2	210	61	3	250	41	9
The Royal Free	129	64	-	175	53	7	177	47	12
The Royal London	127	50	-	210	44	-	184	34	-
WLRTC	147	65	-	267	49	-	381	33	-
UK	3476	78	4	5225	56	6	4805	41	12

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 2007 - March 2021.



6.2 Serum creatinine, 1 April 2007 – 31 March 2021

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. Serum creatinine for living donors in the UK is 103 (IQ-range 89-119) at one year, 97 (84-113) at five years and 92 (80-106) at ten years post donation.

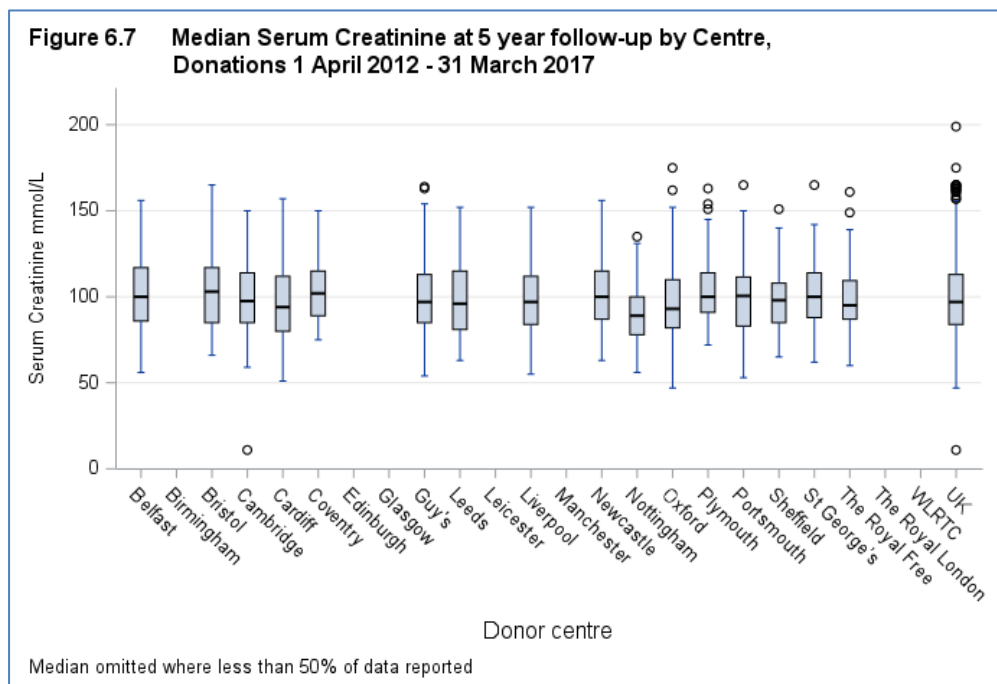
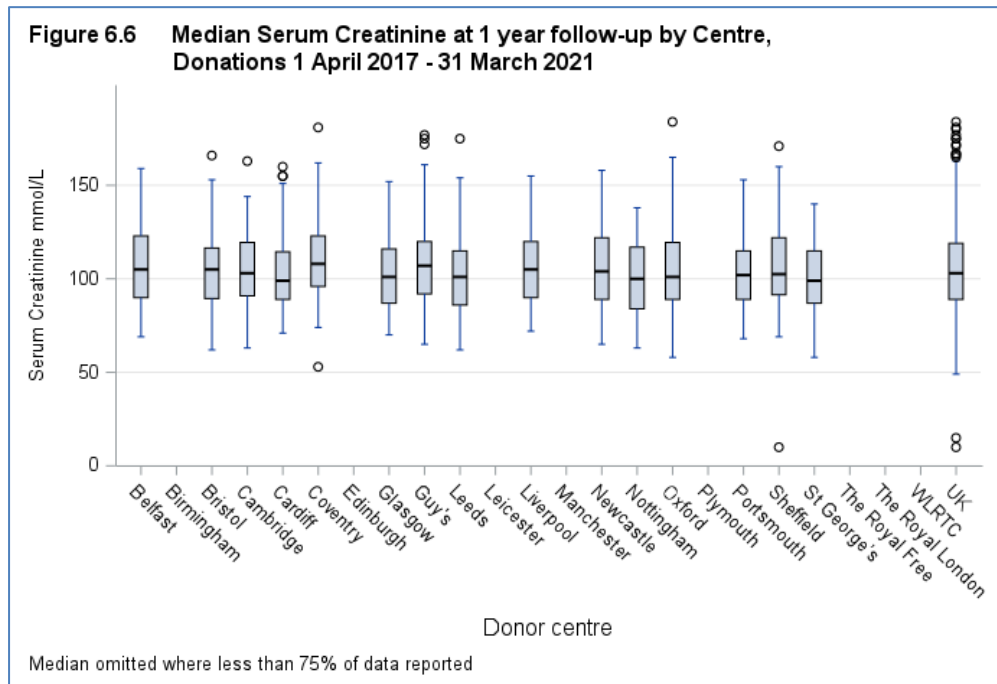


Figure 6.8 Median Serum Creatinine at 10 year follow-up by Centre, Donations 1 April 2007 - 31 March 2012

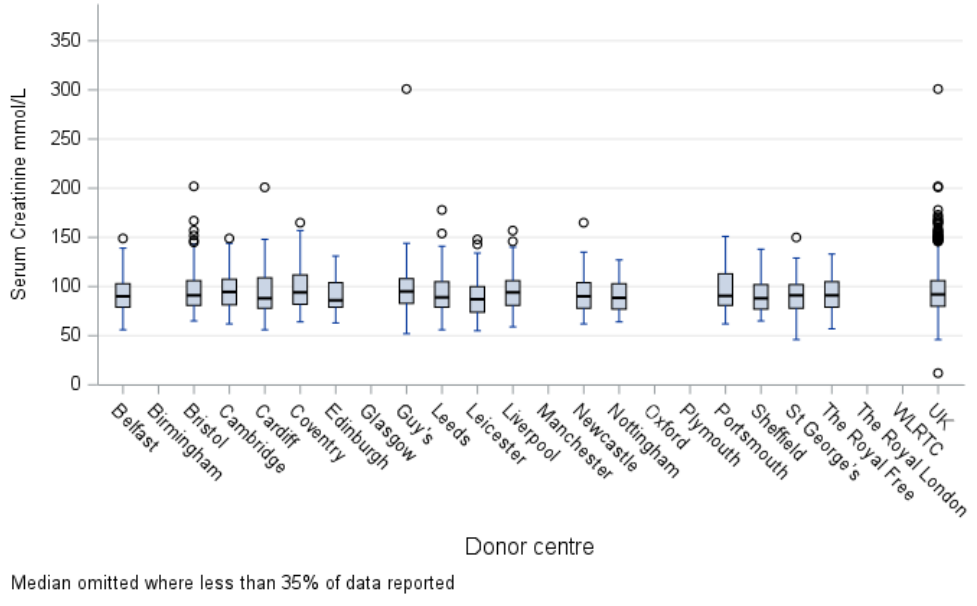


Table 6.3 Median serum creatinine at 1, 5 and 10 year follow up by centre, donations 1 April 2007 - 31 March 2021

Centre	1 Year			5 Year			10 Year		
	N	% ¹	Median (IQ range)	N	% ¹	Median (IQ range)	N	% ¹	Median (IQ range)
Belfast	228	89	105 (90-123)	323	63	100 (86-117)	131	47	90 (79-103)
Birmingham	163	59	- (---)	303	47	(-)	316	31	(-)
Bristol	116	86	105 (89.5-116.5)	189	64	103 (85-117)	208	36	91 (81-106)
Cambridge	114	81	103 (91-119.5)	224	64	97.5 (85-114)	201	54	94.5 (81.5-107.5)
Cardiff	108	93	99 (89-114.5)	179	79	94 (80-112)	176	73	88 (78-109)
Coventry	86	80	108 (96-123)	129	50	102 (89-115)	169	53	94 (82-112)
Edinburgh	182	71	- (---)	195	43	(-)	128	40	86 (79-104)
Glasgow	183	91	101 (87-116)	212	28	(-)	156	23	(-)
Guy's	338	80	107 (92-120)	541	56	97 (85-113)	602	38	95 (83-108)
Leeds	188	79	101 (86-115)	235	65	96 (81-115)	209	55	89 (79-105)
Leicester	120	59	- (---)	150	48	(-)	221	38	87 (74-100)
Liverpool	122	81	105 (90-120)	190	53	97 (84-112)	138	38	94 (81-106)
Manchester	273	71	- (---)	492	47	(-)	335	30	(-)
Newcastle	214	75	104 (89-122)	282	54	100 (87-115)	230	37	90 (78-104)
Nottingham	58	84	100 (84-117)	86	67	89 (78-100)	91	51	88.5 (77-103)
Oxford	197	83	101 (89-119.5)	268	58	93 (82-110)	223	34	(-)
Plymouth	86	72	- (---)	113	50	100 (91-114)	84	26	(-)
Portsmouth	104	82	102 (89-115)	147	79	100.5 (83-111.5)	98	57	90.5 (81-113)
Sheffield	62	90	102.5 (91.5-122)	105	85	98 (85-108)	97	68	88 (77-102)
St George's	131	80	99 (87-115)	210	60	100 (88-114)	250	40	91 (78-102)
The Royal Free	129	64	- (---)	175	53	95 (87-109.5)	177	47	91 (79-105)
The Royal London	127	50	- (---)	210	43	(-)	184	34	(-)
WLRTC	147	65	- (---)	267	49	(-)	381	33	(-)
UK	3476	77	103 (89-119)	5225	55	97 (84-113)	4805	41	92 (80-106)

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 2007 – 31 March 2021

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.

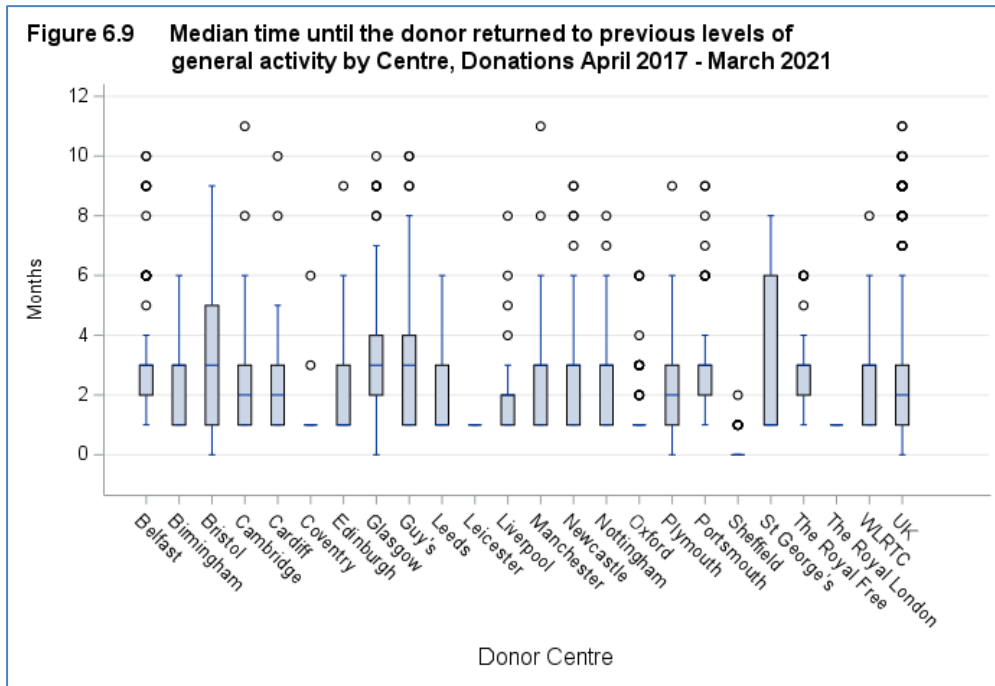
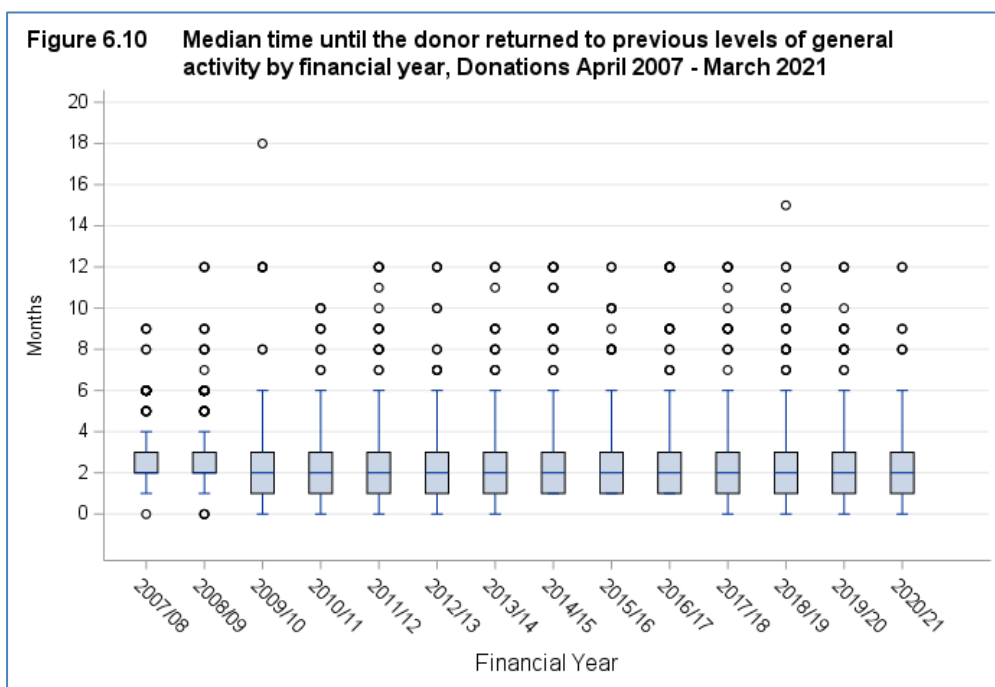


Figure 6.10 shows the median time (in months) to return to normal activity after donation in the UK, by financial year.



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.

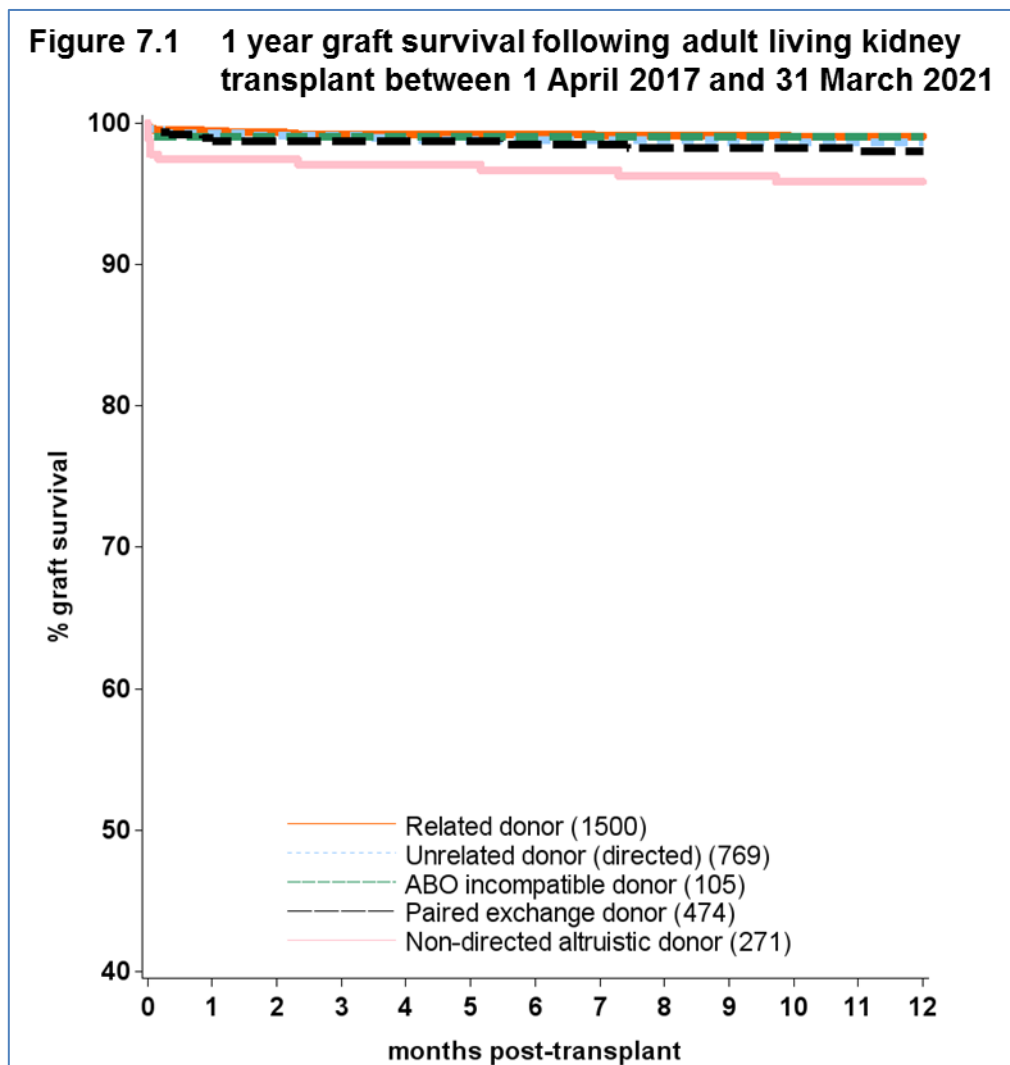


Table 7.1 1 year graft survival following living kidney transplant between 1 April 2017 and 31 March 2021(p=0.0041)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1500	99.0	(98-99)
ABO incompatible donor	105	99.0	(93-100)
Unrelated donor (directed)	769	98.7	(98-99)
Paired exchange donor	474	98.0	(96-99)
Non-directed altruistic donor	271	95.8	(93-98)
HLA incompatible donor*	24	-	-

* 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 2013 and 31 March 2017

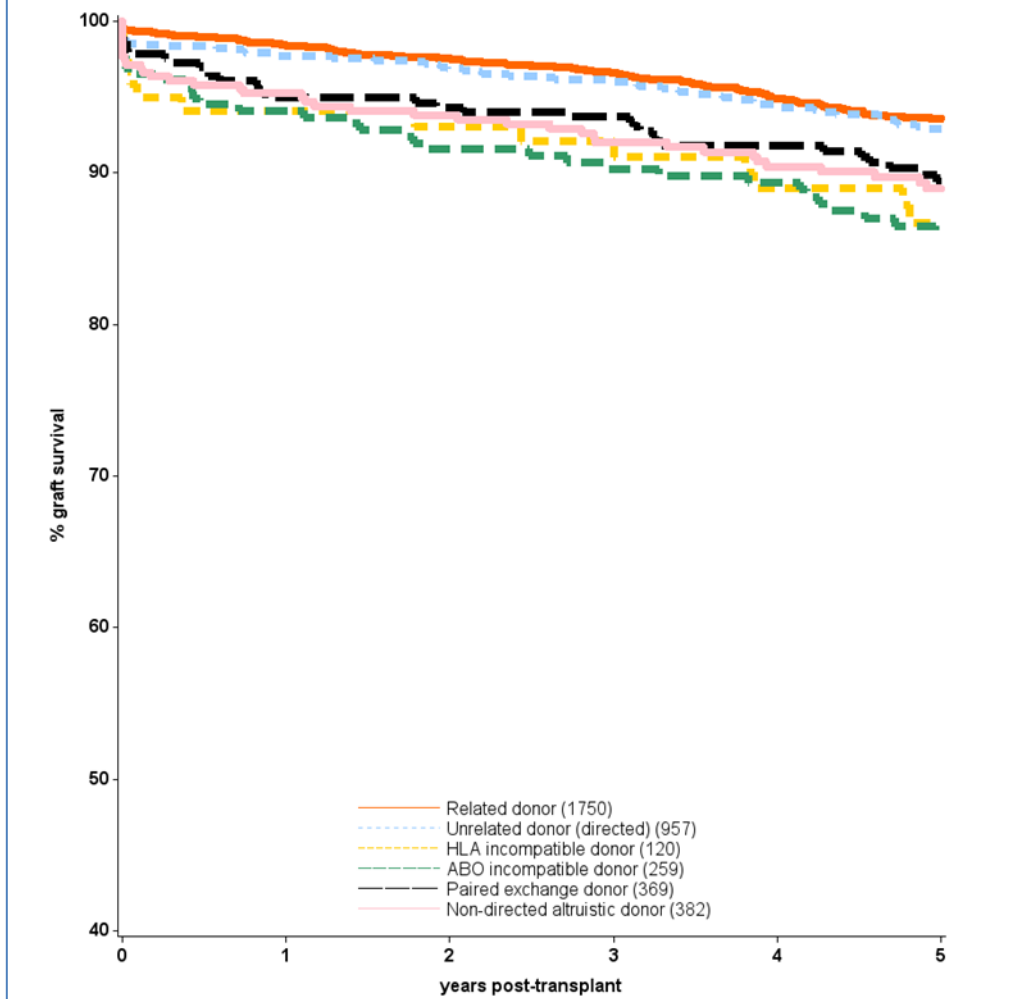


Table 7.2 5 year graft survival following living kidney transplant between 1 April 2013 and 31 March 2017(p<0.0001)

Living Donors	No. at risk on		
	day 0	% Graft survival	(95% confidence interval)
Related donor	1750	93.6	(92-95)
Unrelated donor (directed)	957	92.9	(91-94)
Paired exchange donor	369	89.4	(85-92)
Non-directed altruistic donor	382	89.0	(85-92)
HLA incompatible donor	120	86.7	(78-92)
ABO incompatible donor	259	85.9	(81-90)

Figure 7.3 1 year patient survival following adult living kidney transplant between 1 April 2017 and 31 March 2021

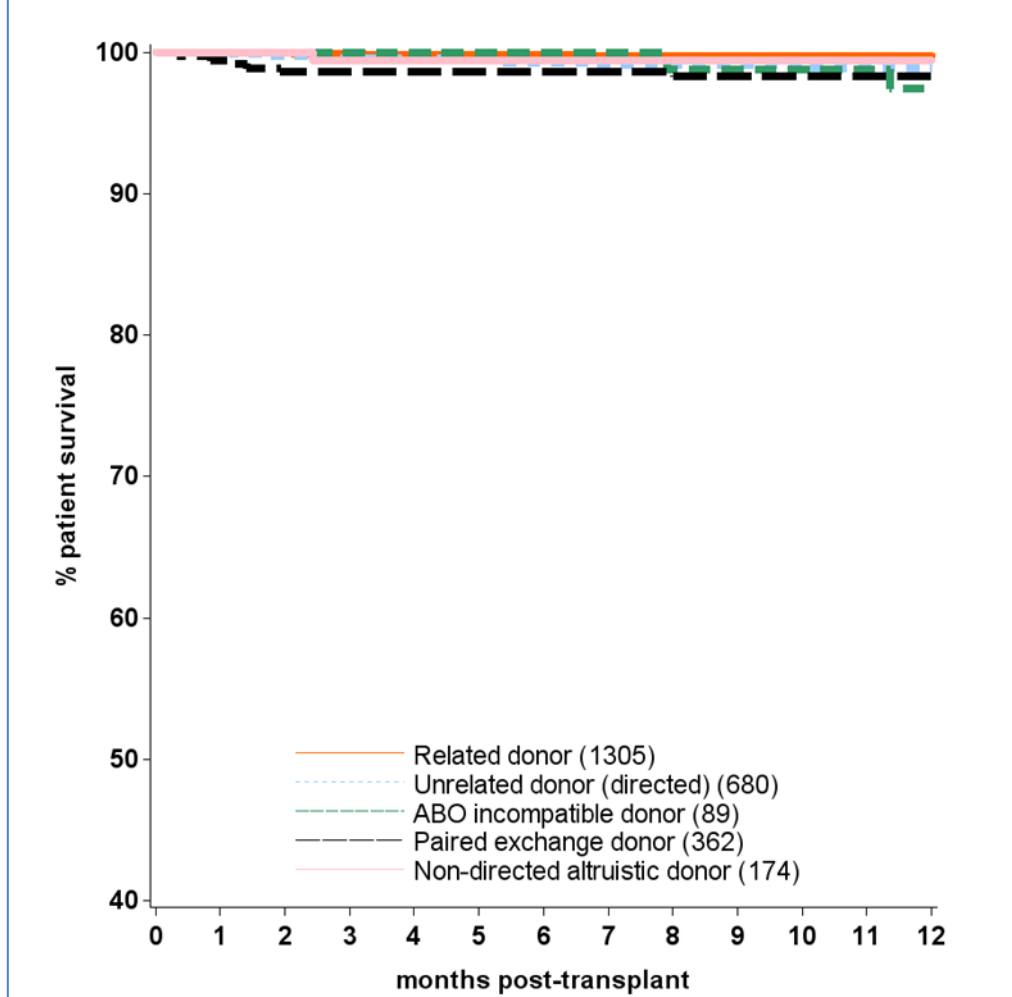


Table 7.3 1 year patient survival following living kidney transplant between 1 April 2017 and 31 March 2021 (p=0.0265)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1305	99.8	(99-100)
Non-directed altruistic donor	174	99.4	(96-100)
Unrelated donor (directed)	680	98.9	(98-99)
Paired exchange donor	362	98.3	(96-99)
ABO incompatible donor	89	97.4	(90-99)
HLA incompatible donor*	13	-	-

* 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 2013 and 31 March 2017

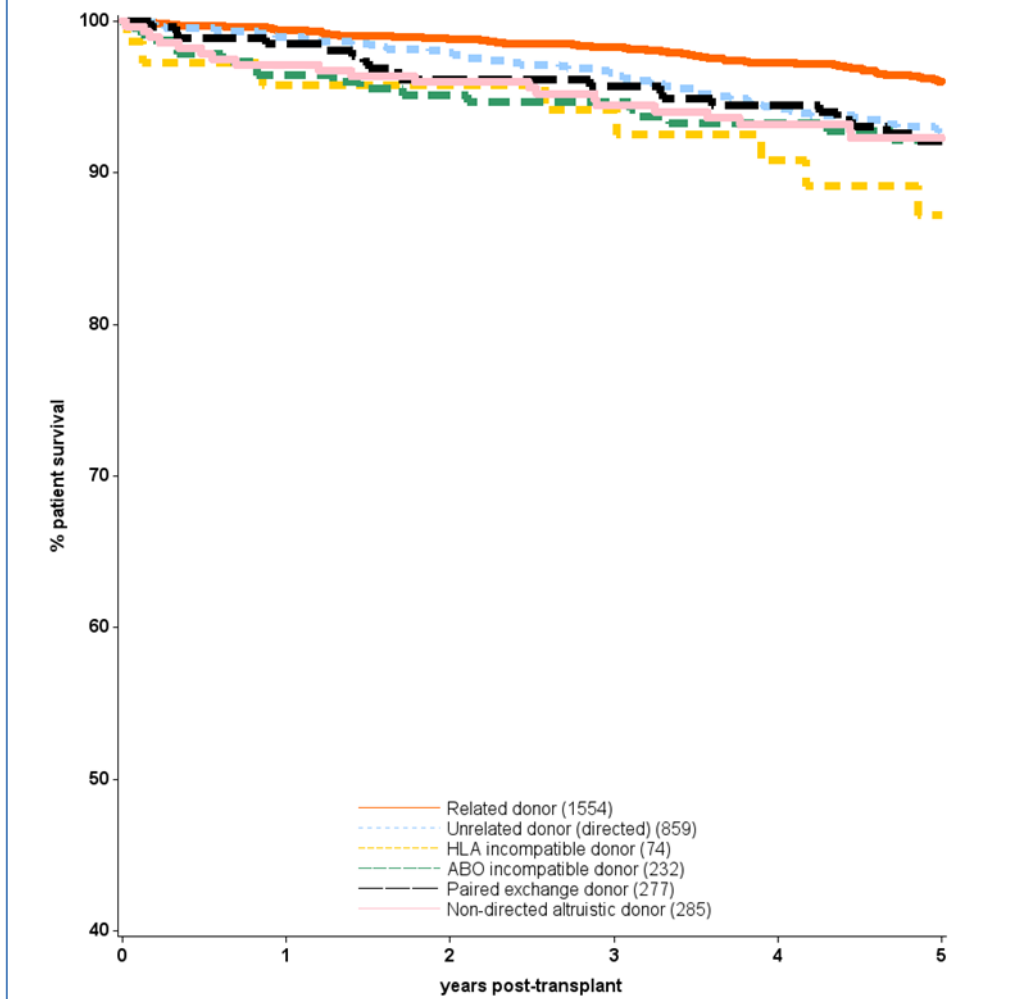


Table 7.4 5 year patient survival following living kidney transplant between 1 April 2013 and 31 March 2017 (p=0.0003)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1554	96.0	(95-97)
Unrelated donor (directed)	859	92.7	(91-94)
Non-directed altruistic donor	285	92.3	(88-95)
ABO incompatible donor	232	92.2	(88-95)
Paired exchange donor	277	92.1	(88-95)
HLA incompatible donor	74	87.2	(76-93)

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

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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.

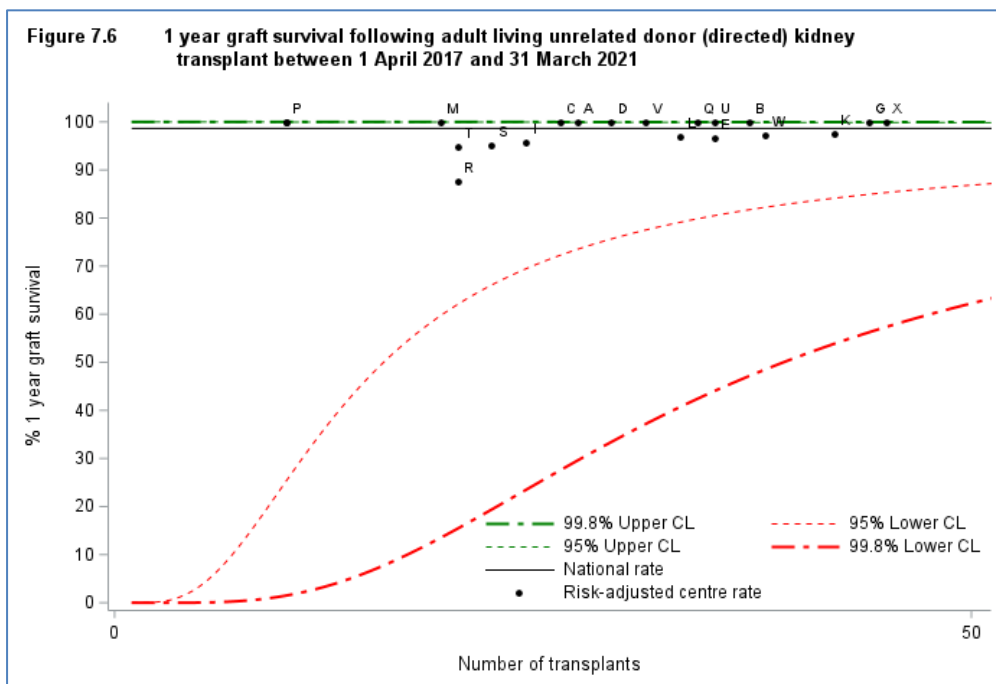
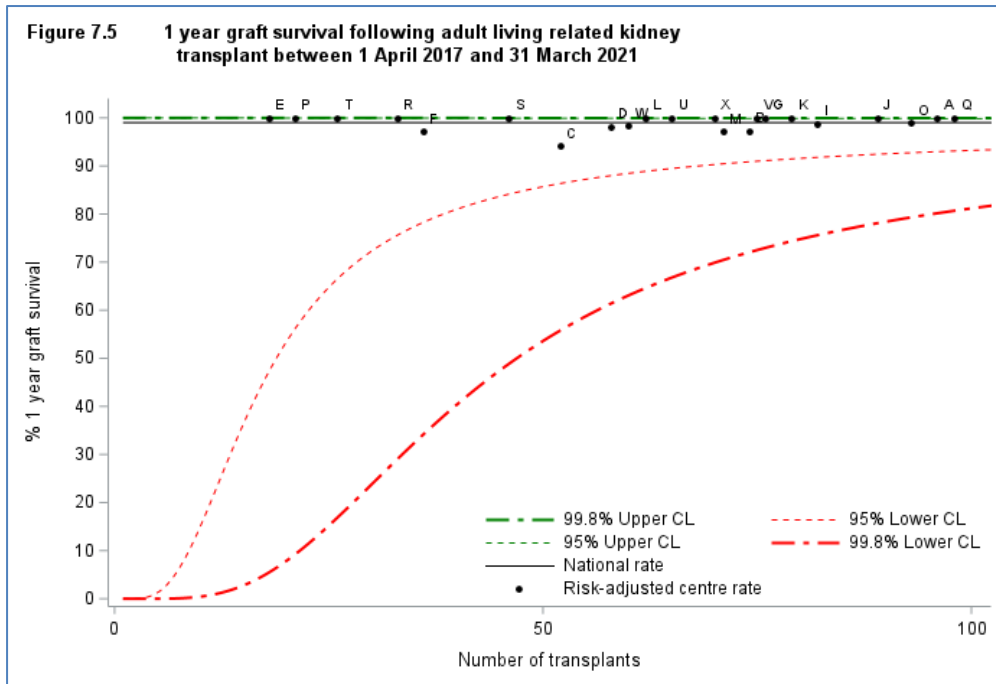


Figure 7.7 1 year graft survival following adult living ABOi donor kidney transplant between 1 April 2017 and 31 March 2021

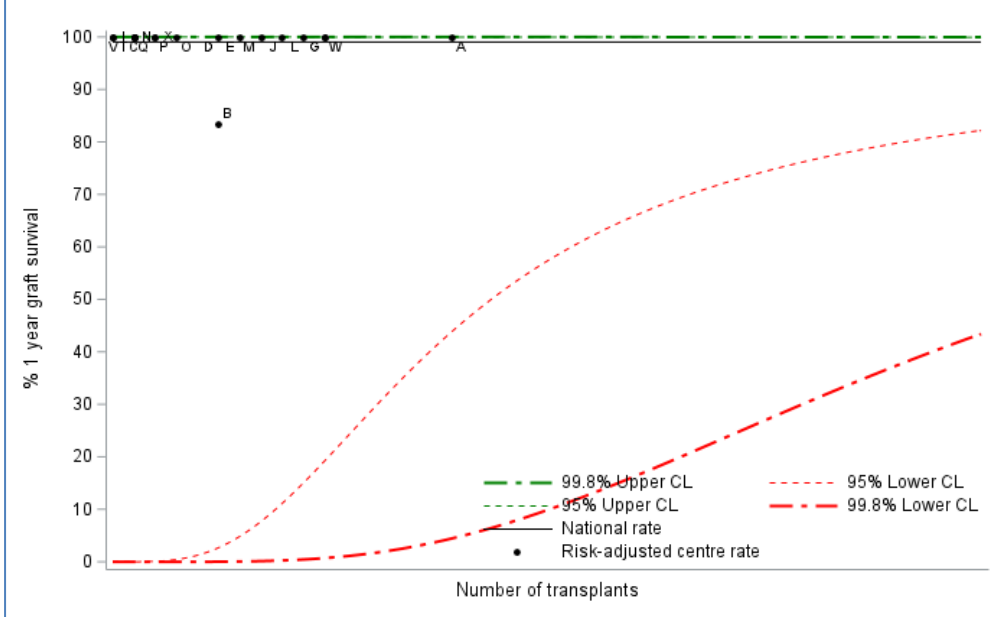


Figure 7.8 1 year graft survival following adult living paired exchange donor kidney transplant between 1 April 2017 and 31 March 2021

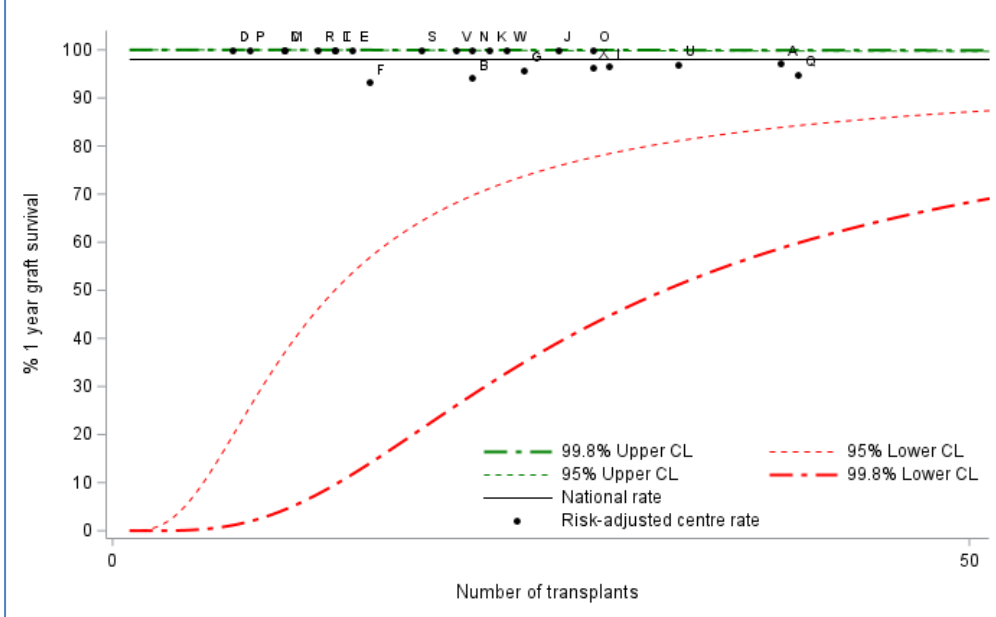


Figure 7.9 1 year graft survival following adult living non-directed altruistic donor kidney transplant between 1 April 2017 and 31 March 2021

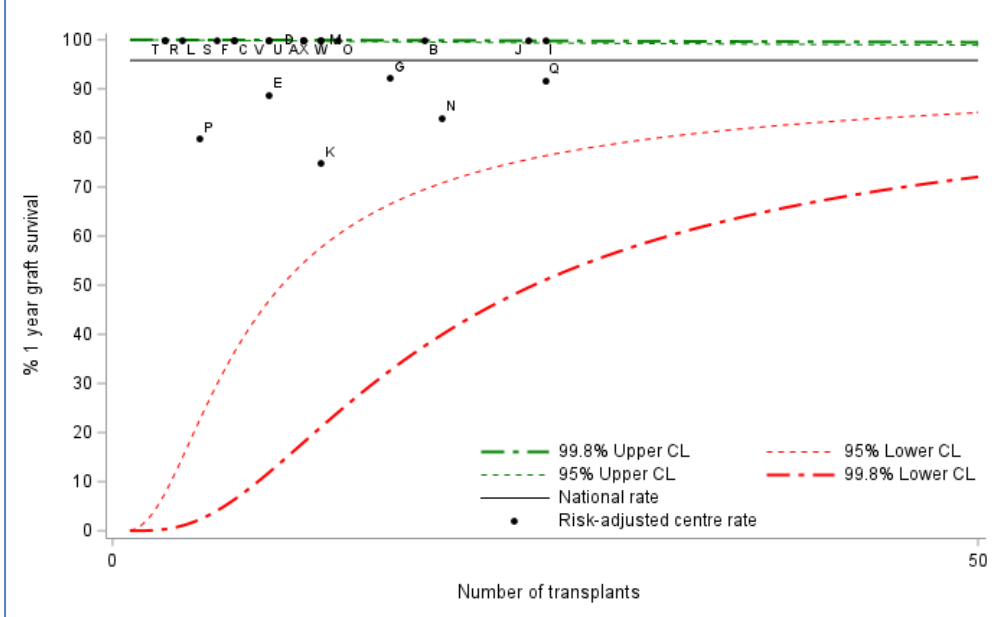


Table 7.5 1 year graft survival following adult living donor kidney transplant between 1 April 2017 and 31 March 2021, by donor type and centre

Centre	Code	Related		Unrelated		HLAi		ABOi		Paired		Non-directed altruistic	
		N	% ¹	N	% ¹	N	% ¹	N	% ¹	N	% ¹	N	% ¹
Belfast	A	96	100	27	100	1	100	17	100	39	97	11	100
Birmingham	B	74	97	37	100	-		6	83	21	94	18	100
Bristol	C	52	94	26	100	-		2	100	10	100	7	100
Cambridge	D	58	98	29	100	5	100	6	100	7	100	11	100
Cardiff	E	18	100	35	97	1	100	7	100	14	100	9	89
Coventry	F	36	97	10	100	2	100	-		15	93	7	100
Edinburgh	G	76	100	44	100	-		11	100	24	96	16	92
Glasgow	I	82	99	24	96	-		1	100	29	97	25	100
Guy's	J	89	100	63	100	1	100	9	100	26	100	24	100
Leeds	K	79	100	42	98	-		-	100	22	100	12	75
Leicester	L	62	100	33	97	-		10	100	13	100	4	100
Liverpool	M	71	97	19	100	4	100	8	100	10	100	12	100
Manchester	N	120	98	65	100	-		2	100	21	100	19	84
Newcastle	O	93	99	60	98	7	100	4	100	28	100	13	100
Nottingham	P	21	100	10	100	-		3	100	8	100	5	80
Oxford	Q	98	100	34	100	2	100	2	100	40	95	25	92
Plymouth	R	33	100	20	88	-		-		12	100	3	100
Portsmouth	S	46	100	22	95	-		-		18	100	6	100
Sheffield	T	26	100	20	95	-		2	100	13	100	3	100
St George's	U	65	100	35	100	-		-		33	97	9	100
The Royal Free	V	75	100	31	100	1	100	1	100	20	100	9	100
The Royal London	W	60	98	38	97	-		11	100	23	100	12	100
WLRTC	X	70	100	45	100	-		3	100	28	96	11	100
UK		1500	99	769	99	24	100	105	99	474	98	271	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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