



Blood and Transplant

ANNUAL REPORT ON LIVING DONOR KIDNEY TRANSPLANTATION

**REPORT FOR 2018/2019
(1 APRIL 2004 – 31 MARCH 2019)**

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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 2004. 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 934 adult living donor kidney transplants performed in the UK in 2018/19 a decrease of 17 transplants compared to 2017/18. Of these, 453 (455 in 2017/18) were related, 232 (238 in 2017/18) were unrelated, 7 (8 in 2017/18) were HLAi, 34 (41 in 2017/18) were ABOi, 146 (123 in 2017/18) were paired/pooled and 62 (86 in 2017/18) were altruistic donor transplants. The equivalent number of paediatric transplants was 79, a 10% increase from the previous year.
- The proportion of living donors across the UK being prescribed anti-hypertensive drugs is 4% at one year, 7% at five years and 11% at ten years post donation.
- Serum creatinine for living donors in the UK is 104 (IQ-range 90-120) at one year, 97 (84-111) at five years and 92 (81-106) at ten years post donation.
- The UK rate of graft survival five years after adult living donor kidney transplant by type is; unrelated 94%, paired exchange 92%, related 92%, altruistic 91%, ABOi 86% and HLAi 81%.
- 42% of registered patients in the UK Living Kidney Sharing Scheme have been transplanted and 63% of identified transplants proceed.

Use of the contents of this report should be acknowledged as follows:
Annual Report on Living Donor Kidney Transplantation 2018/19. NHS Blood and Transplant

Introduction

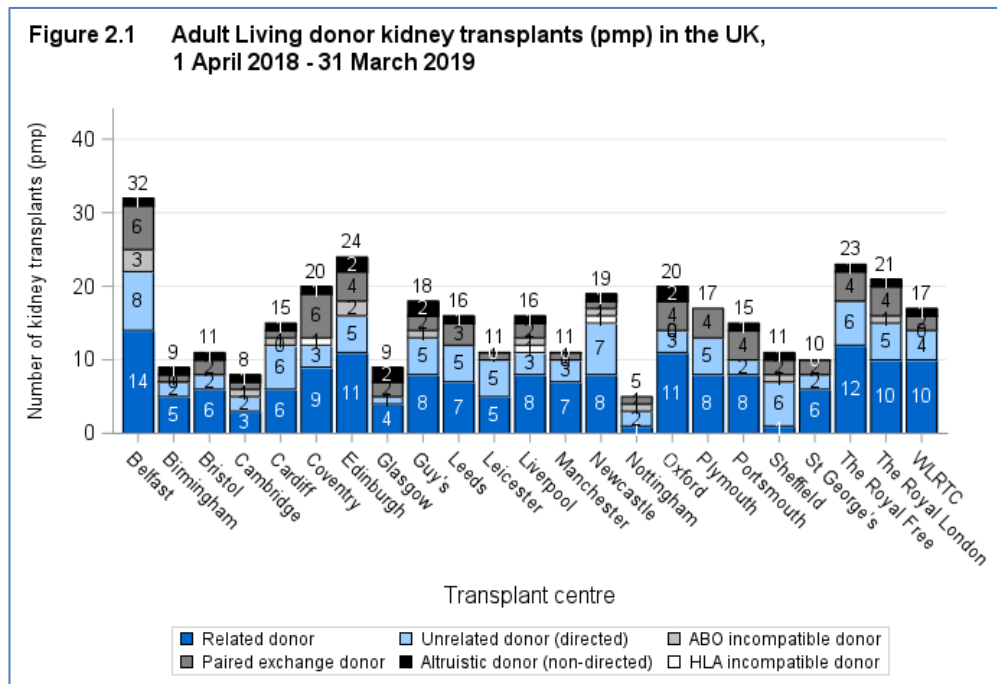
This report presents information on transplant activity between 1 April 2004 and 31 March 2019, for all 24 centres performing living donor kidney transplantation in the UK. Data were obtained from the UK Transplant Registry, at NHS Blood & Transplant, that holds information relating to donors, recipients 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 2014 to 31 March 2018 and five-year post-transplant for the period 1 April 2010 to 31 March 2014. 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 labeled as GOSH.

In addition to the transplants reported here, we have been notified of 1 further transplants that occurred in Guy's that was not added to the database in time for the report to be produced.

Figure 2.1 shows the number of adult living donor kidney transplants per million population (pmp) that were performed in 2018/19 in each transplant centre. Belfast 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 2004 and 31 March 2019. The number of transplants increased from 422 in 2004/05 to 934 in 2018/19.

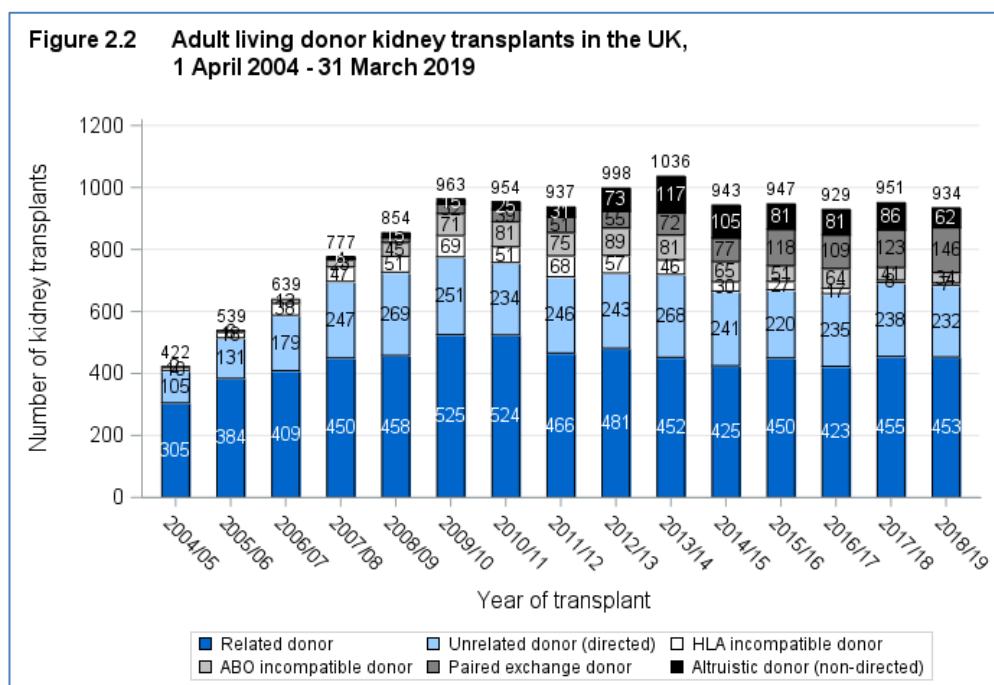


Figure 2.3 and **Table 2.1** show the number of adult living donor kidney transplants performed in 2018/19 in each transplant centre. Guy's performed the most adult living donor kidney transplants last year with 66 patients receiving a transplant. All centres perform non-directed altruistic kidney donation and participate in the UK Living Kidney Sharing Schemes. 14 centres (17 centres in 2017/18) performed ABO incompatible (ABOi) transplants and 5 centres (4 centres in 2017/18) performed HLA incompatible (HLAi) transplants in 2018/19.

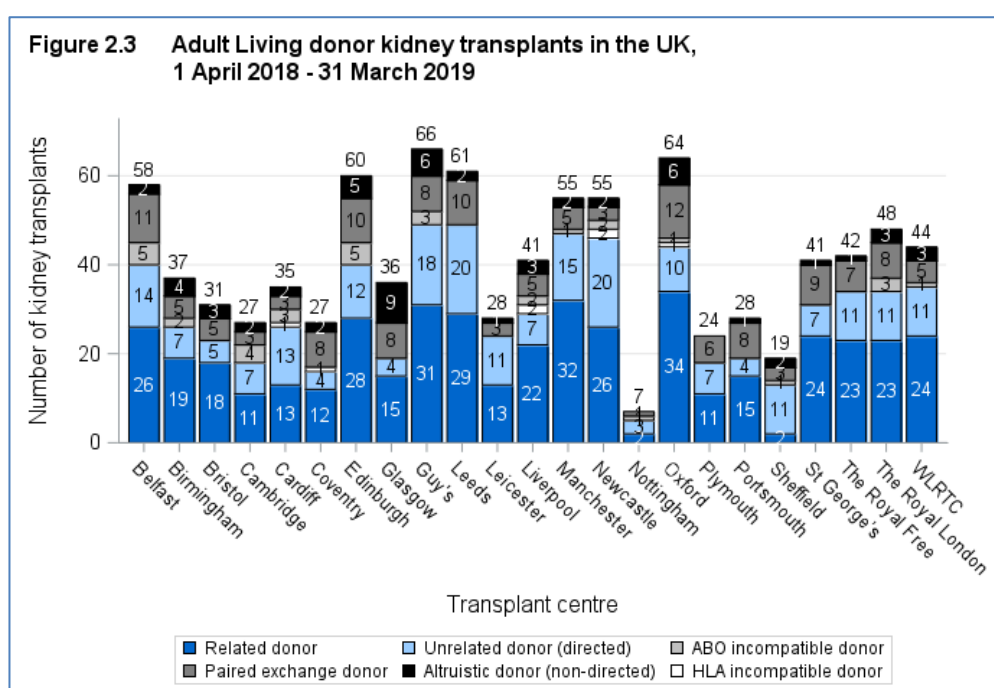


Table 2.1 Adult living donor kidney transplants in the UK, 1 April 2018 - 31 March 2019

Transplant Centre	Donor type					Altruistic donor (non-directed)
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	
Belfast	26	14	0	5	11	2
Birmingham	19	7	0	2	5	4
Bristol	18	5	0	0	5	3
Cambridge	11	7	0	4	3	2
Cardiff	13	13	1	3	3	2
Coventry	12	4	1	0	8	2
Edinburgh	28	12	0	5	10	5
Glasgow	15	4	0	0	8	9
Guy's	31	18	0	3	8	6
Leeds	29	20	0	0	10	2
Leicester	13	11	0	0	3	1
Liverpool	22	7	2	2	5	3
Manchester	32	15	0	1	5	2
Newcastle	26	20	2	2	3	2
Nottingham	2	3	0	1	1	0
Oxford	34	10	1	1	12	6
Plymouth	11	7	0	0	6	0
Portsmouth	15	4	0	0	8	1
Sheffield	2	11	0	1	3	2
St George's	24	7	0	0	9	1
The Royal Free	23	11	0	0	7	1
The Royal London	23	11	0	3	8	3
WLRTC	24	11	0	1	5	3

Figure 2.4 shows the proportion of adult living donor kidney transplants by donor type and centre in 2018/19.

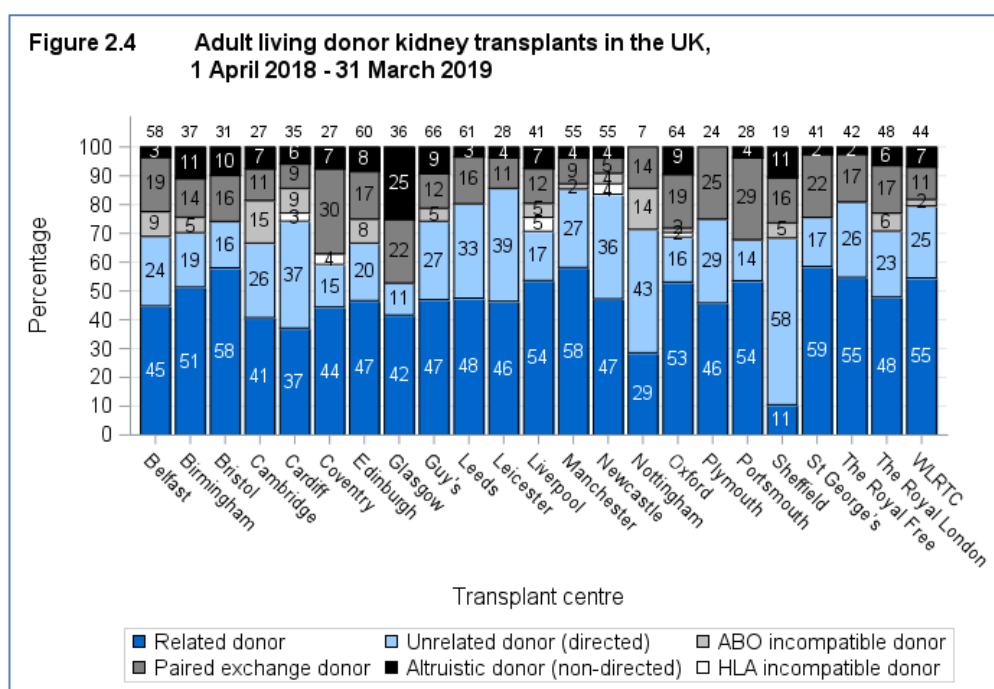
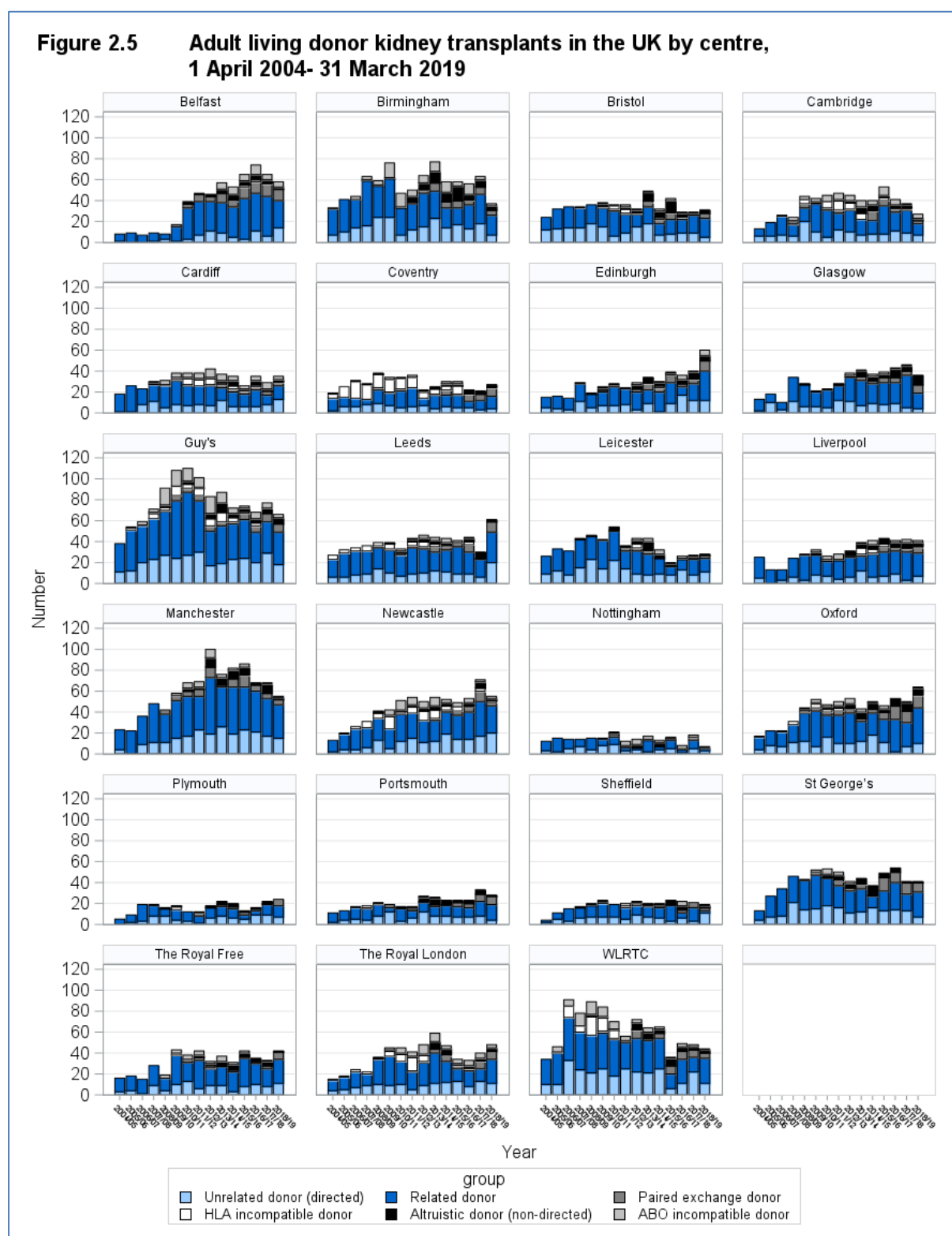


Figure 2.5 shows the number of adult living donor kidney transplants by donor type and centre between 1 April 2004 and 31 March 2019.



PAEDIATRIC

Figure 2.6 shows the number of paediatric living donor kidney transplants performed in the UK between 1 April 2004 and 31 March 2019. The number of transplants increased from 47 in 2004/05 to 79 in 2018/19.

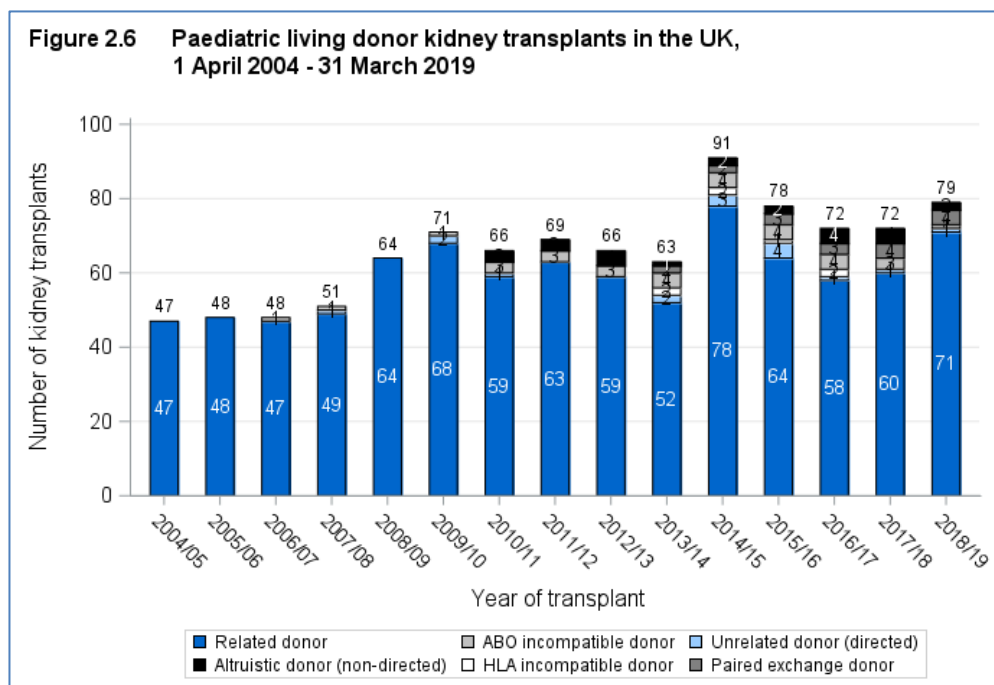


Figure 2.7 and **Table 2.2** show the number of paediatric living donor kidney transplants performed in 2018/19 in each transplant centre. Guy's transplant team performed the most living donor kidney transplants last year with 22 patients receiving a transplant (13 at GOSH and 9 at Guy's). Children are also benefitting from the UKLKSS and HLA and ABO antibody removal programmes to facilitate living donor transplants.

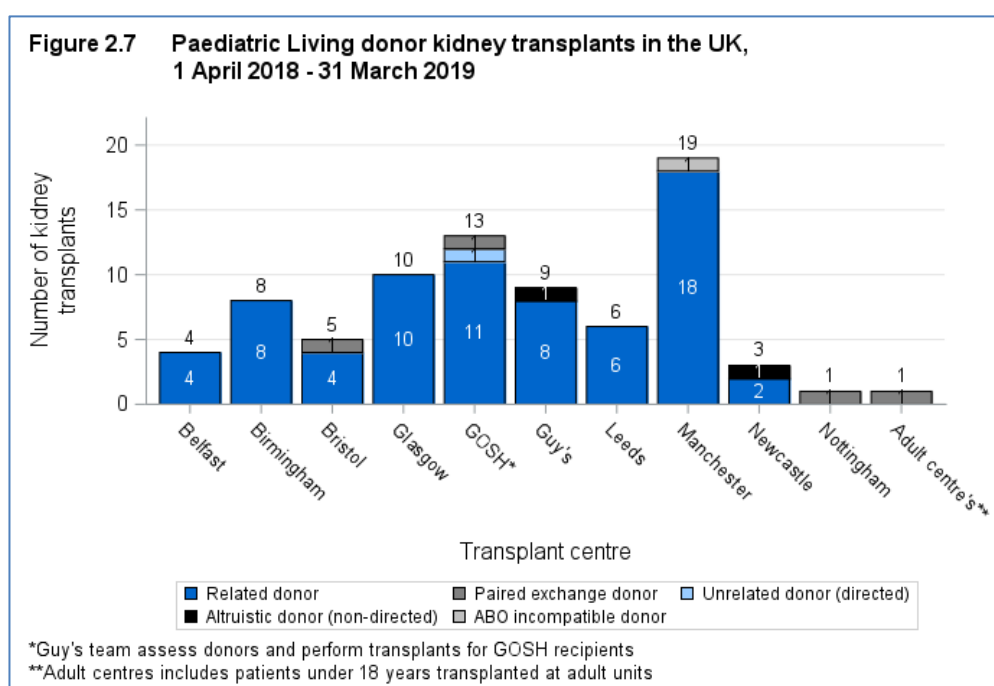


Table 2.2 Paediatric living donor kidney transplants in the UK, 1 April 2018 - 31 March 2019

Transplant Centre	Donor type					
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	Altruistic donor (non-directed)
Adult centre's**	0	0	0	0	1	0
Belfast	4	0	0	0	0	0
Birmingham	8	0	0	0	0	0
Bristol	4	0	0	0	1	0
GOSH*	11	1	0	0	1	0
Glasgow	10	0	0	0	0	0
Guy's	8	0	0	0	0	1
Leeds	6	0	0	0	0	0
Manchester	18	0	0	1	0	0
Newcastle	2	0	0	0	0	1
Nottingham	0	0	0	0	1	0

Figure 2.8 shows the proportion of paediatric living donor kidney transplants by donor type and centre in 2018/19.

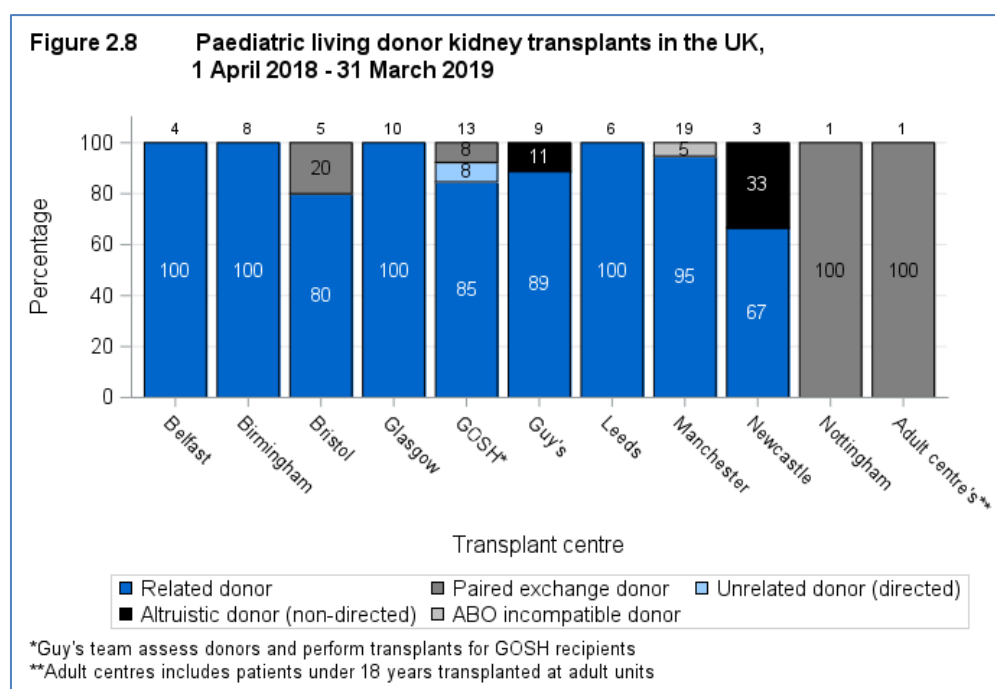
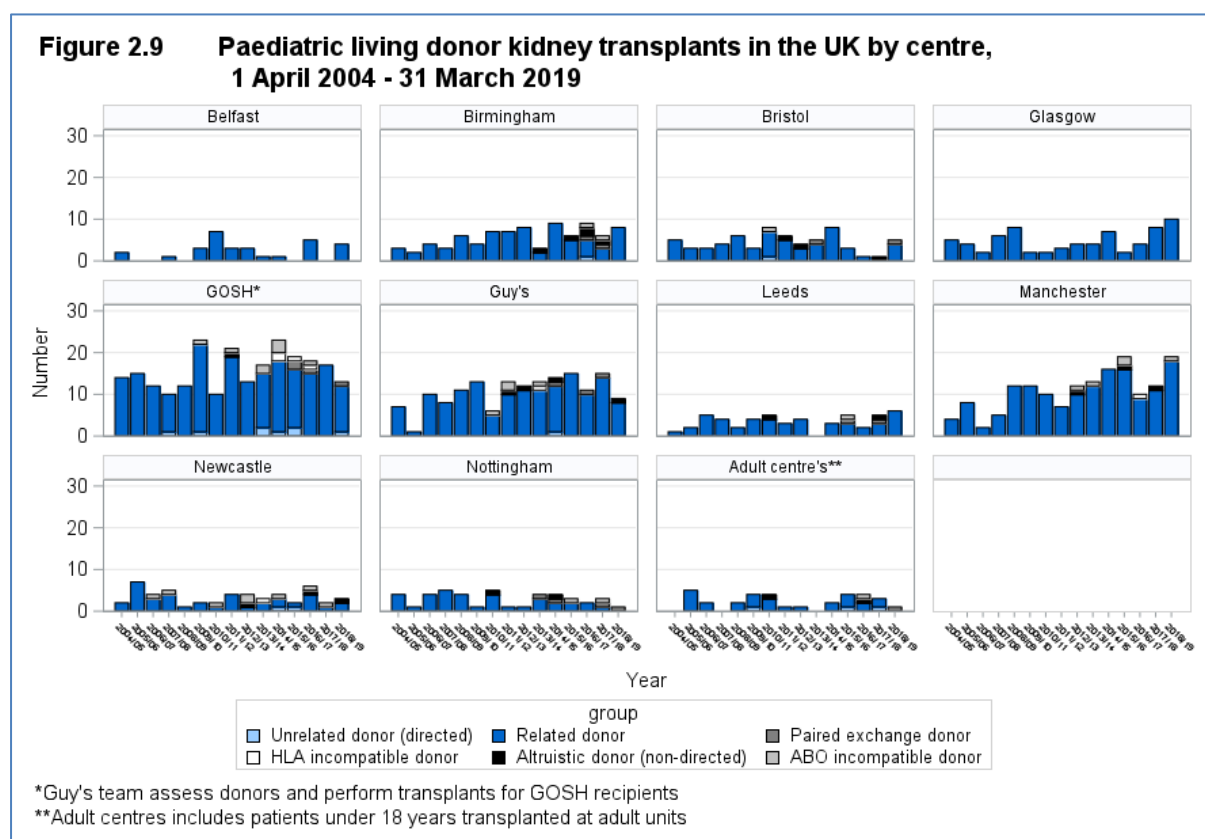


Figure 2.9 shows the number of paediatric living donor kidney transplants by donor type and centre between 1 April 2004 and 31 March 2019.



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 Caucasian and 14% are from Black, Asian or other minority ethnic groups (BAME). 1% of non-directed altruistic and 9% of paired/pooled donors are from BAME donors but 22% of adult BAME recipients receive a kidney from a non-directed altruistic donor and 17% from paired-pooled donors.

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 66% at Belfast to 17% at Birmingham.

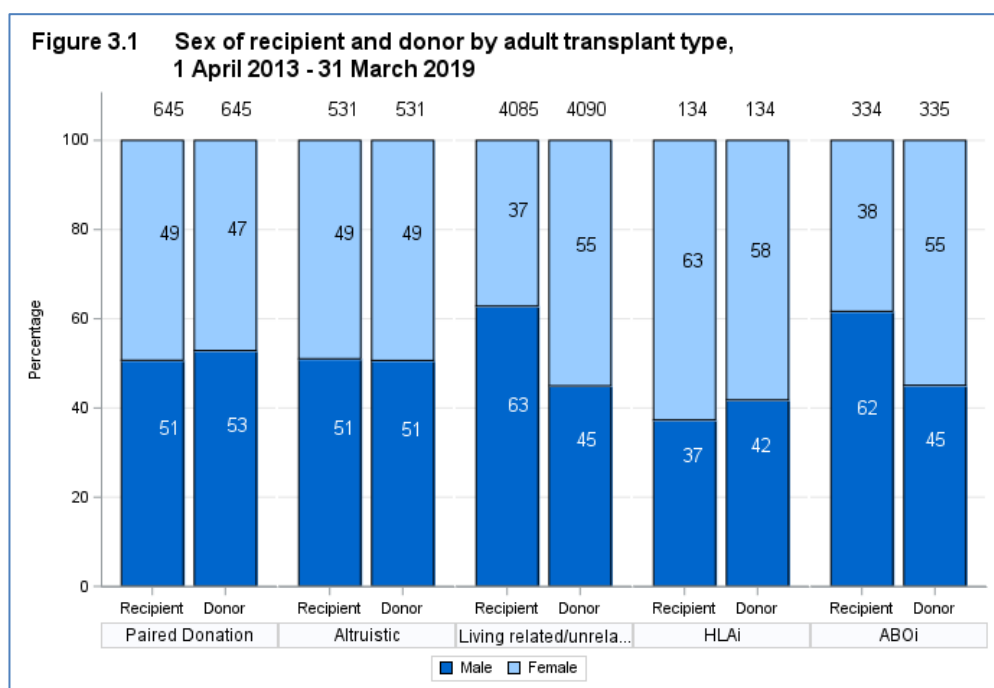


Figure 3.2 Ethnicity of recipient and donor by adult transplant type, 1 April 2013 - 31 March 2019

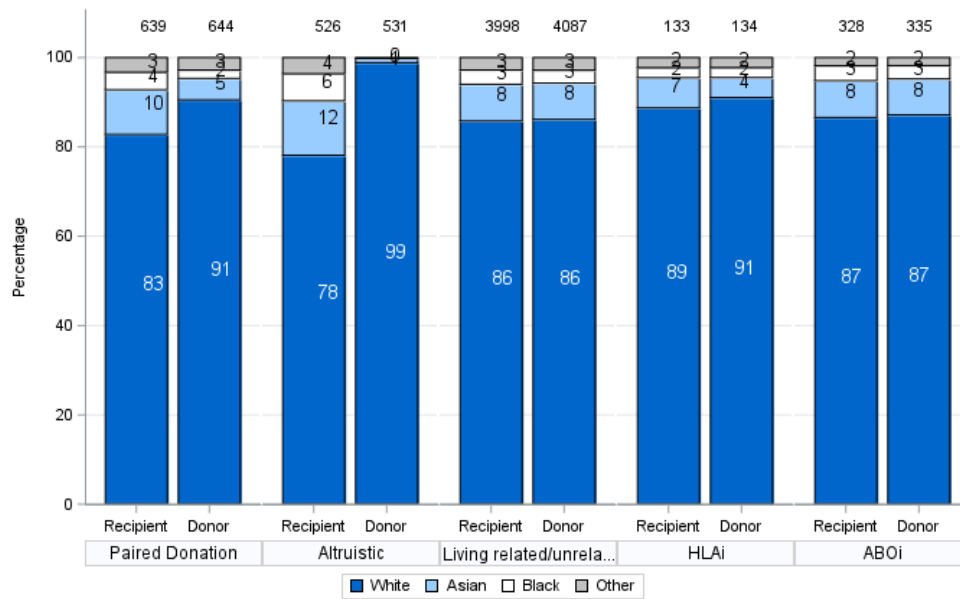


Figure 3.3 Age of recipient and donor by adult transplant type, 1 April 2013 - 31 March 2019

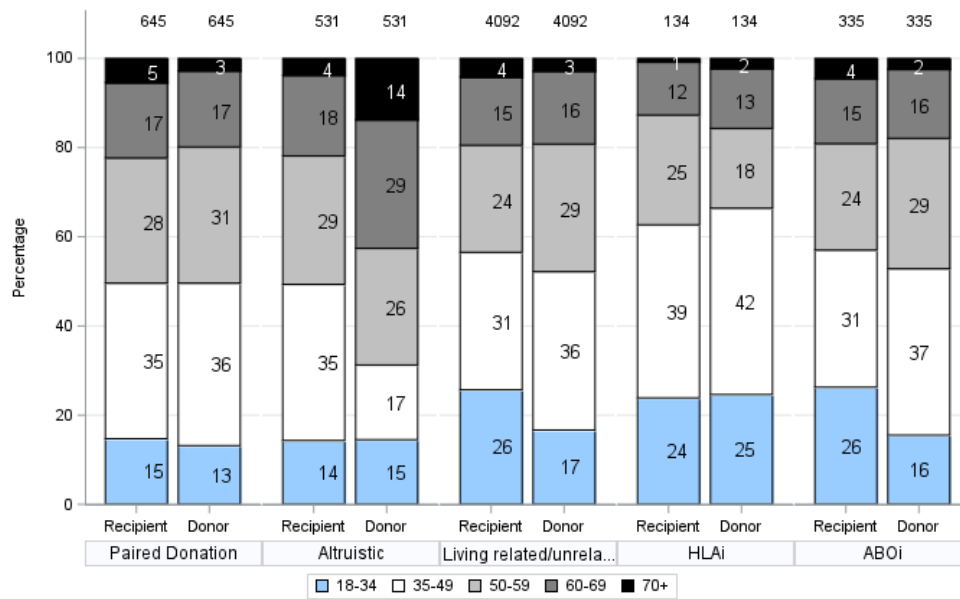


Figure 3.4 Recipient Calculated Reaction Frequency by adult transplant type
1 April 2013 - 31 March 2019

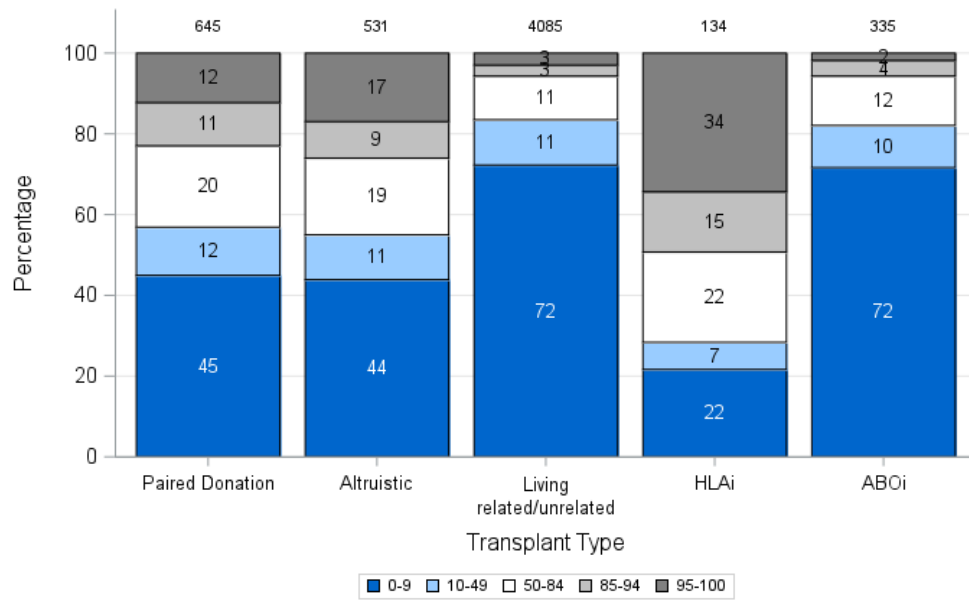


Figure 3.5 Adult HSP by transplant type and year of transplant,
1 April 2013 - 31 March 2019

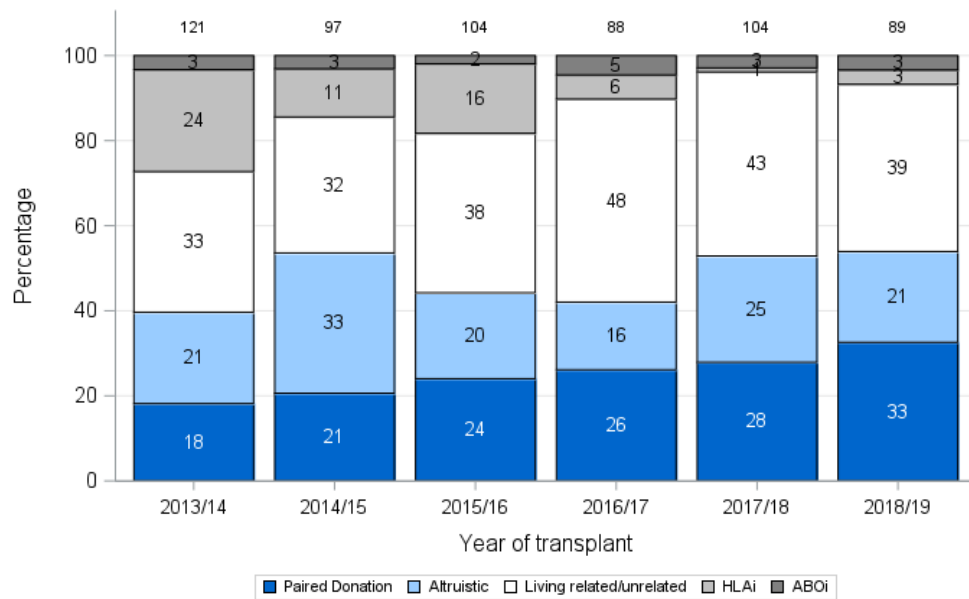


Figure 3.6 Recipient and donor blood group by adult transplant type, 1 April 2013 - 31 March 2019

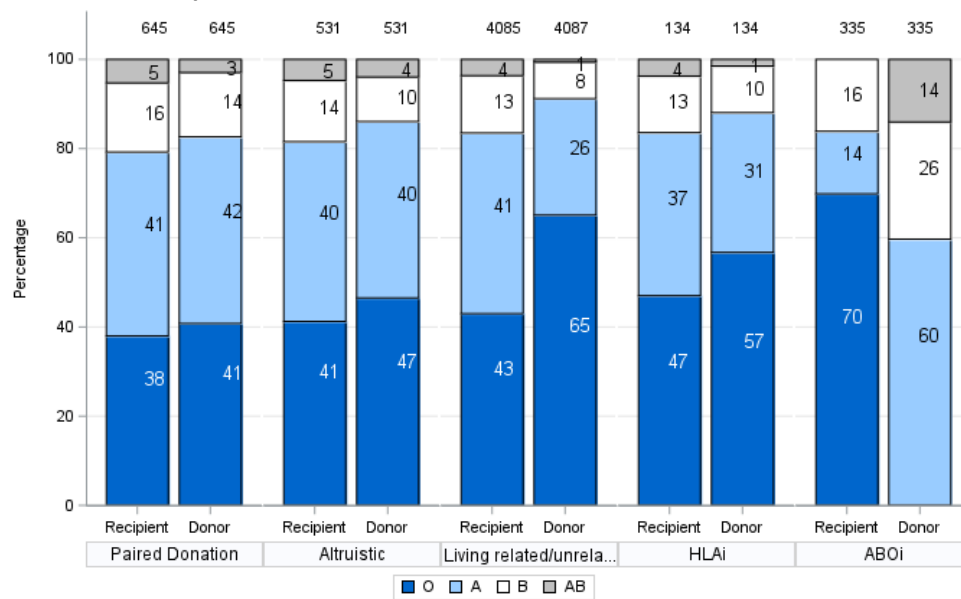


Figure 3.7 Dialysis status at transplant by adult transplant type, 1 April 2013 - 31 March 2019

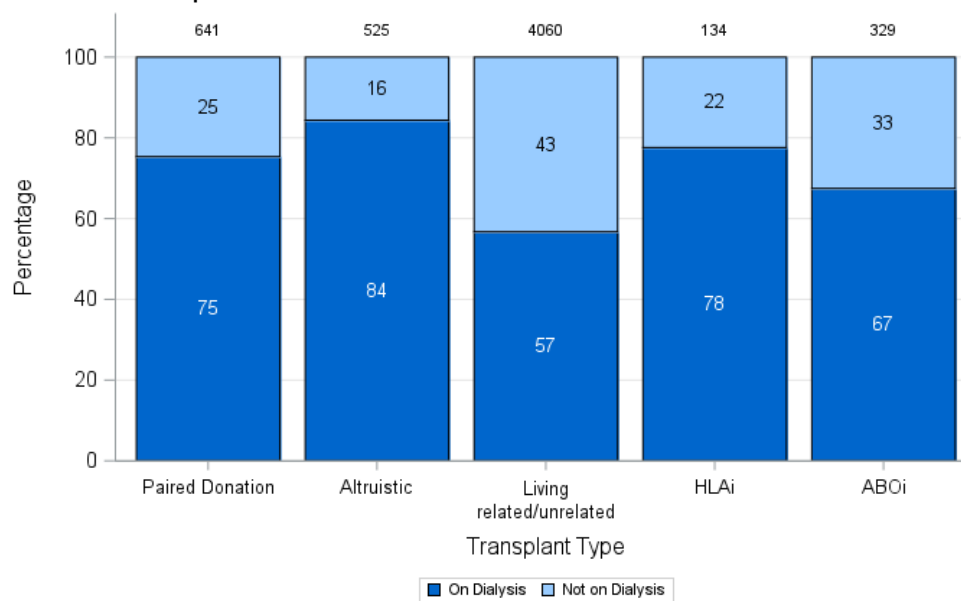
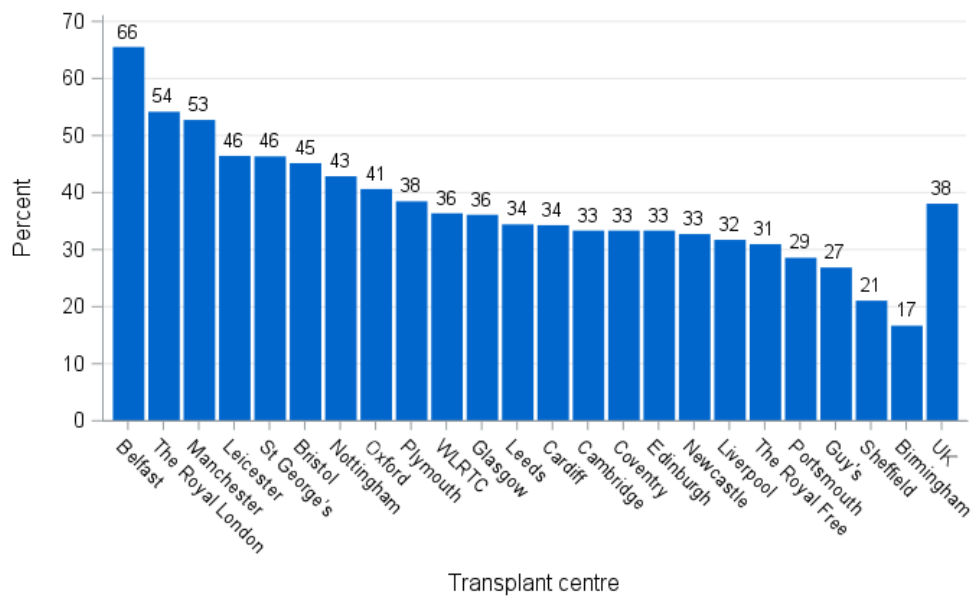


Figure 3.8 Adult living donor pre-emptive transplant rates by centre,
1 April 2018 - 31 March 2019



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.

81% of paediatric recipients of direct living donor kidney transplants are Caucasian and 19% are from Black, Asian or other minority ethnic groups (BAME). 7% of non-directed altruistic and 6% of paired/pooled donors are from BAME donors but 40% of paediatric BAME recipients receive a kidney from a non-directed altruistic donor and 22% from paired-pooled donors.

54% of children transplanted from a non-directed altruistic donor have a cRF ≥ 50 and 17% of children transplanted through the paired/pooled scheme have cRF ≥ 50 .

The paediatric living donor pre-emptive transplant rates ranged from 100% at Nottingham to 0% at Newcastle.

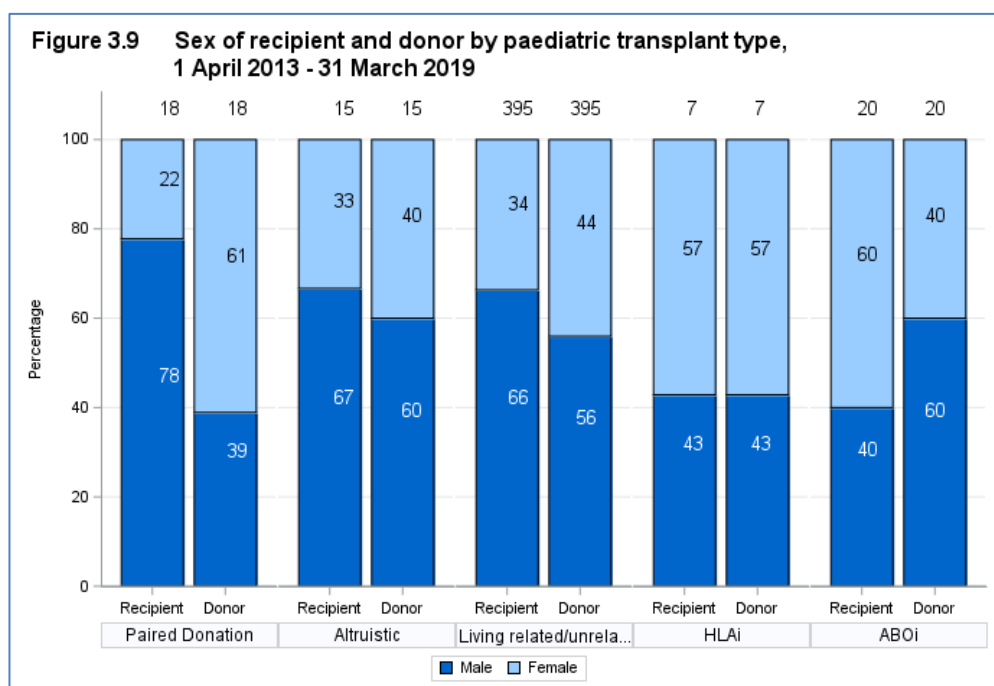


Figure 3.10 Ethnicity of recipient and donor by paediatric transplant type, 1 April 2013 - 31 March 2019

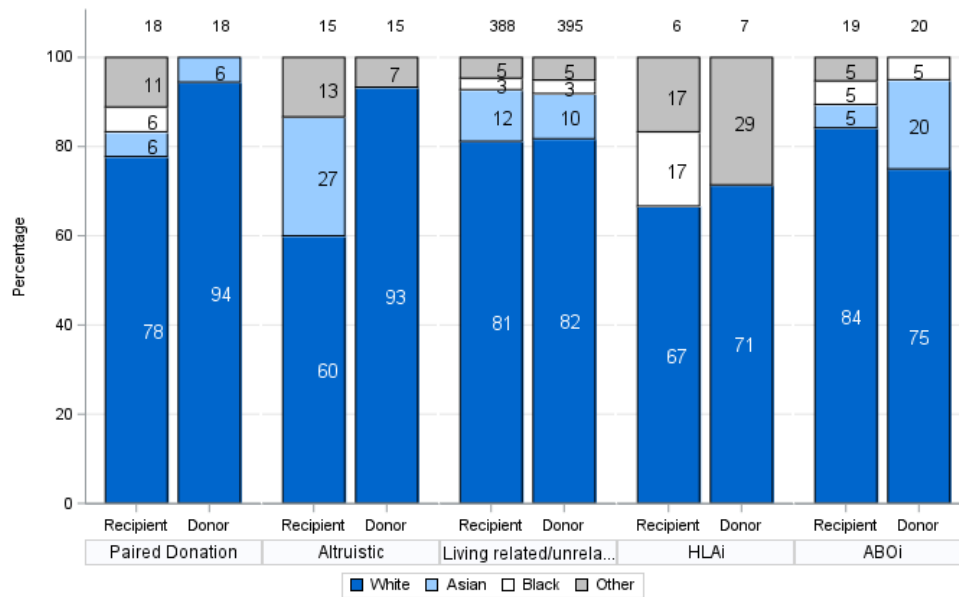


Figure 3.11 Age of recipient and donor by paediatric transplant type, 1 April 2013 - 31 March 2019

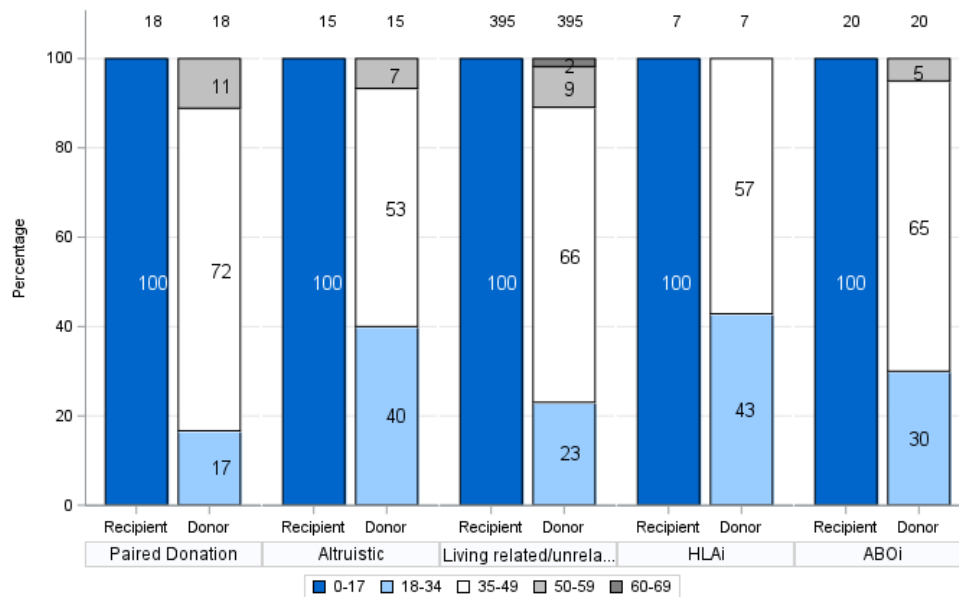


Figure 3.12 Recipient Calculated Reaction Frequency by paediatric transplant type
1 April 2013 - 31 March 2019

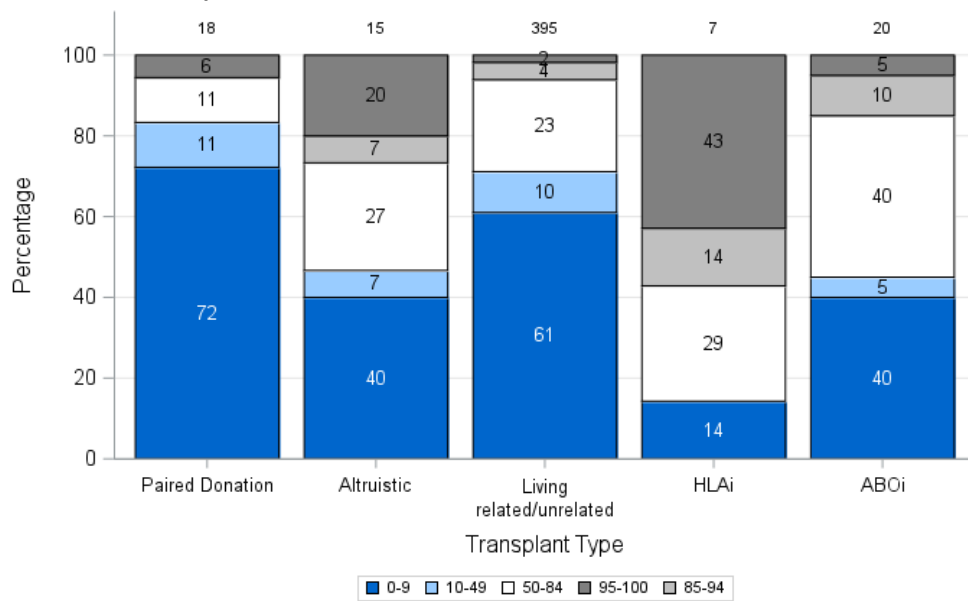


Figure 3.13 Paediatric HSP by transplant type and year of transplant,
1 April 2013 - 31 March 2019

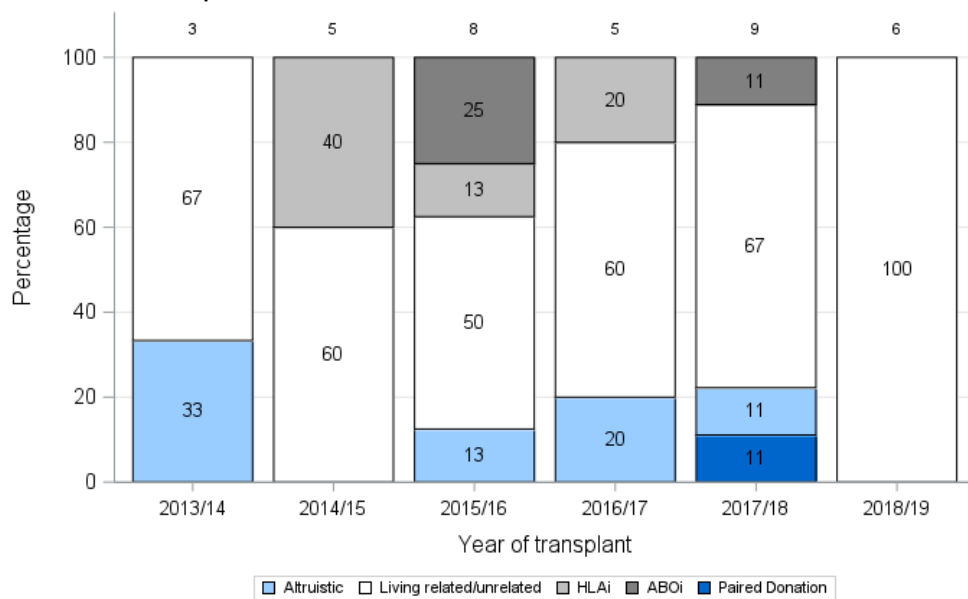


Figure 3.14 Recipient and donor blood group by paediatric transplant type, 1 April 2013 - 31 March 2019

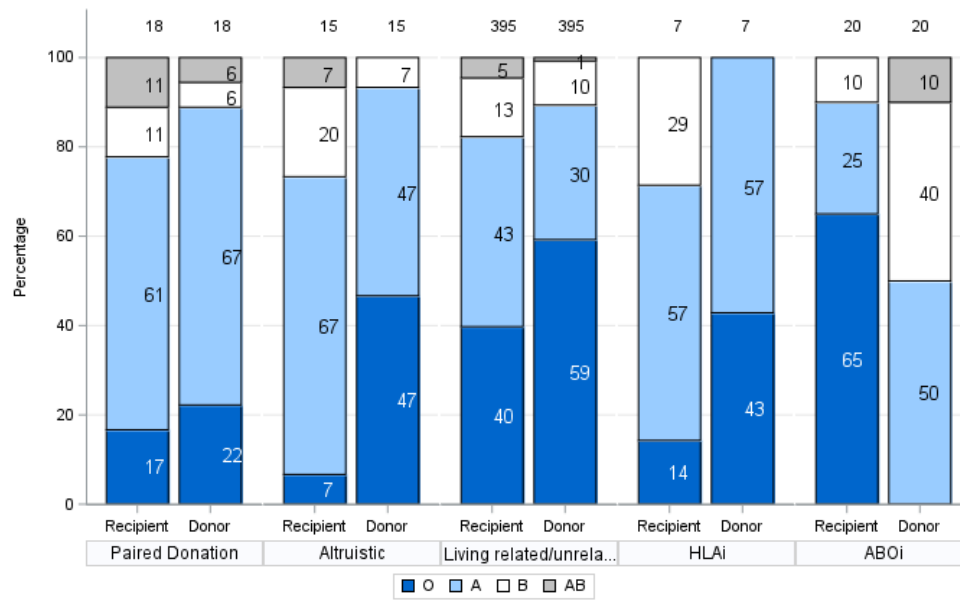


Figure 3.15 Dialysis status at transplant by paediatric transplant type, 1 April 2013 - 31 March 2019

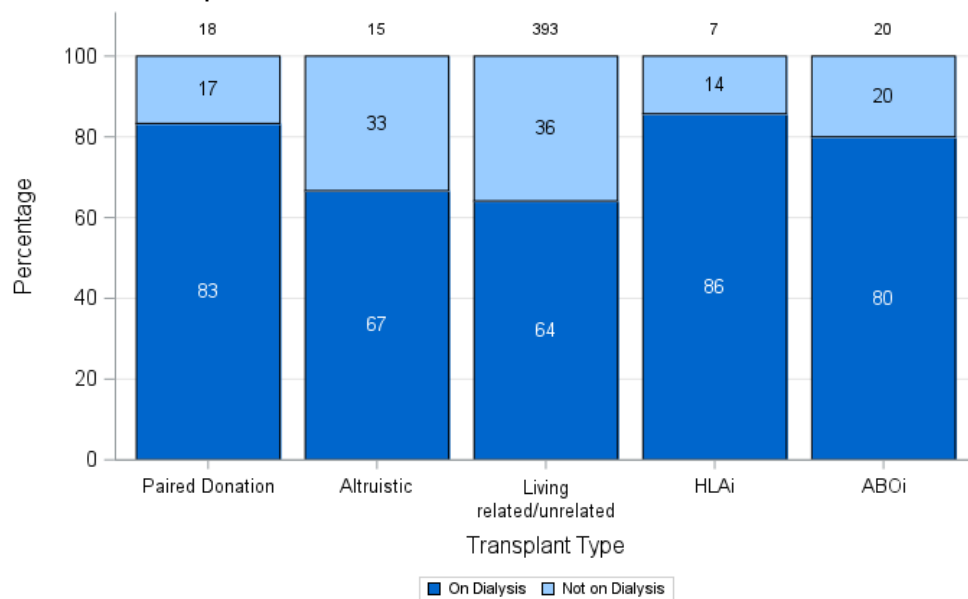
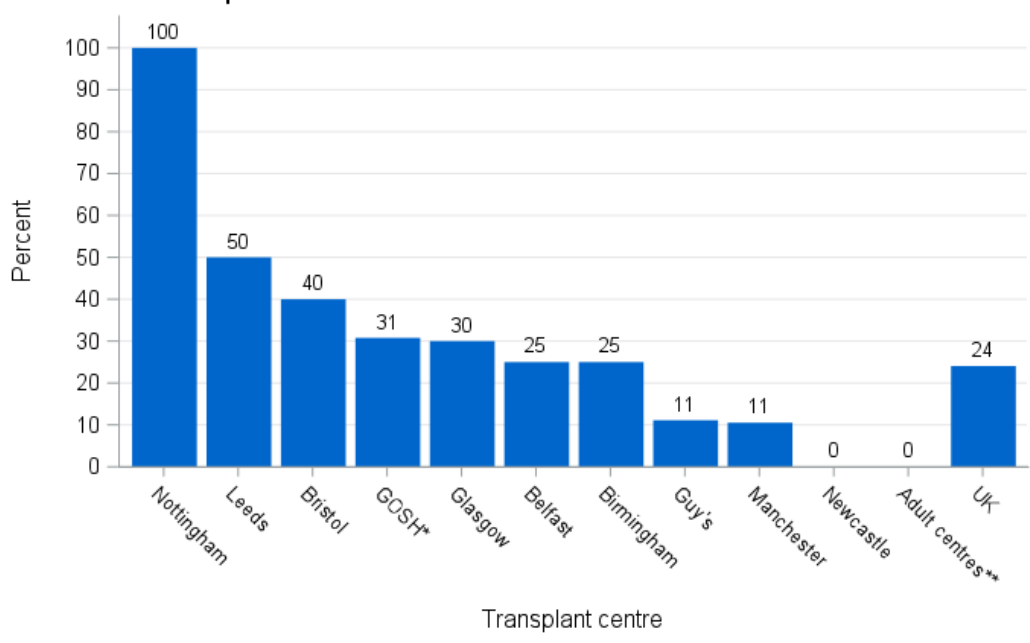


Figure 3.16 Paediatric living donor pre-emptive transplant rates by centre, 1 April 2018 - 31 March 2019



UK Living Kidney Sharing Schemes

4.1 Paired Donation Scheme

4.1.1 Registrations: Matching Runs, 1 April 2013 – 31 March 2019

Figure 4.1 shows the number of patients included in matching runs from 1 April 2013 to 31 March 2019. The number of patients included has increased over this period with 211 in April 2013 to 260 in January 2019. Overall, there were 1,584 patients included in matching runs over this period. **Figure 4.2** shows the number of pairs included in each matching run, split by pair incompatibility.

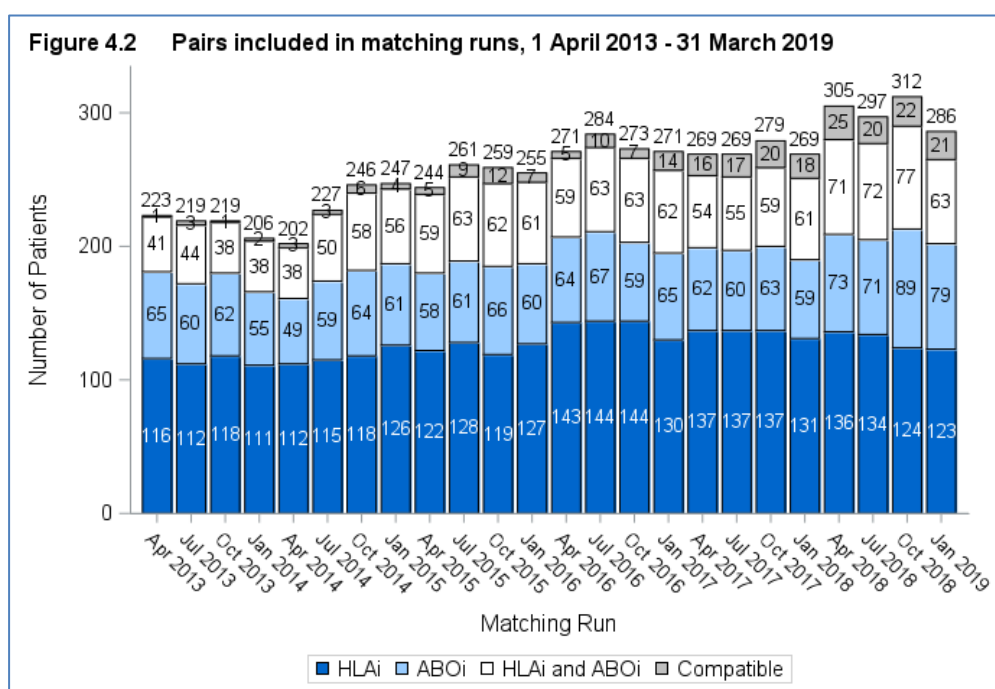
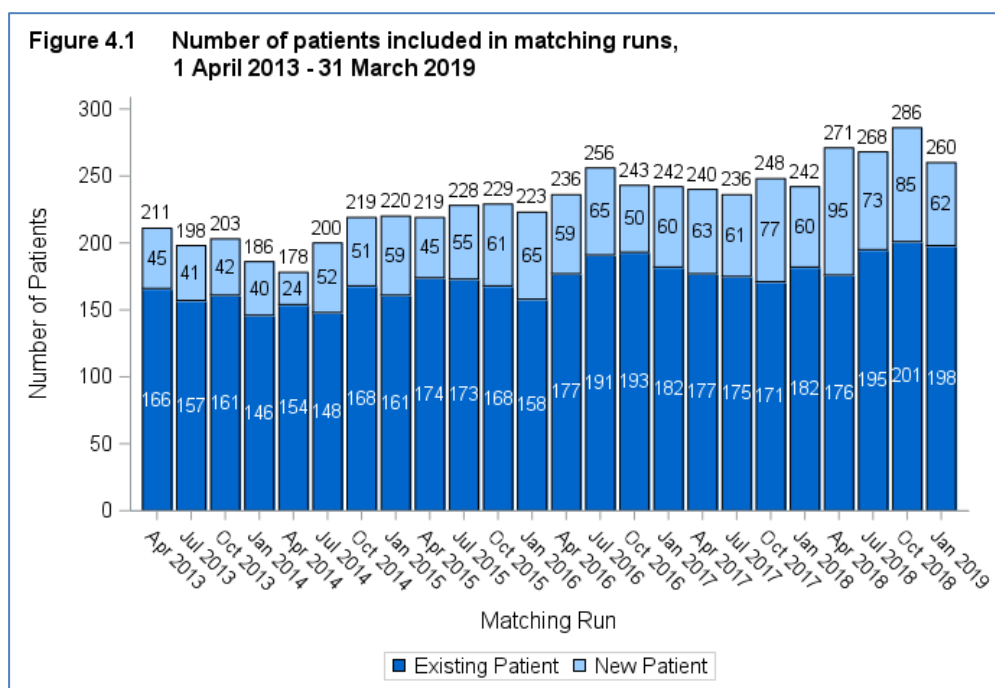


Figure 4.3 shows the number of pairs included in matching runs from 1 April 2013 to 31 March 2019 by centre. This is broken down further by the nature of the incompatibility between the pair. It can be seen that Belfast has had the highest number of pairs registered over this time period. Most pairs registered over this period were HLA incompatible (43%). This information is also shown in **Table 4.1**.

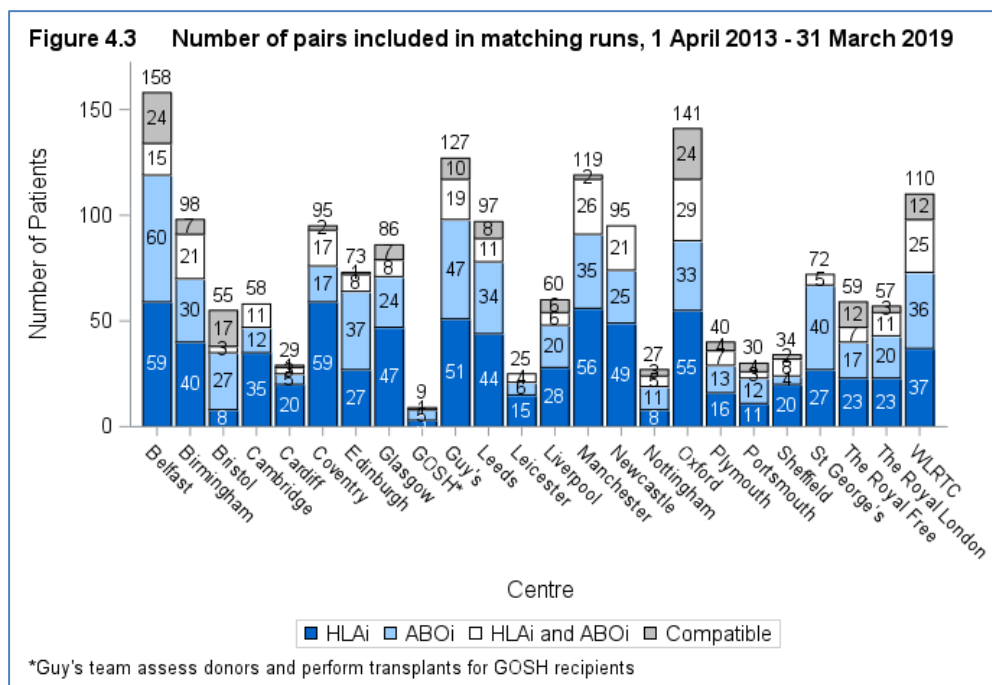


Table 4.1 Pairs included in matching runs by compatibility and Centre, April 2013 - March 2019					
Centre	Number of pairs	HLAi	ABOi	HLAi and ABOi	Compatible
Belfast	158	59	60	15	24
Birmingham	98	40	30	21	7
Bristol	55	8	27	3	17
Cambridge	58	35	12	11	0
Cardiff	29	20	5	3	1
Coventry	95	59	17	17	2
Edinburgh	73	27	37	8	1
Glasgow	86	47	24	8	7
GOSH*	9	3	5	0	1
Guy's	127	51	47	19	10
Leeds	97	44	34	11	8
Leicester	25	15	6	4	0
Liverpool	60	28	20	6	6
Manchester	119	56	35	26	2
Newcastle	95	49	25	21	0
Nottingham	27	8	11	5	3
Oxford	141	55	33	29	24
Plymouth	40	16	13	7	4
Portsmouth	30	11	12	3	4
Sheffield	34	20	4	8	2
St George's	72	27	40	5	0
The Royal Free	59	23	17	7	12
The Royal London	57	23	20	11	3
WLRTC	110	37	36	25	12
UK	1754	761	570	273	150
*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 2013 - 31 March 2019					
Year	Registered with different blood groups		Registered with unacceptable antigens		Total number of patients registered
	N	%	N	%	
13/14	2	1.3	24	15.5	155
14/15	0	-	25	12.3	203
15/16	3	1.2	34	14	243
16/17	5	2.1	51	21.1	242
17/18	6	2.4	39	15.9	246
18/19	0	-	23	8	287

4.1.2 Outcomes: Matching Runs, 1 April 2015 – 31 March 2019

Figure 4.4 shows the outcomes of patients included in matching runs from 1 April 2015 to 31 March 2019, split by centre. Overall, 42% of patients registered have had a transplant through the paired donation scheme.

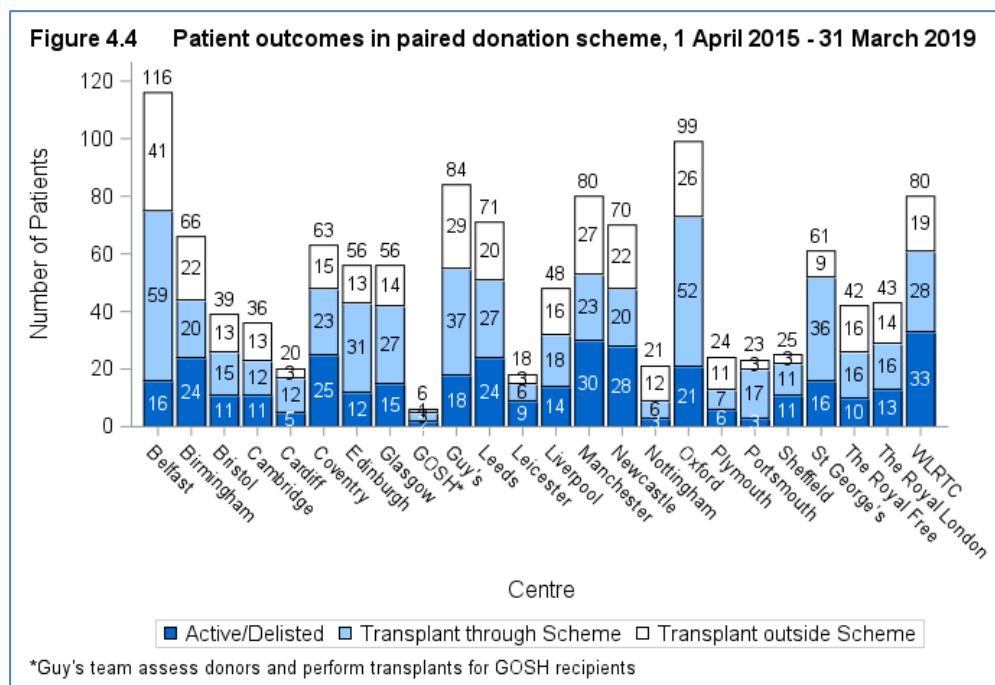
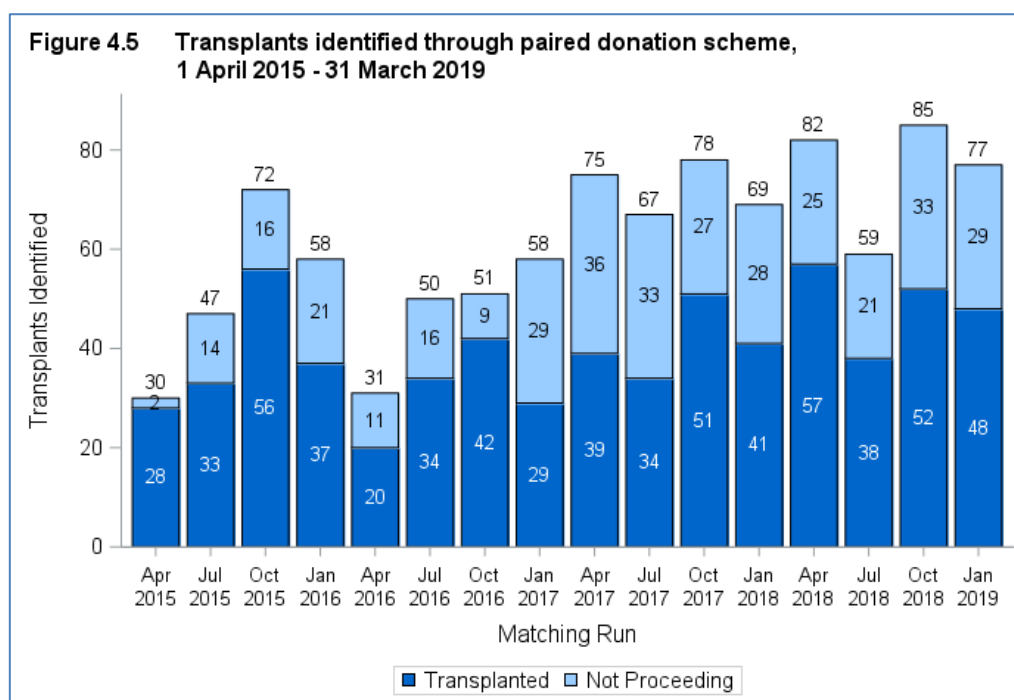


Figure 4.5 shows the transplants identified in each matching run from 1 April 2015 to 31 March 2019. The number of those that proceeded to transplant is also shown. Overall, 63% of transplants identified through the paired donation scheme have proceeded to transplant over this period.



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

Table 4.3 Transplants as a proportion of registered patients by calculated reaction frequency, 1 April 2015 - 31 March 2019			
Calculated Reaction Frequency	Patients Registered	Patients Transplanted	
		N	(%)
0-9%	419	206	(49)
10-84%	337	189	(56)
85-94%	138	72	(52)
95-99%	223	52	(23)
100%	130	3	(2)

Table 4.4 Transplants as a proportion of registered pairs by blood group, 1 April 2015 - 31 March 2019											
Donor Blood Group	Patient Blood Group (Patients Transplanted/Pairs Registered (%))										
	O			A			B			AB	
O	95/	277	(34%)	84/	136	(62%)	25/	47	(53%)	4/	10 (40%)
A	116/	408	(28%)	71/	181	(39%)	34/	56	(61%)	1/	14 (7%)
B	33/	99	(33%)	29/	57	(51%)	13/	40	(33%)	1/	4 (25%)
AB	4/	16	(25%)	8/	19	(42%)	3/	17	(18%)	1/	7 (14%)

Figure 4.6 shows the number of patients transplanted from matching runs between 1 April 2015 and 31 March 2019. This is split by centre and exchange type.

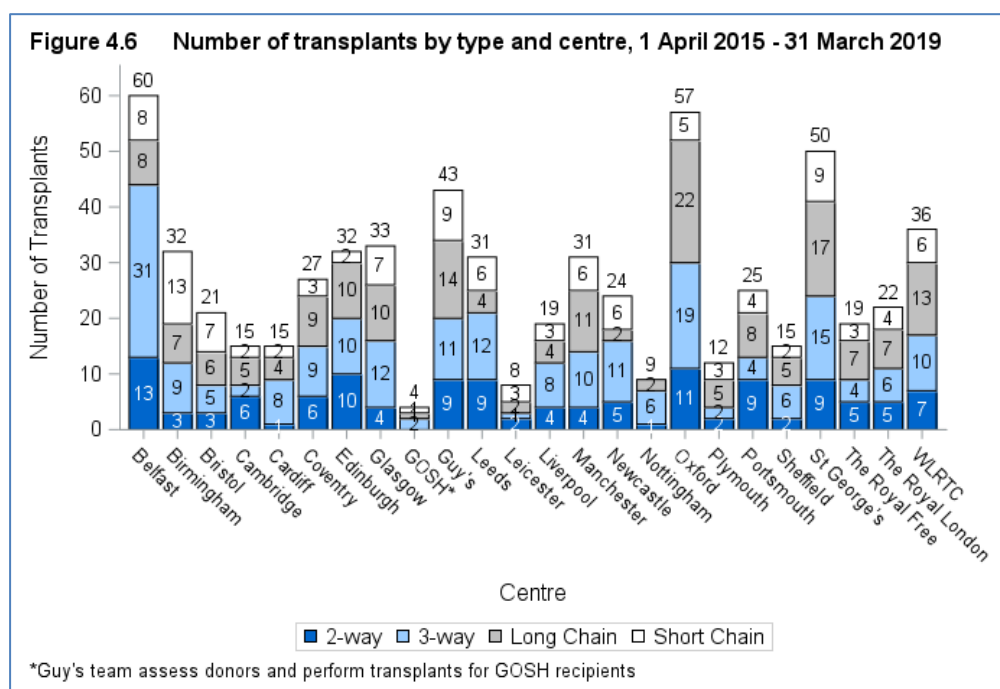


Figure 4.7 shows the patients transplanted from matching runs between 1 April 2015 and 31 March 2019. This is split by centre and the incompatibility of the patient with their registered donor. **Table 4.5** shows the percentage of pairs transplanted through paired donation given that they have been included in 1 or more, 2 or more or 5 or more matching runs. **Table 4.6** shows the average waiting time for transplant in the paired donation scheme. Data is censored if the patient received a transplant outside the scheme.

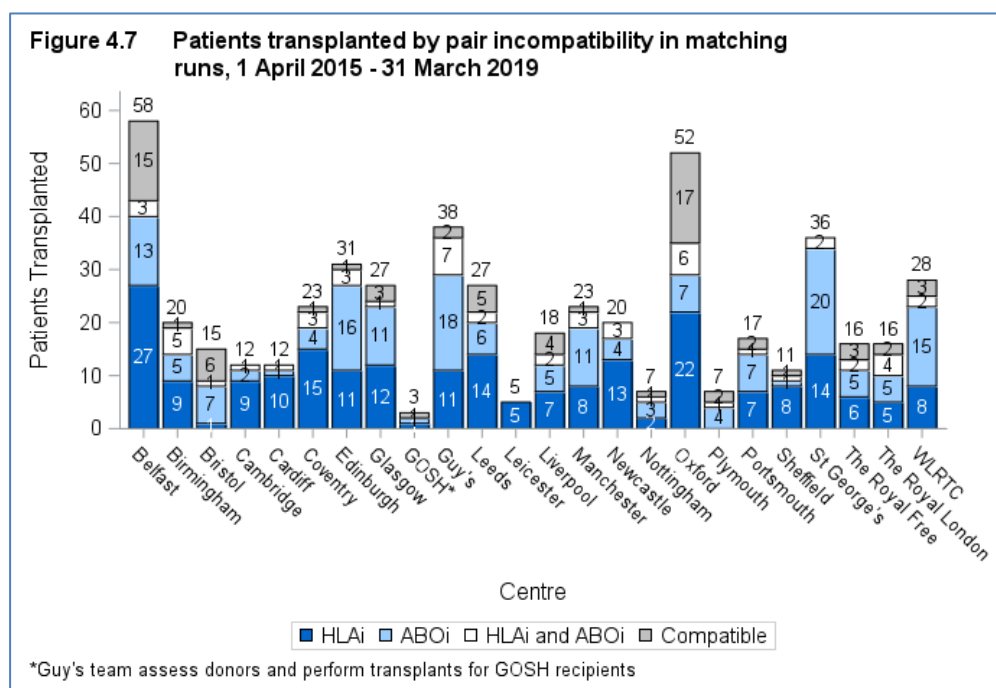
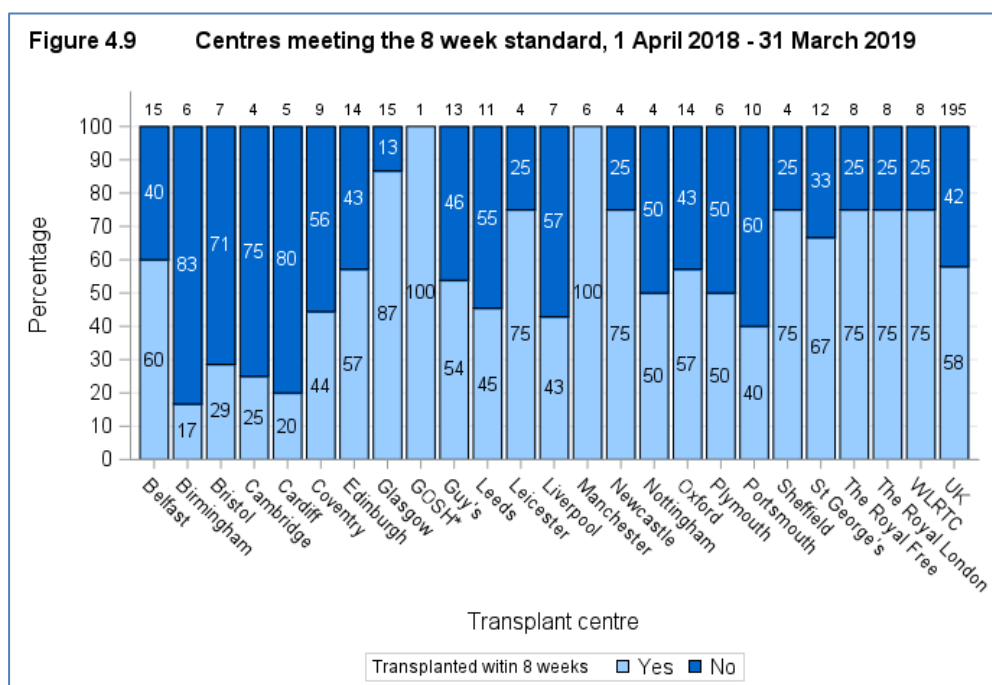
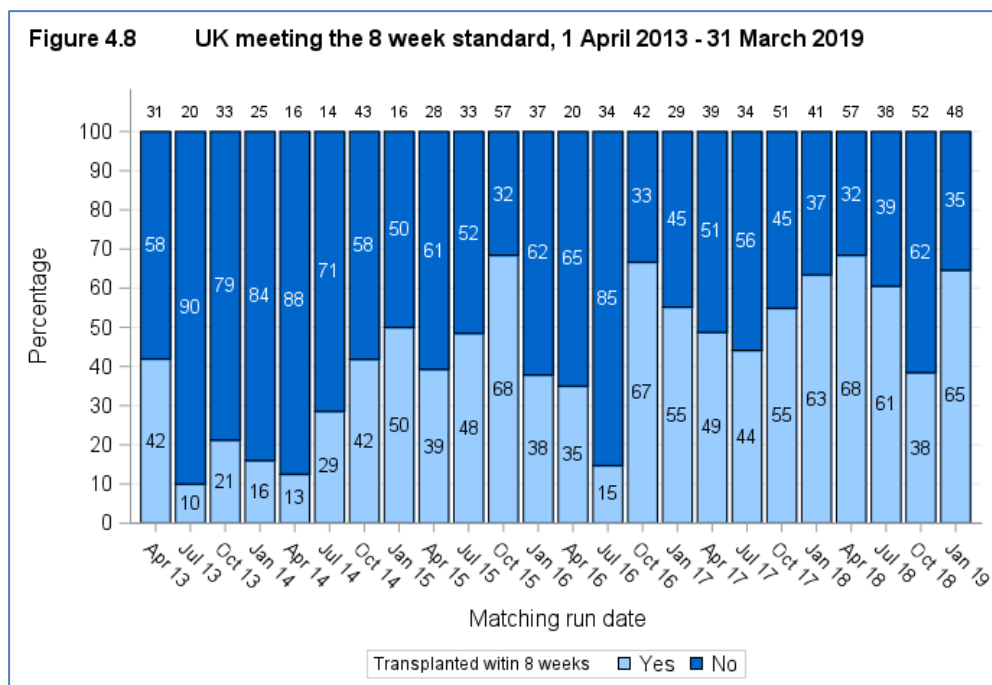


Table 4.5 Transplants by group type and Centre, April 2015 - March 2019					
Centre	Number of Transplants	2-way	3-way	Short Chain	Long Chain
Belfast	60	13	31	8	8
Birmingham	32	3	9	7	13
Bristol	21	3	5	6	7
Cambridge	15	6	2	5	2
Cardiff	15	1	8	4	2
Coventry	27	6	9	9	3
Edinburgh	32	10	10	10	2
Glasgow	33	4	12	10	7
GOSH*	4	0	2	1	1
Guy's	43	9	11	14	9
Leeds	31	9	12	4	6
Leicester	8	2	1	2	3
Liverpool	19	4	8	4	3
Manchester	31	4	10	11	6
Newcastle	24	5	11	2	6
Nottingham	9	1	6	2	0
Oxford	57	11	19	22	5
Plymouth	12	2	2	5	3
Portsmouth	25	9	4	8	4
Sheffield	15	2	6	5	2
St George's	50	9	15	17	9
The Royal Free	19	5	4	7	3
The Royal London	22	5	6	7	4
WLRTC	36	7	10	13	6
UK	640	130	213	183	114

Table 4.6 Median waiting time to paired donation kidney transplant in the UK, for patients registered 1 April 2009 - 31 March 2015			
Pair Incompatibility	Number of patients registered	Waiting time (days)	
		Median	95% Confidence interval
HLAi	314	1147	564 - 1730
ABOi	246	771	615 - 927
All Pairs	665	1139	758 - 1520

4.1.3 Recipients transplanted within the 8 week standard, 1 April 2013 – 31 March 2019

Figures 4.8 and 4.9 shows the time from date of transplant identified to surgery, by matching run date and transplant centre, respectively.



Where centres have fallen outside the 8 week standard this may reflect other centres being unable to accommodate the required date of surgery rather than the centre itself.

4.2 Non-directed Altruistic Donation

4.2.1 Transplants, 1 April 2010 – 31 March 2019

Figure 4.10 shows the number of altruistic donor kidney transplants from 1 April 2010 to 31 March 2019. This is split by whether the donation was to the deceased donor waiting list or the paired donation scheme. The number of transplants has increased from 28 in 2010/11 to 118 in 2013/14 before falling to 64 in 2018/19.

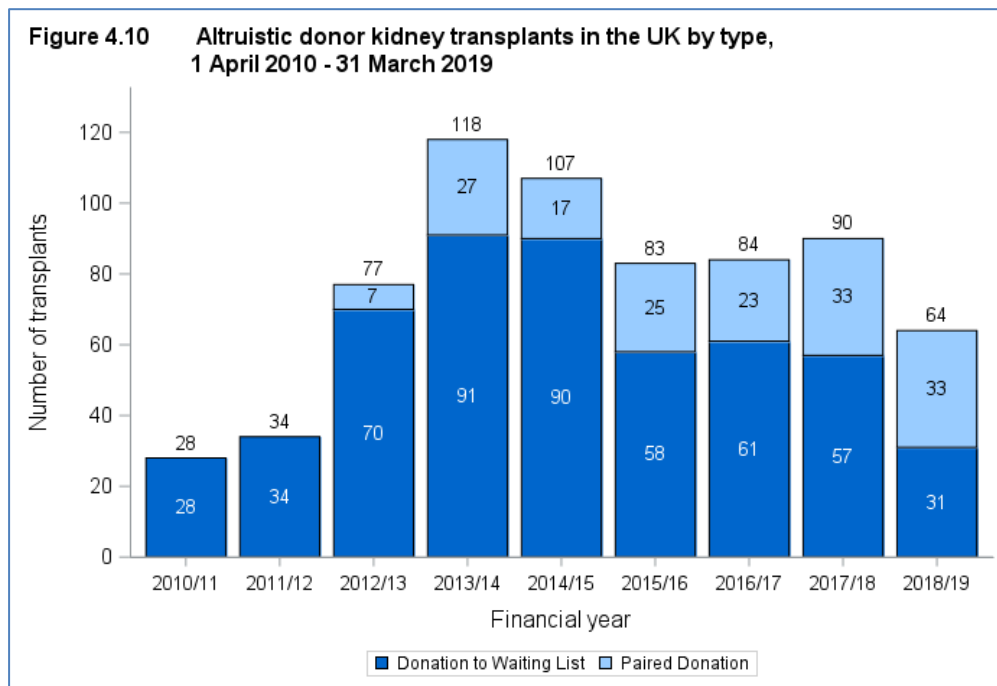
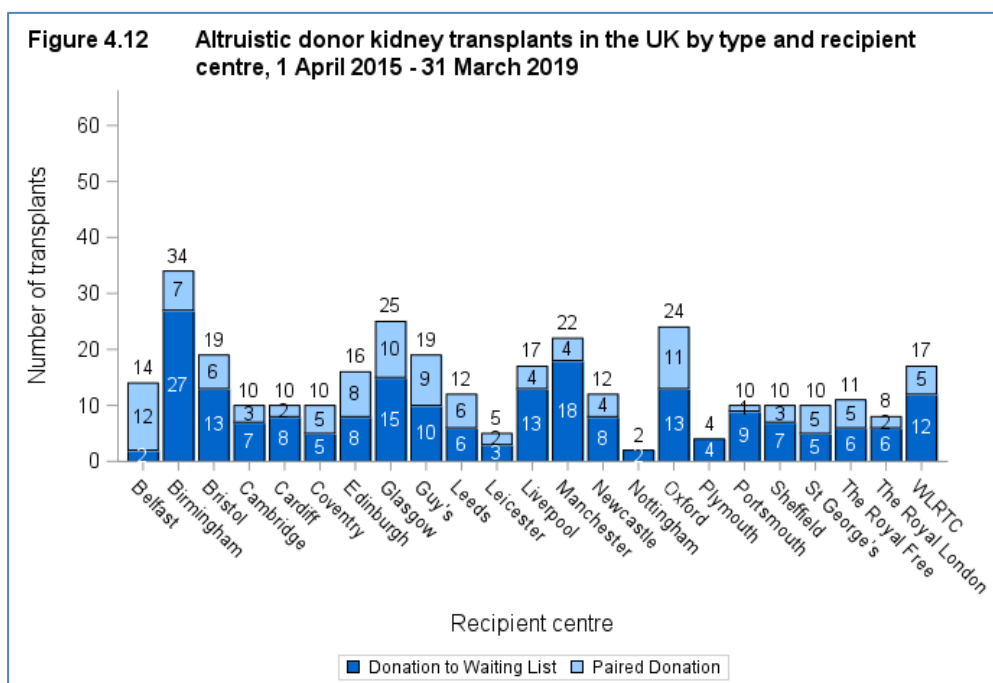
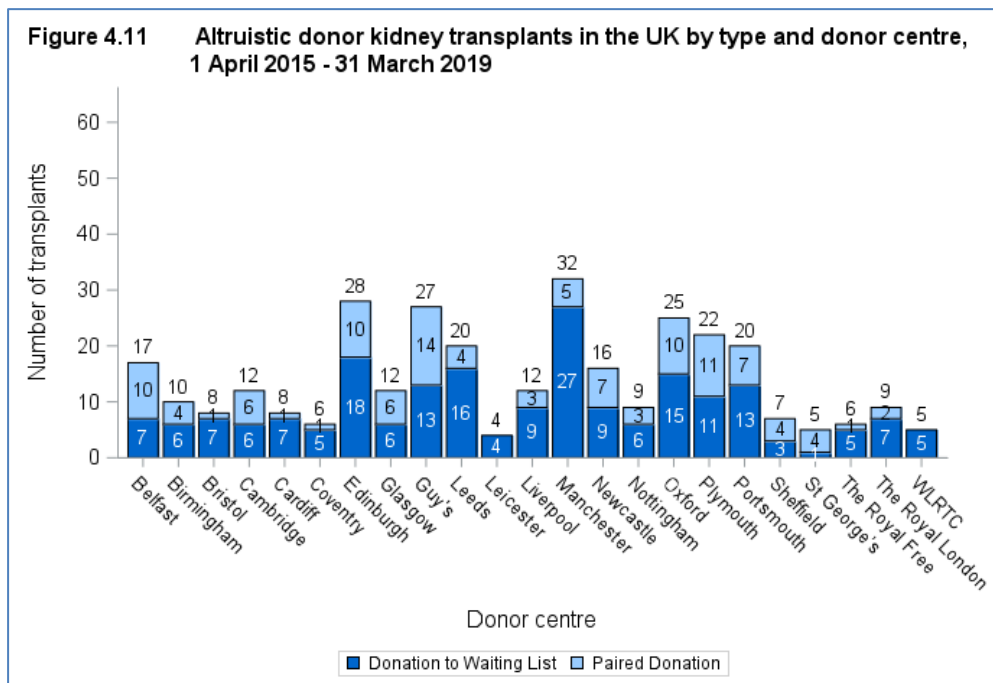


Figure 4.11 shows the number of altruistic donor kidney transplants from 1 April 2015 to 31 March 2019 by donor centre. Manchester had the highest number of altruistic donors. **Figure 4.12** shows the number of altruistic donor kidney transplant from 1 April 2015 to 31 March 2019 by recipient centre. Birmingham had the highest number of recipients of altruistic donors.



4.2.2 Time to donation, 1 April 2015 – 31 March 2019

Figure 4.13 shows the median time in months from notification to donation from 1 April 2015 to 31 March 2019, by centre. This ranged from 1 to 3 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.

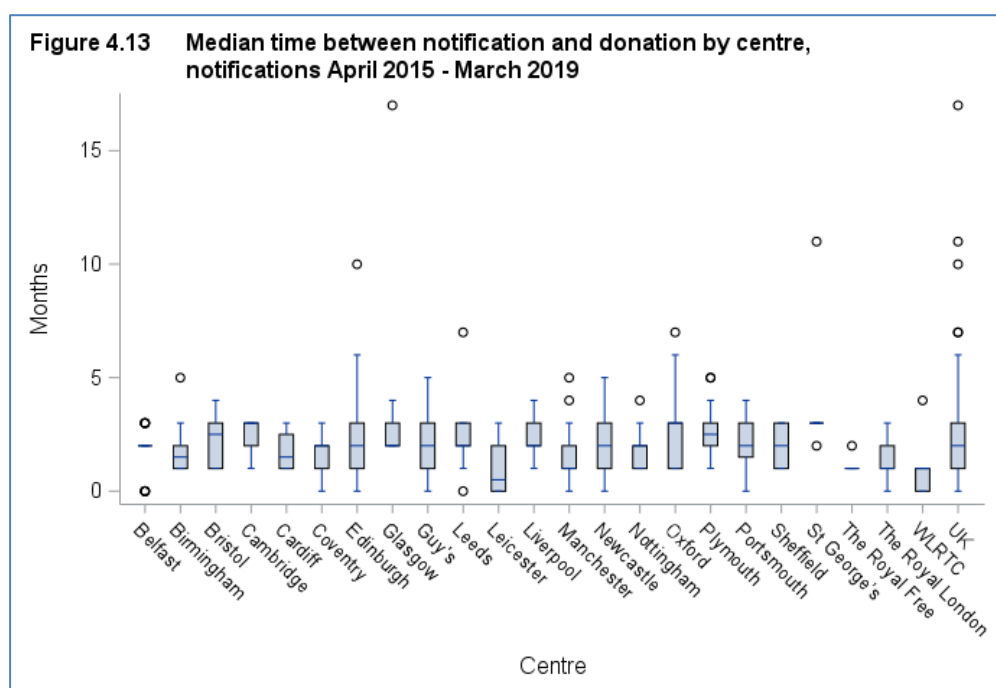


Table 4.7 Median time between notification and donation by Centre, Donations April 2015 - March 2019			
Centre	Number of donors	Median	Interquartile range
Belfast	17	2	2 - 2
Birmingham	10	2	1 - 2
Bristol	8	2	1 - 3
Cambridge	12	3	2 - 3
Cardiff	8	2	1 - 2
Coventry	6	2	1 - 2
Edinburgh	27	2	1 - 3
Glasgow	11	2	2 - 3
Guy's	27	2	1 - 3
Leeds	19	2	2 - 3
Leicester	4	1	0 - 2
Liverpool	12	2	2 - 3
Manchester	29	1	1 - 2
Newcastle	15	2	1 - 3
Nottingham	9	2	1 - 2
Oxford	20	3	1 - 3
Plymouth	22	3	2 - 3
Portsmouth	20	2	2 - 3
Sheffield	7	2	1 - 3
St George's	5	3	3 - 3
The Royal Free	6	1	1 - 1
The Royal London	9	1	1 - 2
WLRTC	5	1	0 - 1
UK	308	2	1 - 3

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.

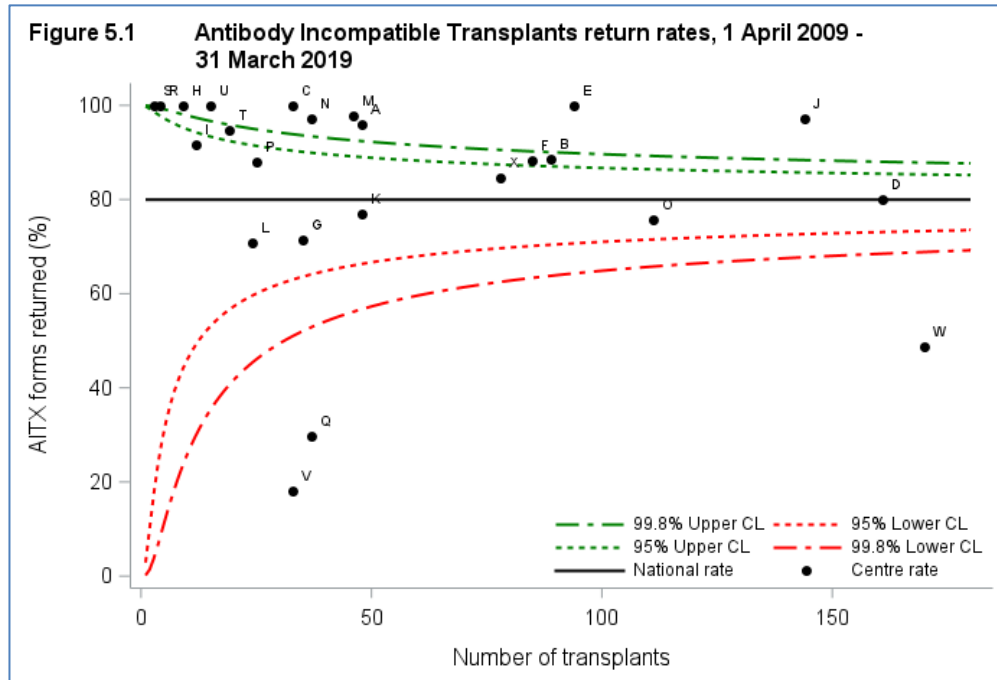


Table 5.1 **Antibody incompatible transplant form return rates,
1 April 2009 – 31 March 2019**

Transplant Centre	Code	Number of transplants	AITX forms returned	
			N	%
Belfast	A	48	46	96
Birmingham	B	89	79	89
Bristol	C	33	33	100
Cambridge	D	161	129	80
Cardiff	E	94	94	100
Coventry	F	85	75	88
Edinburgh	G	35	25	71
Glasgow	H	9	9	100
GOSH*	I	12	11	92
Guy's	J	144	140	97
Leeds	K	48	37	77
Leicester	L	24	17	71
Liverpool	M	46	45	98
Manchester	N	37	36	97
Newcastle	O	111	84	76
Nottingham	P	25	22	88
Oxford	Q	37	11	30
Plymouth	R	4	4	100
Portsmouth	S	3	3	100
Sheffield	T	19	18	95
St George's	U	15	15	100
The Royal Free	V	33	6	18
The Royal London	W	170	83	49
WLRTC	X	78	66	85
UK		1360	1088	80

*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 41 in the latest financial year.

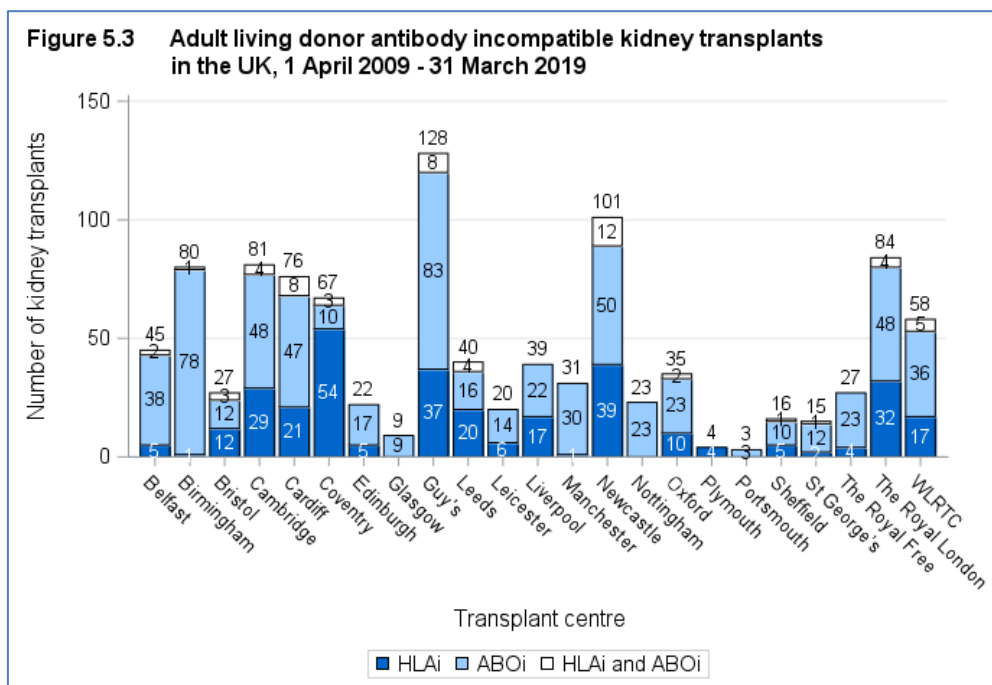
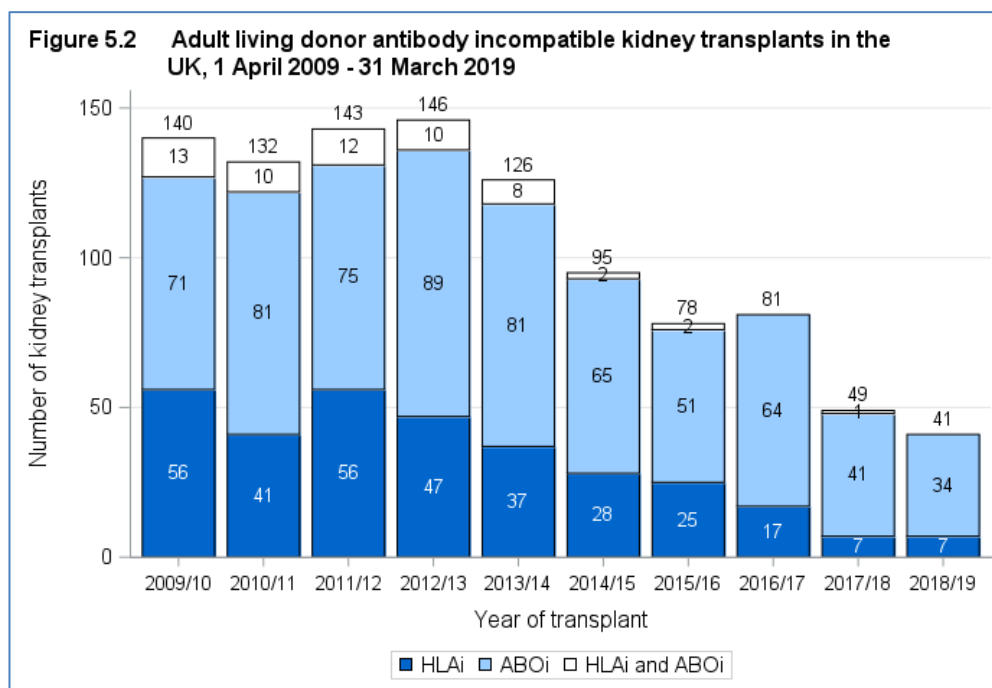


Table 5.2 shows the donor and recipient blood group for all ABOi transplants.

Table 5.2 Donor and recipient blood group for all adult ABOi transplants, 1 April 2009 - 31 March 2019						
Recipient blood group	Donor blood group					
	A		B		AB	
	N	(%)	N	(%)	N	(%)
A	1	(<1)	70	(10)	50	(7)
B	89	(13)	1	(<1)	32	(5)
O	326	(46)	124	(18)	12	(2)

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 2009 - 31 March 2019								
Donor-Recipient ABO	Recipient CRF at transplant							
	0-9		10-84		85-94		95-100	
	N	(%)	N	(%)	N	(%)	N	(%)
A-A	18	(2)	20	(2)	13	(1)	30	(3)
A-AB	2	(<1)	2	(<1)	1	(<1)	1	(<1)
A-B	60	(6)	15	(2)	3	(<1)	11	(1)
A-O	219	(21)	77	(8)	13	(1)	18	(2)
AB-A	36	(4)	9	(1)	3	(<1)	2	(<1)
AB-AB	1	(<1)	-		1	(<1)	3	(<1)
AB-B	25	(2)	4	(<1)	1	(<1)	2	(<1)
AB-O	8	(1)	1	(<1)	2	(<1)	1	(<1)
B-A	50	(5)	11	(1)	3	(<1)	6	(1)
B-AB	-		-		-		1	(<1)
B-B	6	(1)	4	(<1)	3	(<1)	8	(1)
B-O	78	(8)	34	(3)	8	(1)	4	(<1)
O-A	21	(2)	8	(1)	4	(<1)	14	(1)
O-AB	3	(<1)	2	(<1)	-		-	
O-B	1	(<1)	8	(1)	1	(<1)	6	(1)
O-O	35	(3)	35	(3)	22	(2)	51	(5)

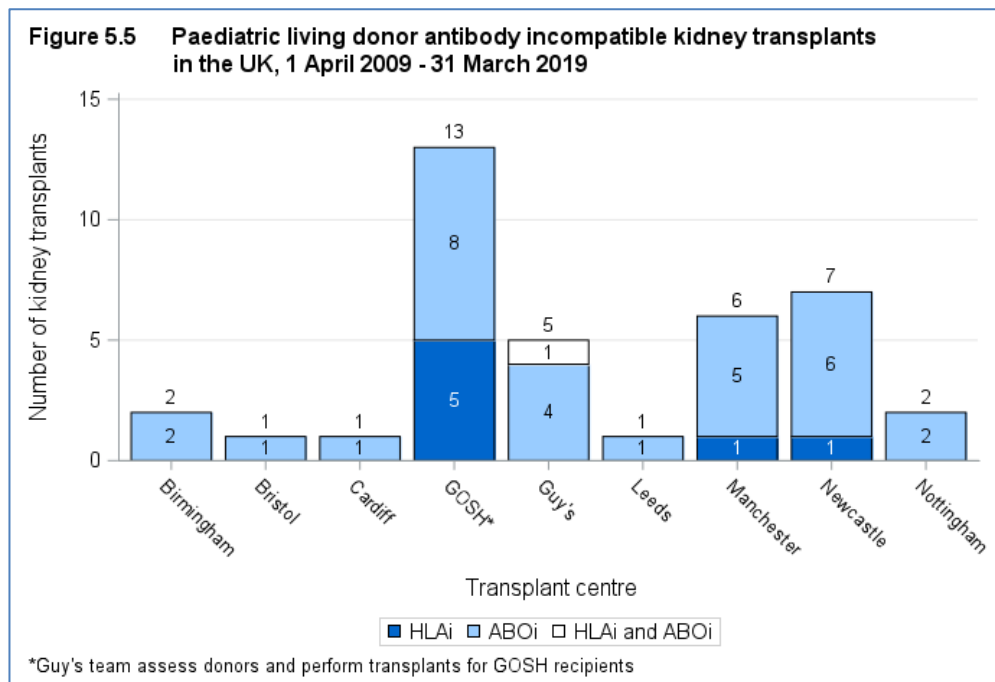
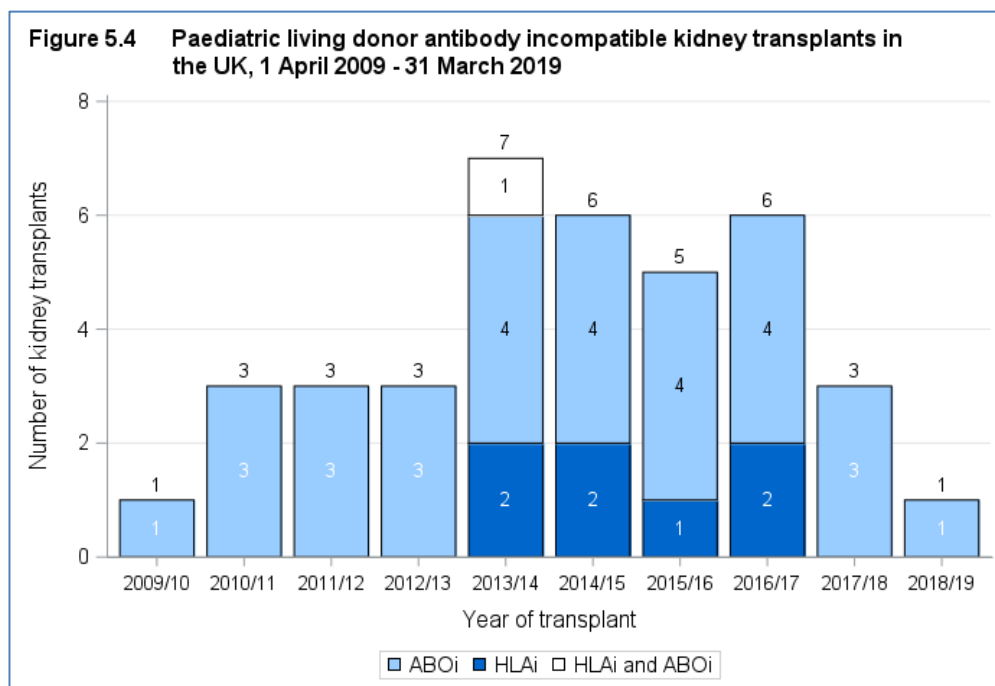
Table 5.4 shows the pre and at transplant level group for all HLAi transplants. Data are only presented for cases where an antibody incompatible form has been completed and returned. **Table 5.5** shows the calculated reaction frequency by incompatibility type.

Table 5.4 Pre and at transplant antibody level group for all adult HLAi transplants, 1 April 2009 - 31 March 2019										
Pre treatment antibody level group	At Transplant antibody level group									
	CDC pos, Flow pos, DSA SPA pos		CDC neg, Flow pos, DSA SPA pos		CDC neg, Flow neg, DSA SPA pos		CDC neg, Flow neg, DSA SPA neg		CDC NT, Flow pos, DSA SPA pos	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
CDC NT, Flow pos, DSA SPA pos	-		-		20	(5)	-		15	(4)
CDC neg, Flow neg, DSA SPA pos	-		1	(<1)	100	(26)	22	(6)	-	
CDC neg, Flow pos, DSA SPA pos	-		79	(20)	45	(12)	38	(10)	-	
CDC pos, Flow pos, DSA SPA pos	4	(1)	14	(4)	11	(3)	5	(1)	1	(<1)
Unknown	-		1	(<1)	-		1	(<1)	-	

Table 5.5 At transplant calculated reaction frequency by incompatibility type, 1 April 2009 - 31 March 2019						
Calculated Reaction Frequency	ABOi		HLAi		HLAi and ABOi	
	N	%	N	%	N	%
0-9	472	(72)	82	(26)	10	(17)
10-84	138	(21)	78	(24)	14	(24)
85-94	24	(4)	46	(14)	9	(16)
95-100	18	(3)	115	(36)	25	(43)

PAEDIATRIC

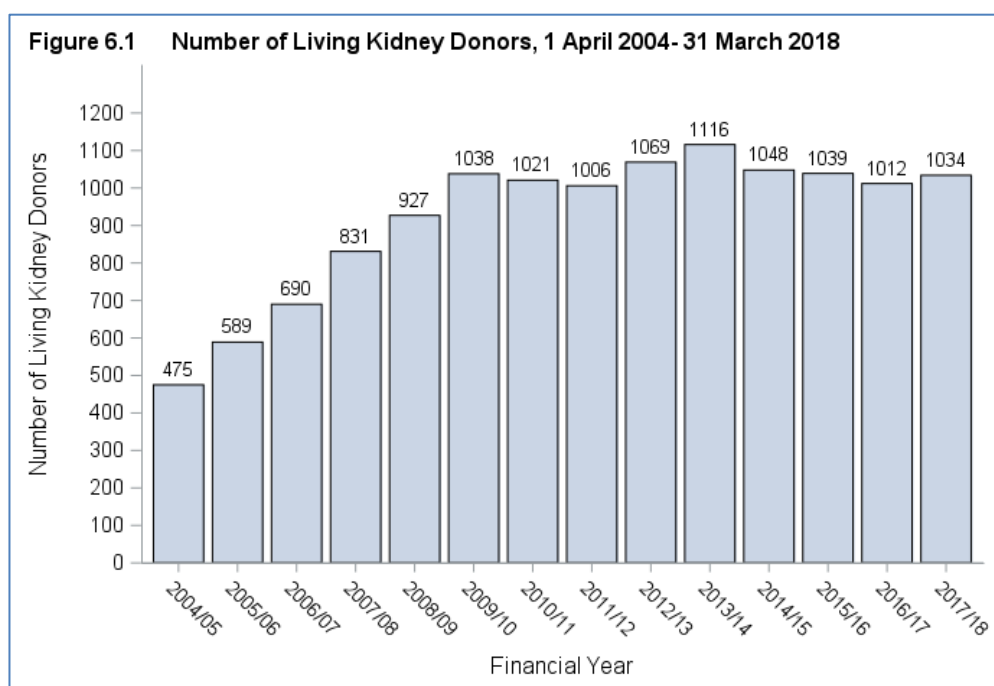
Figures 5.4 and 5.5 show the number of living donor antibody incompatible kidney transplants by financial year and centre respectively.



Living Donor Follow-Up

This section contains information on all living donors who have donated to both adult and paediatric recipients from 2004/05 to 2017/18. 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 2004/05 to 2017/18. The number of living donors has increased from 475 in 2004/05 to 1034 in 2017/18.



Of the living donors over this period, 87 deaths have been recorded. The causes of death are shown in **Table 6.1**. No donors have joined the kidney waiting list, although one has received a kidney transplant from a living donor.

Table 6.1 Cause of death for living donors 1 April 2004 – 31 March 2018		
Cause of Death	N	%
Cancer	39	45
Bowel	3	3
Breast	4	4
Colonic	1	1
Gastric	1	1
Liver	1	1
Lung	2	2
Oesophagus	3	3
Pancreatic	7	8
Prostate	1	1
Testicular	1	1
Throat	1	1
Uterus	1	1
Other	13	15
Brain Tumor	2	2
Intracranial hemorrhage	4	4
Seizure	2	2
Parkinson's disease	1	1
Pulmonary embolism	1	1
Bronchopneumonia	2	2
Other	10	11
Unknown	26	30
TOTAL	87	100

6.1 Prescription of Antihypertensive drugs, 1 April 2004 – 31 March 2018

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, 7% at five years and 11% at ten years post donation.

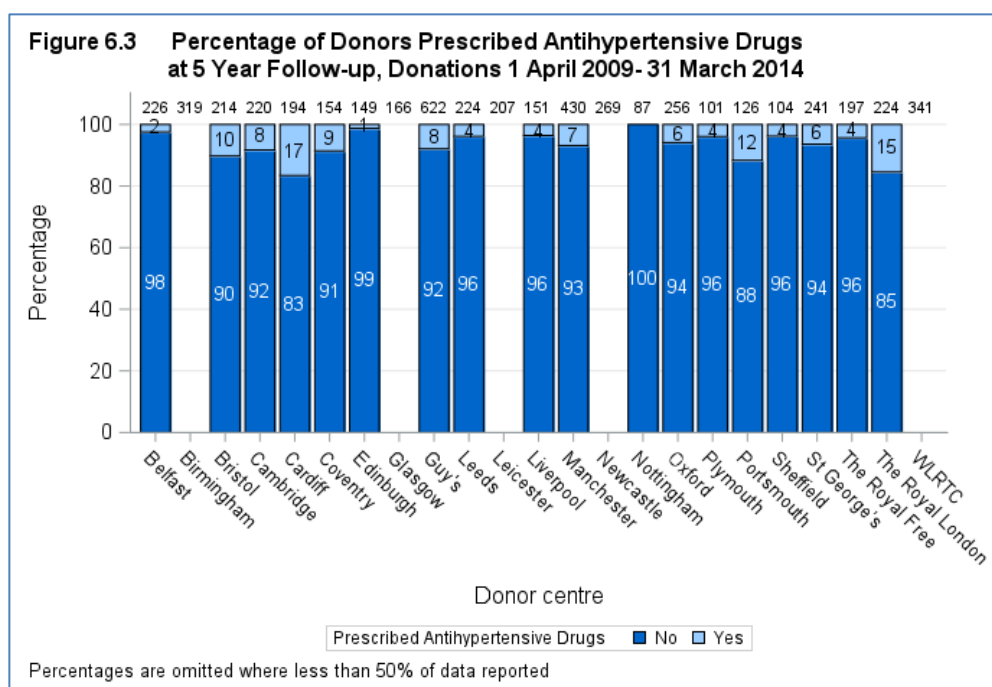
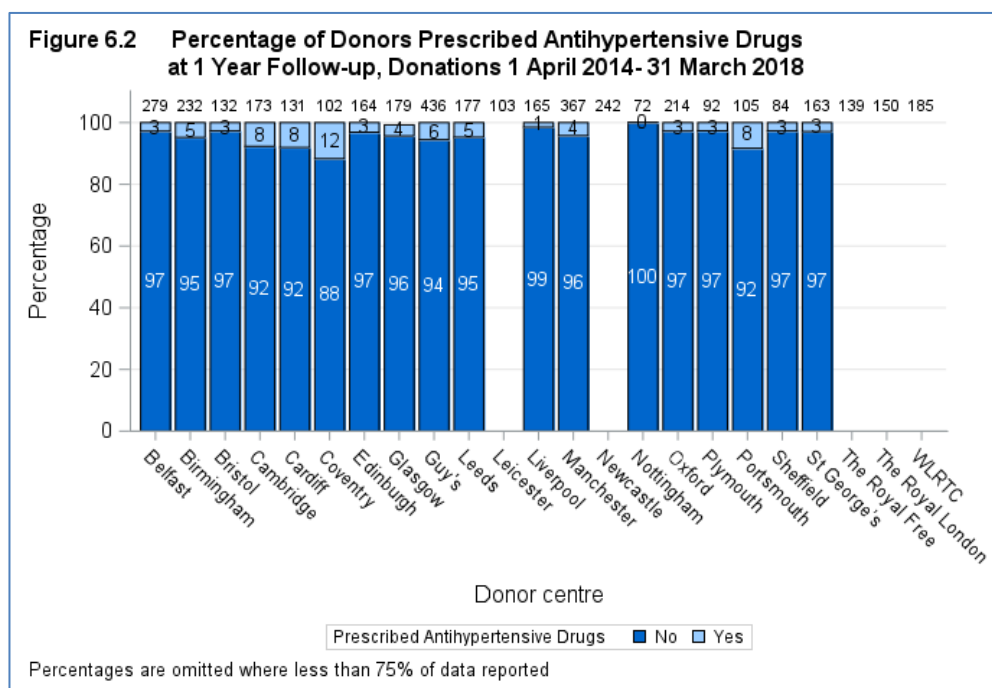


Figure 6.4 Percentage of Donors Prescribed Antihypertensive Drugs at 10 Year Follow-up, Donations 1 April 2004- 31 March 2009

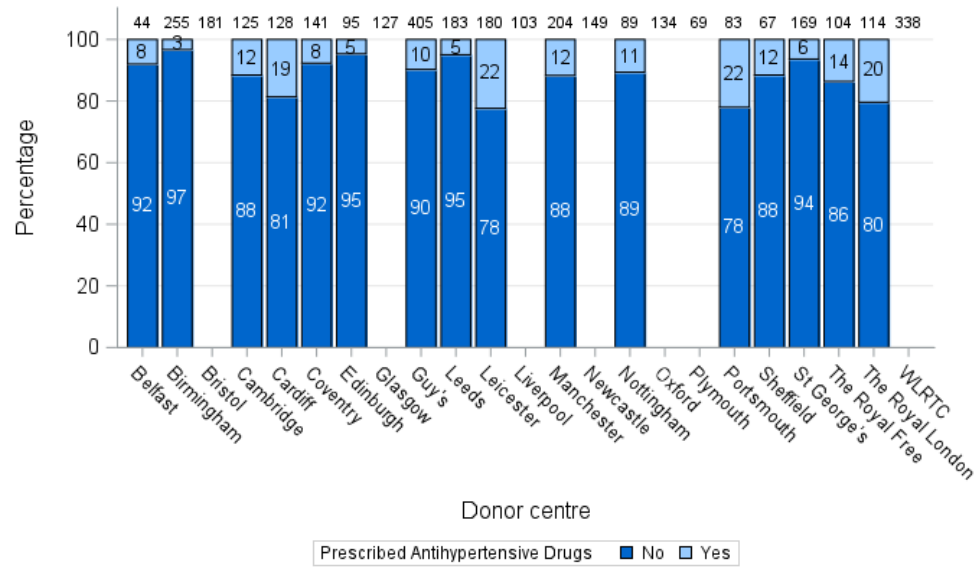


Table 6.2 Percentage of Donors Prescribed Antihypertensive Drugs by Centre, Donations April 2004 - March 2018

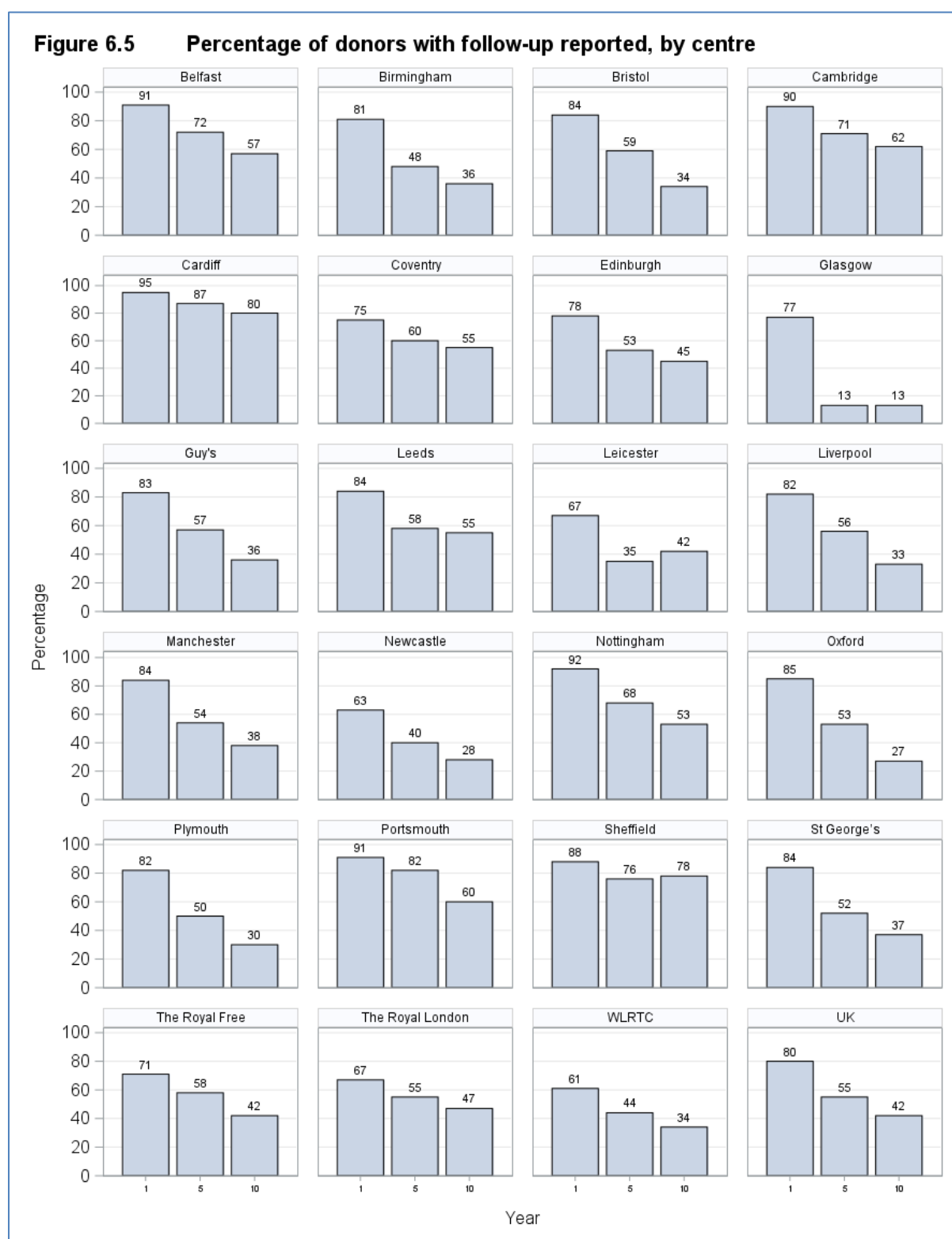
Centre	1 Year			5 Year			10 Year		
	N	% ¹	% ²	N	% ¹	% ²	N	% ¹	% ²
Belfast	279	91	3	226	72	2	44	57	8
Birmingham	232	81	5	319	48	-	255	36	3
Bristol	132	84	3	214	59	10	181	34	-
Cambridge	173	90	8	220	71	8	125	62	12
Cardiff	131	95	8	194	87	17	128	80	19
Coventry	102	75	12	154	60	9	141	55	8
Edinburgh	164	78	3	149	53	1	95	45	5
Glasgow	179	77	4	166	13	-	127	13	-
Guy's	436	83	6	622	57	8	405	36	10
Leeds	177	84	5	224	58	4	183	55	5
Leicester	103	67	-	207	35	-	180	42	22
Liverpool	165	82	1	151	56	4	103	33	-
Manchester	367	84	4	430	54	7	204	38	12
Newcastle	241	63	-	269	40	-	149	28	-
Nottingham	72	92	0	87	68	0	89	53	11
Oxford	214	85	3	256	53	6	134	27	-
Plymouth	92	82	3	101	50	4	69	30	-
Portsmouth	105	91	8	126	82	12	83	60	22
Sheffield	84	88	3	104	76	4	67	78	12
St George's	163	84	3	241	52	6	169	37	6
The Royal Free	139	71	-	197	58	4	104	42	14
The Royal London	150	67	-	224	55	15	114	47	20
WLRTC	185	61	-	341	44	-	338	34	-
UK	4085	80	4	5222	55	7	3487	42	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 2004 - March 2018.



6.2 Serum creatinine, 1 April 2004 – 31 March 2018

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 104 (IQ-range 90-120) at one year, 97 (84-111) at five years and 92 (81-106) at ten years post donation.

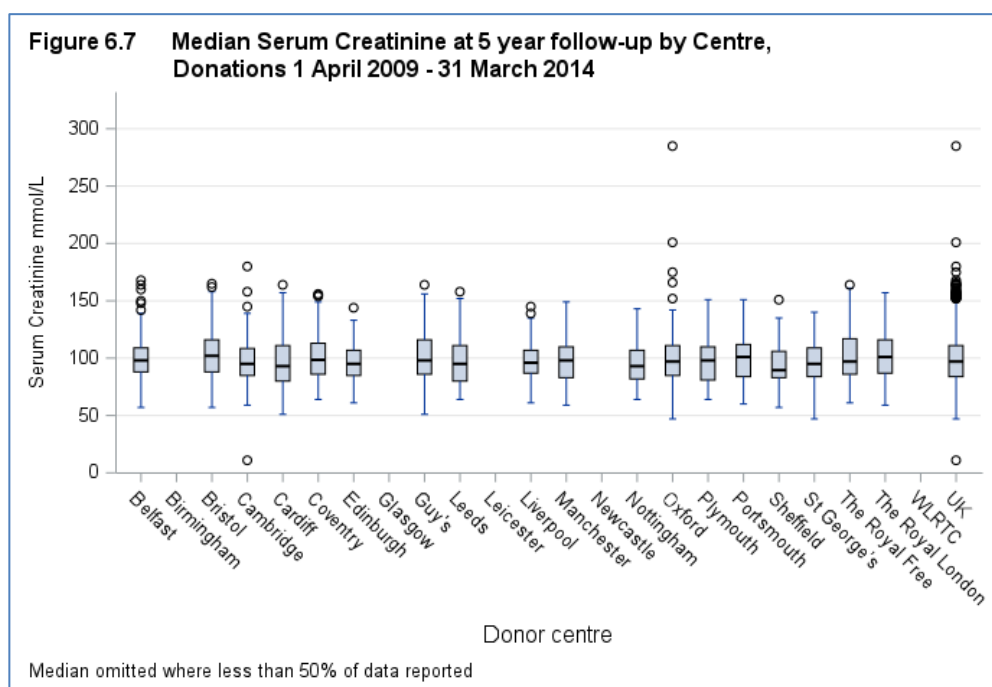
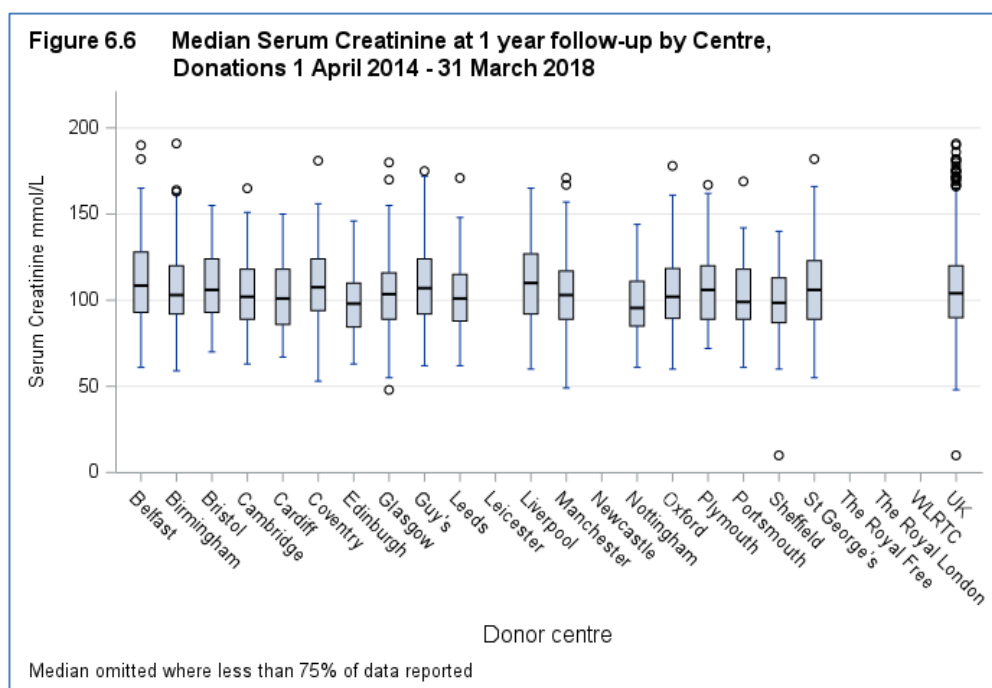


Figure 6.8 Median Serum Creatinine at 10 year follow-up by Centre,
Donations 1 April 2004 - 31 March 2009

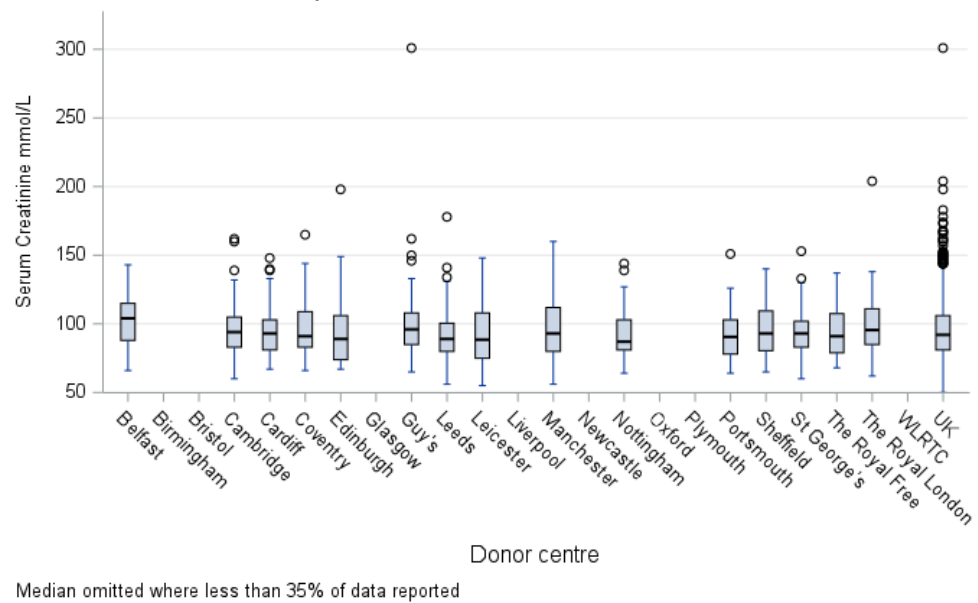


Table 6.3

**Median Serum Creatinine at 1, 5 and 10 year follow up by Centre,
Donations 1 April 2004 - 31 March 2018**

Centre	1 Year			5 Year			10 Year		
	N	% ¹	Median (IQ range)	N	% ¹	Median (IQ range)	N	% ¹	Median (IQ range)
Belfast	279	90	108.5 (93-128)	226	72	98 (88-109)	44	57	104 (88-115)
Birmingham	232	80	103 (92-120)	319	48	(-)	255	35	90 (81-103)
Bristol	132	84	106 (93-124)	214	58	102 (88-116)	181	34	(-)
Cambridge	173	90	102 (89-118)	220	71	95 (85-108.5)	125	62	94 (83-105)
Cardiff	131	93	101 (86-118)	194	87	93 (80-111)	128	80	93 (81-103)
Coventry	102	76	107.5 (94-124)	154	61	98.5 (86-113)	141	55	91 (83-109)
Edinburgh	164	78	98 (84.5-110)	149	52	95 (85-107)	95	45	89 (74-106)
Glasgow	179	77	103.5 (89-116)	166	13	(-)	127	13	(-)
Guy's	436	82	107 (92-124)	622	56	98 (86-116)	405	36	96 (85-108)
Leeds	177	82	101 (88-115)	224	56	95 (80-111)	183	55	89 (80-100.5)
Leicester	103	64	- (---)	207	34	(-)	180	41	88.5 (75-108)
Liverpool	165	76	110 (92-127)	151	54	96 (87-107)	103	33	(-)
Manchester	367	83	103 (89-117)	430	53	98 (83-110)	204	38	93 (80-112)
Newcastle	241	63	- (---)	269	40	(-)	149	28	(-)
Nottingham	72	92	95.5 (85-111)	87	68	93 (82-107)	89	53	87 (81-103)
Oxford	214	84	102 (89.5-118.5)	256	53	97 (85-111)	134	27	(-)
Plymouth	92	82	106 (89-120)	101	50	98 (81-110)	69	30	(-)
Portsmouth	105	90	99 (89-118)	126	79	101 (84-112)	83	60	90.5 (78-103)
Sheffield	84	88	98.5 (87-113)	104	75	89.5 (83-106)	67	78	93 (80.5-109.5)
St George's	163	82	106 (89-123)	241	51	95 (84-109)	169	37	93 (83-102)
The Royal Free	139	71	- (---)	197	58	97 (86-117)	104	42	91 (79-107.5)
The Royal London	150	67	- (---)	224	54	101 (87-116)	114	47	95.5 (85-111)
WLRTC	185	61	- (---)	341	44	(-)	338	34	(-)
UK	4085	80	104 (90-120)	5222	55	97 (84-111)	3487	41	92 (81-106)

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 2004 – 31 March 2018

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.

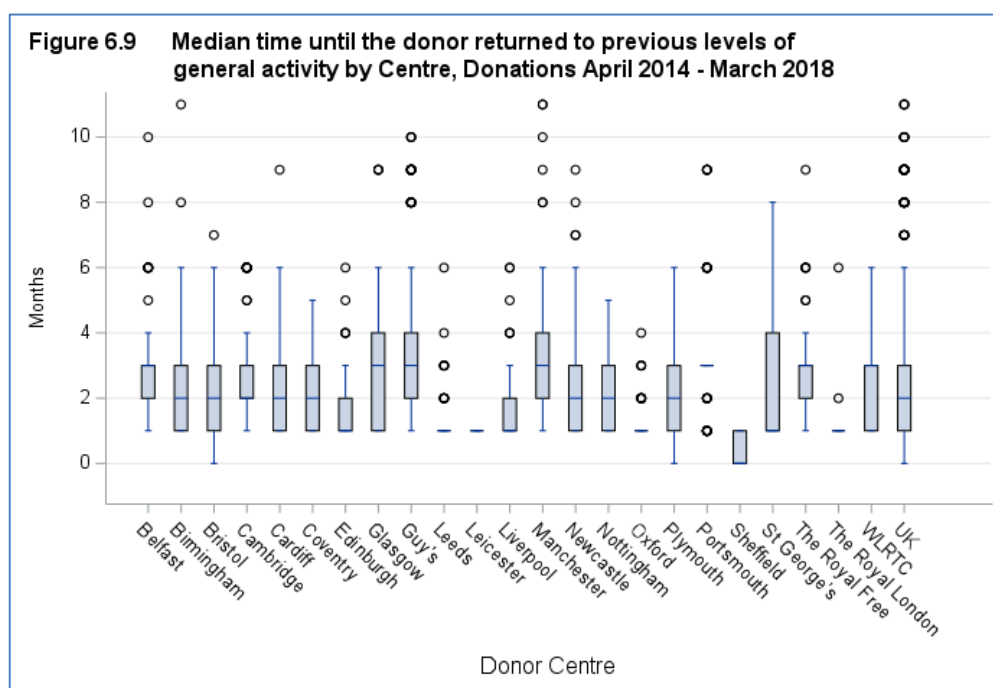
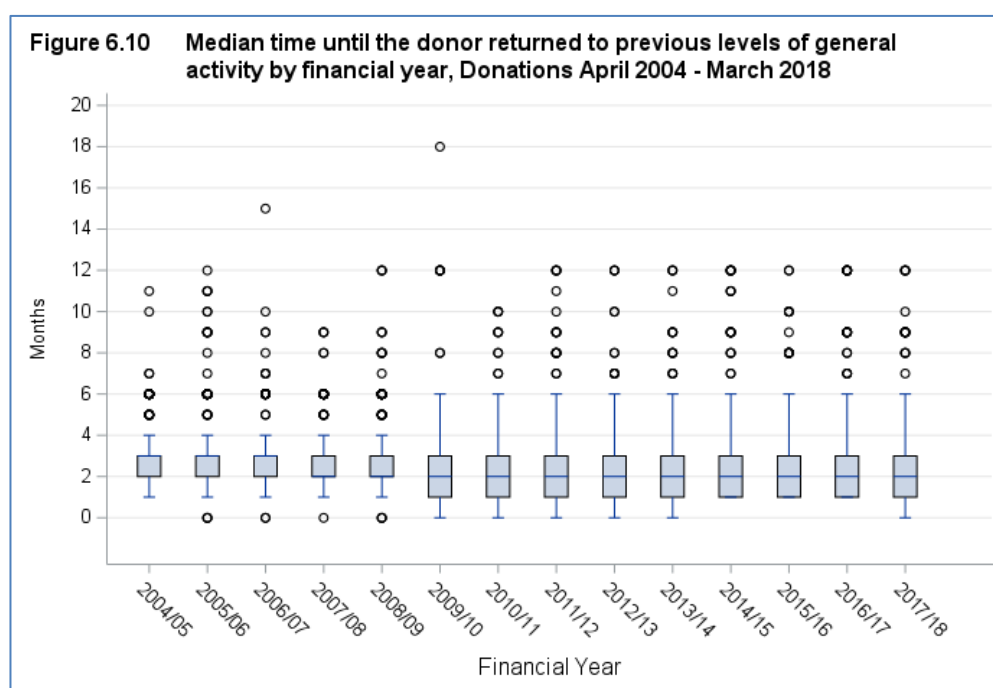


Figure 6.10 shows the median time (in months) to return to normal activity after donation in the UK, by financial year.



Recipient 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.

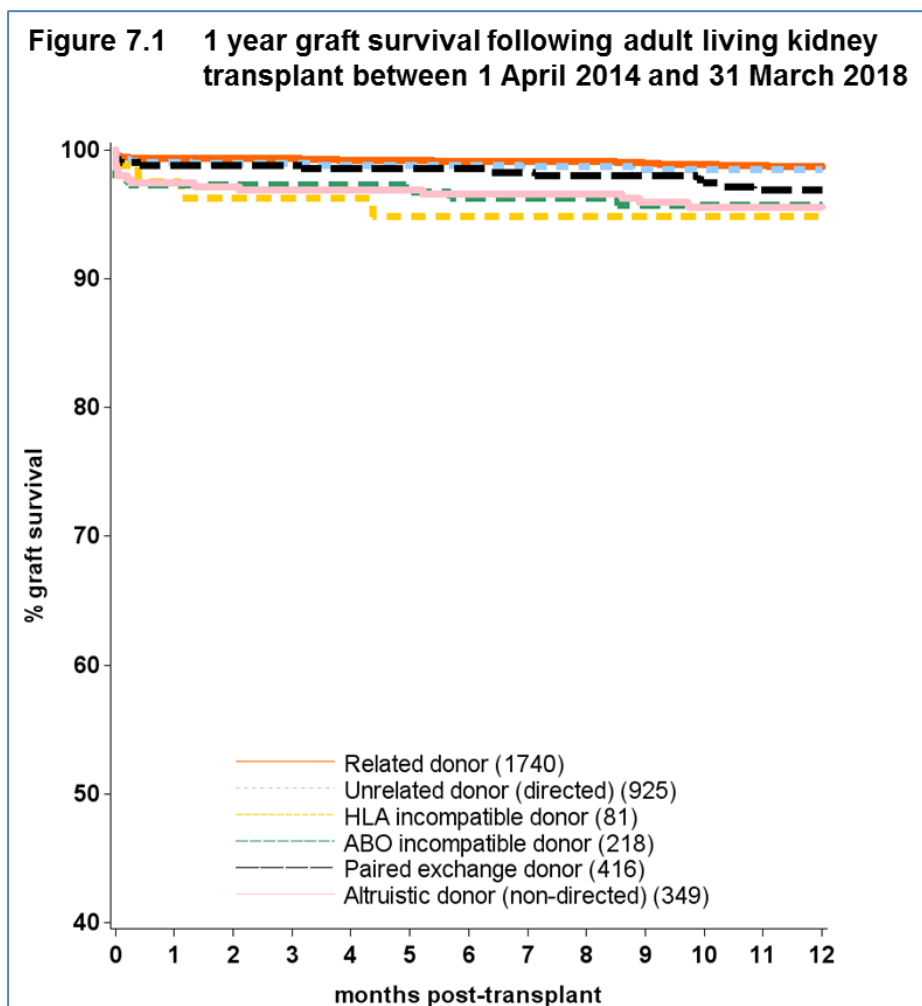


Table 7.1 1 year graft survival following living kidney transplant between 1 April 2014 and 31 March 2018 (p=0.0001)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1740	98.7	(98-99)
Unrelated donor (directed)	925	98.4	(97-99)
Paired exchange donor	416	96.8	(94-98)
ABO incompatible donor	218	95.7	(92-98)
Altruistic donor (non-directed)	349	95.6	(93-97)
HLA incompatible donor	81	94.8	(87-98)

Figure 7.2 5 year graft survival following adult living kidney transplant between 1 April 2010 and 31 March 2014

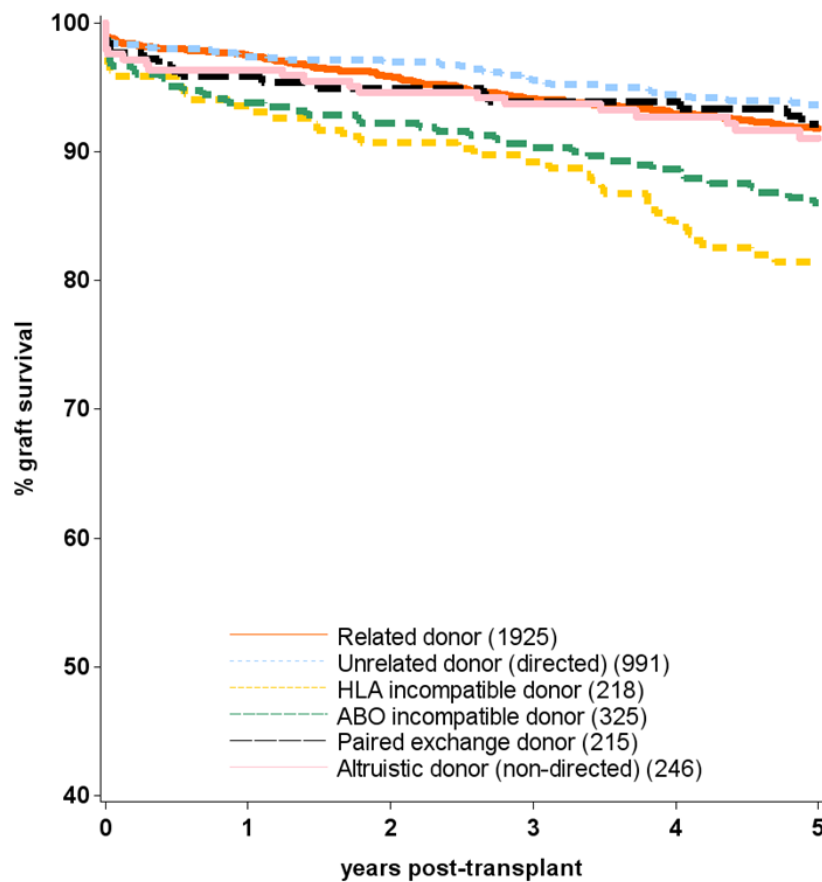


Table 7.2 5 year graft survival following living kidney transplant between 1 April 2010 and 31 March 2014 (p<0.0001)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Unrelated donor (directed)	991	93.7	(92-95)
Paired exchange donor	215	92.1	(87-95)
Related donor	1925	91.8	(90-93)
Altruistic donor (non-directed)	246	91.0	(86-94)
ABO incompatible donor	325	86.0	(82-89)
HLA incompatible donor	218	81.4	(75-86)

Figure 7.3 1 year patient survival following adult living kidney transplant between 1 April 2014 and 31 March 2018

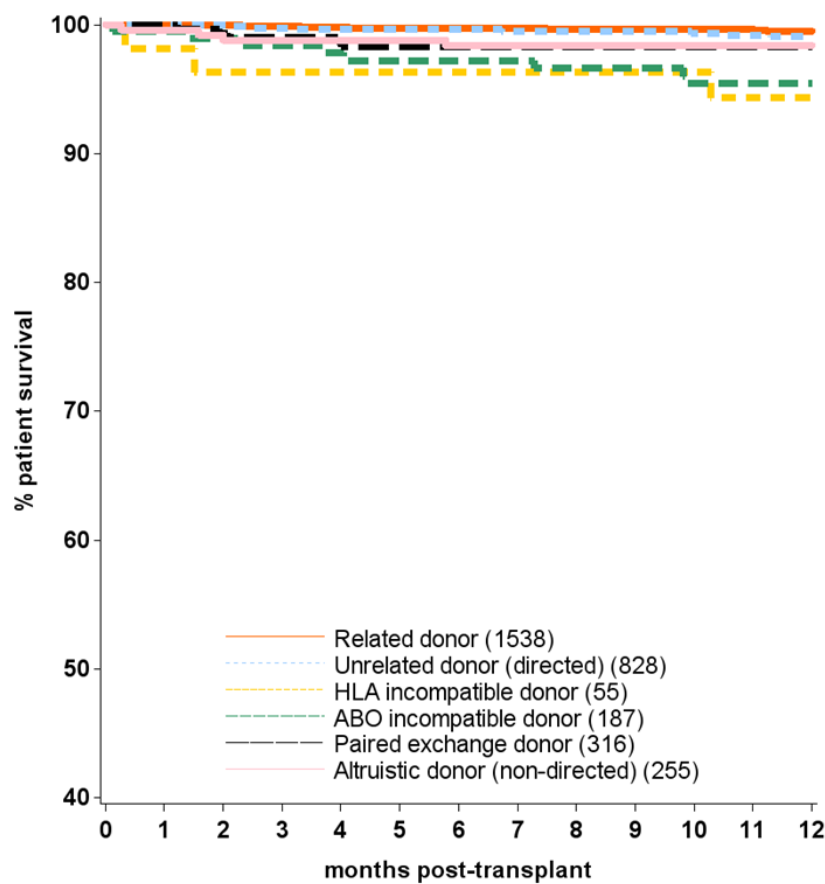


Table 7.3 1 year patient survival following living kidney transplant between 1 April 2014 and 31 March 2018 (p<0.0001)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1538	99.5	(99-100)
Unrelated donor (directed)	828	99.1	(98-100)
Altruistic donor (non-directed)	255	98.4	(96-99)
Paired exchange donor	316	98.3	(96-99)
ABO incompatible donor	187	95.4	(91-98)
HLA incompatible donor	55	94.4	(83-98)

Figure 7.4 5 year patient survival following adult living kidney transplant between 1 April 2010 and 31 March 2014

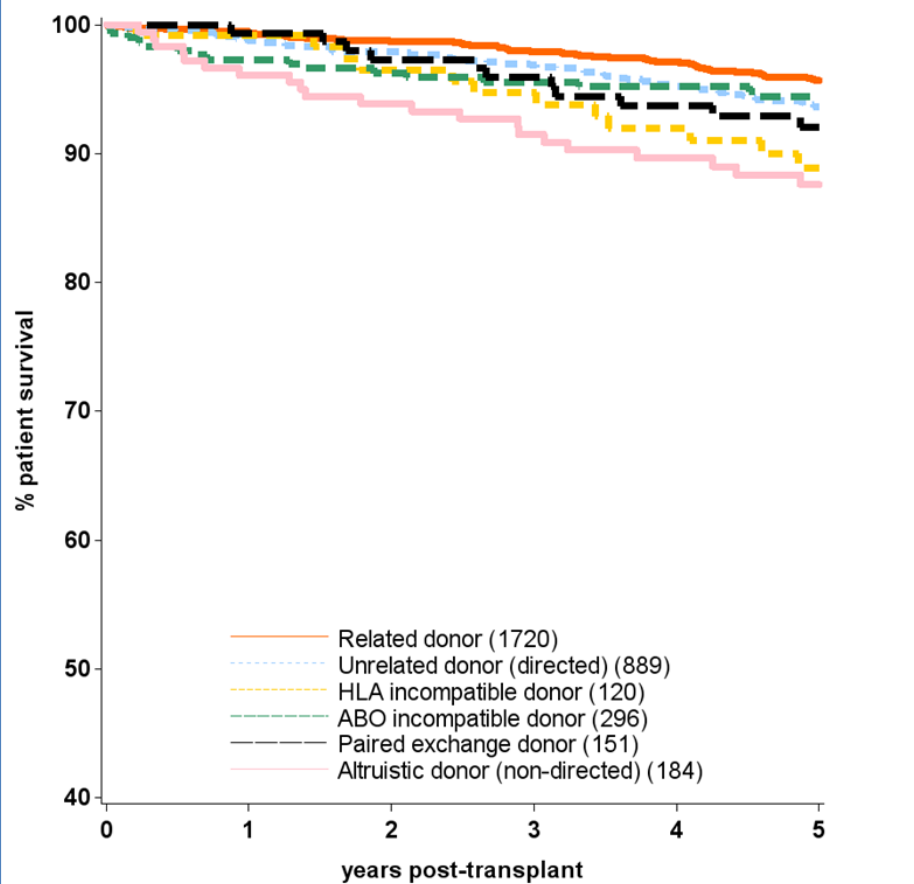


Table 7.4 5 year patient survival following living kidney transplant between 1 April 2010 and 31 March 2014 (p<0.0001)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1720	95.7	(95-97)
ABO incompatible donor	296	94.4	(91-97)
Unrelated donor (directed)	889	93.6	(92-95)
Paired exchange donor	151	92.0	(86-96)
HLA incompatible donor	120	88.9	(81-94)
Altruistic donor (non-directed)	184	87.6	(82-92)

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 patients return to local renal units for follow-up care after their transplant and although we report survival according to transplant unit, patients 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 patient 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 7.10 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.

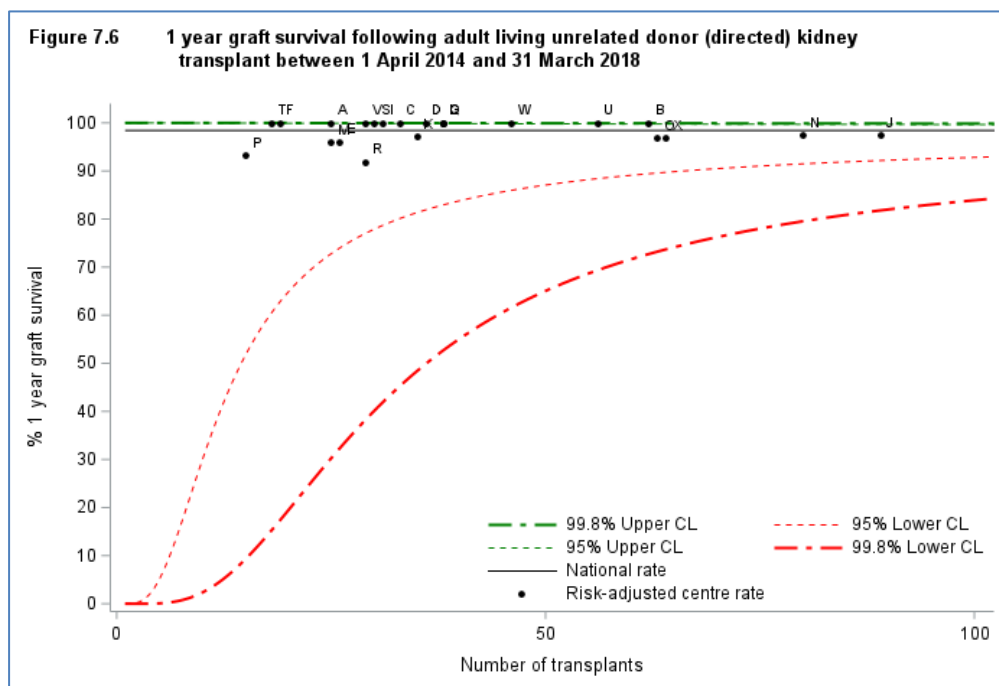
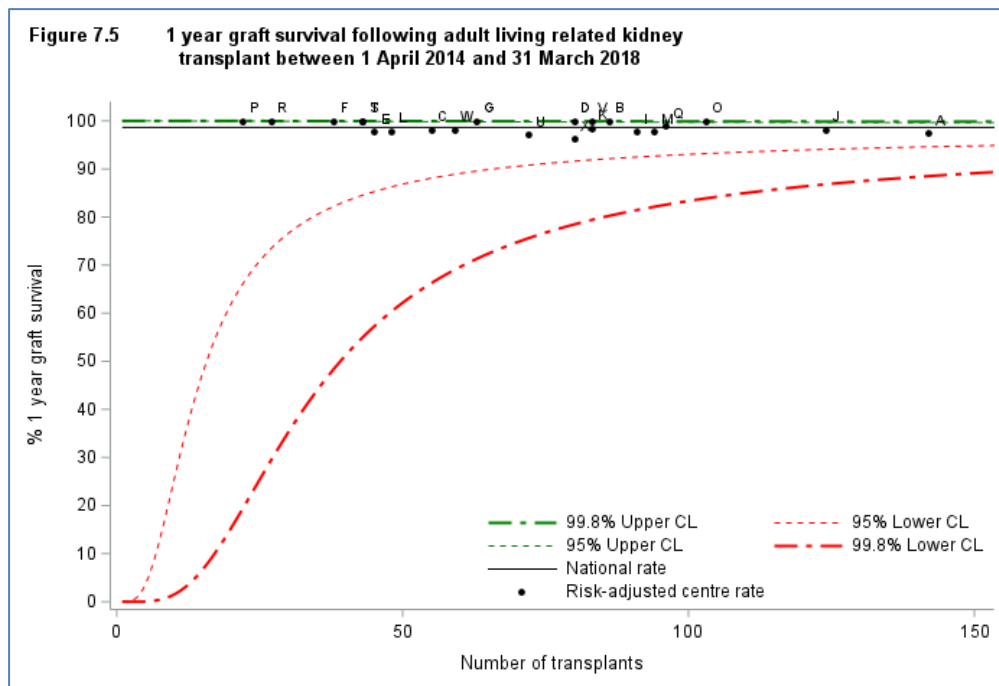


Figure 7.7 1 year graft survival following adult living HLAi donor kidney transplant between 1 April 2014 and 31 March 2018

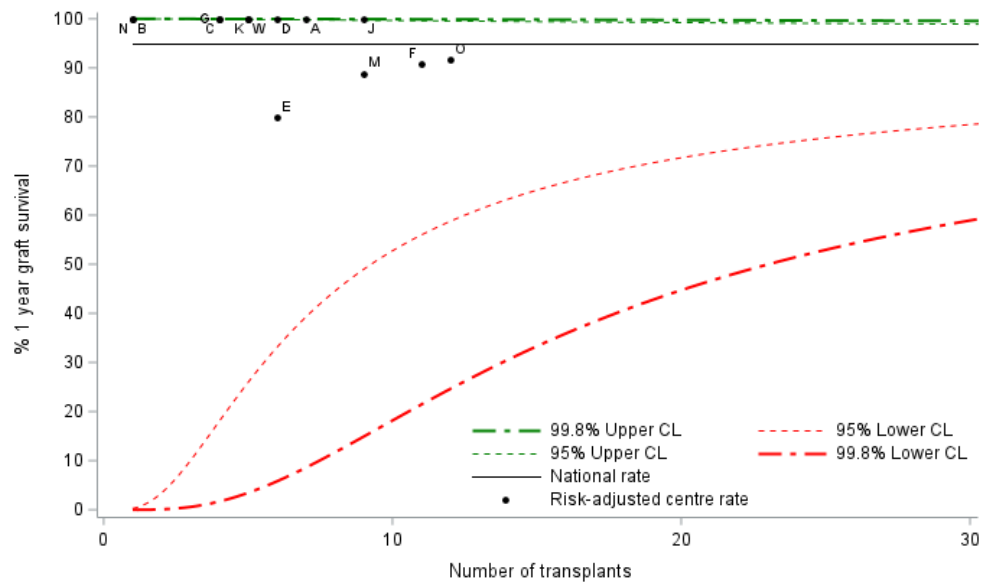


Figure 7.8 1 year graft survival following adult living ABOi donor kidney transplant between 1 April 2014 and 31 March 2018

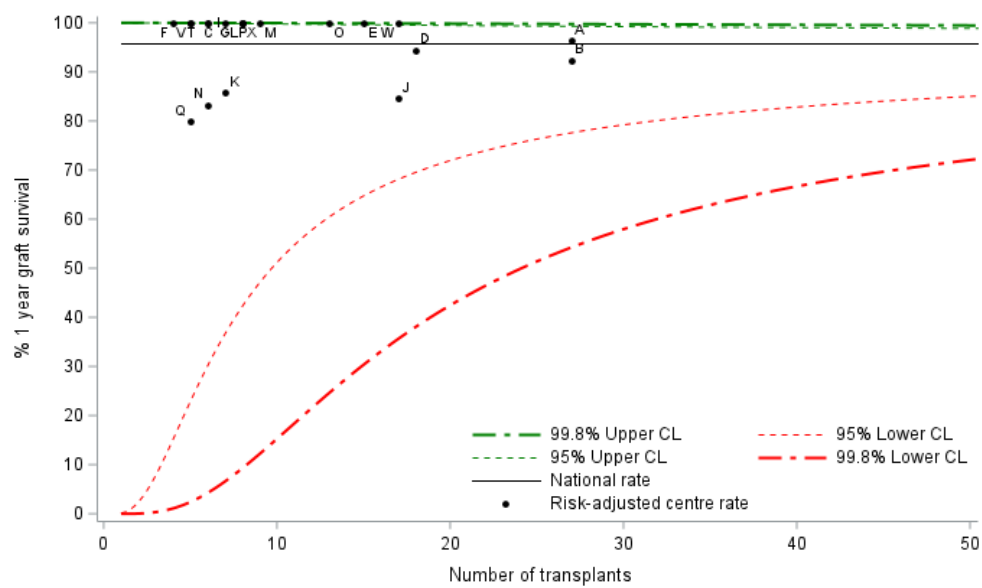


Figure 7.9 1 year graft survival following adult living paired exchange donor kidney transplant between 1 April 2014 and 31 March 2018

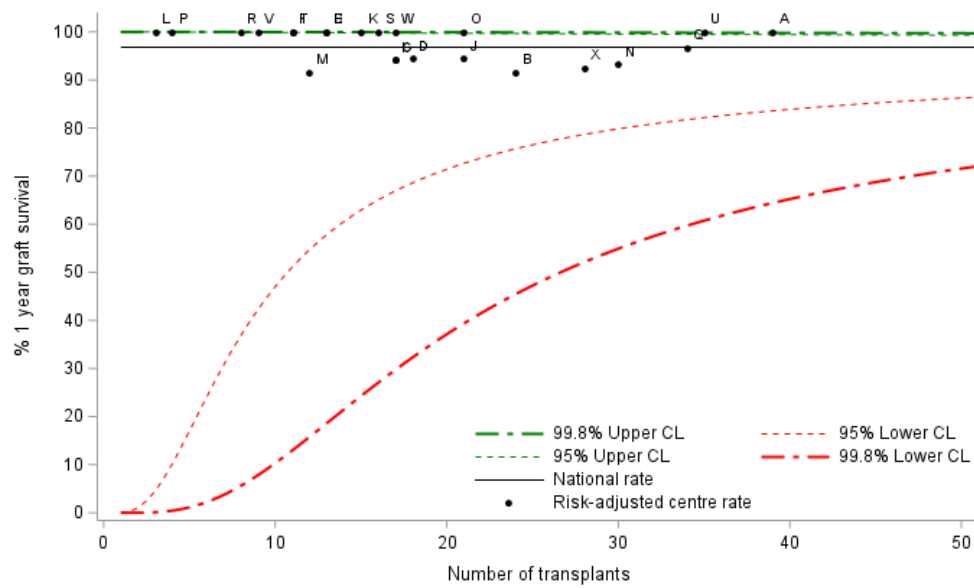


Figure 7.10 1 year graft survival following adult living altruistic donor (non-directed) kidney transplant between 1 April 2014 and 31 March 2018

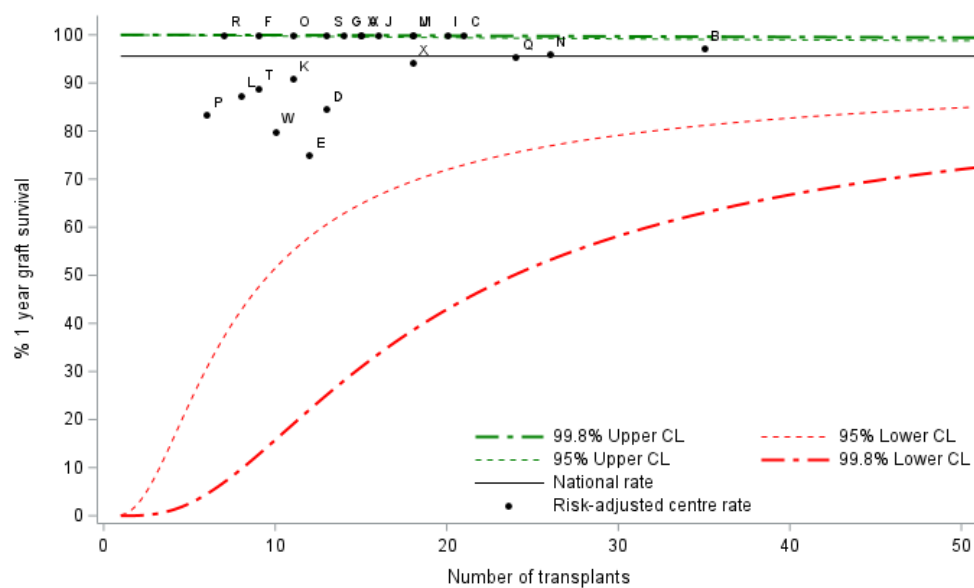


Table 7.5		1 year graft survival following adult living donor kidney transplant between 1 April 2014 and 31 March 2018, by donor type and centre											
Centre	Code	Related		Unrelated		HLAi		ABOi		Paired		Altruistic	
		N	% ¹	N	% ¹	N	% ¹	N	% ¹	N	% ¹	N	% ¹
Belfast	A	142	97	25	100	7	100	27	96	39	100	15	100
Birmingham	B	86	100	62	100	1	100	27	92	24	92	35	97
Bristol	C	55	98	33	100	4	100	6	100	13	100	21	100
Cambridge	D	80	100	36	100	6	100	18	94	18	94	13	85
Cardiff	E	45	98	26	96	6	80	15	100	13	100	12	75
Coventry	F	38	100	19	100	11	91	4	100	11	100	9	100
Edinburgh	G	63	100	38	100	4	100	7	100	17	94	14	100
Glasgow	I	91	98	31	100	0	-	6	100	17	94	20	100
Guy's	J	124	98	89	98	9	100	17	85	21	94	16	100
Leeds	K	83	98	35	97	5	100	7	86	15	100	11	91
Leicester	L	48	98	38	100	0	-	8	100	3	100	8	88
Liverpool	M	94	98	25	96	9	89	9	100	12	92	18	100
Manchester	N	161	99	80	98	1	100	6	83	30	93	26	96
Newcastle	O	103	100	63	97	12	92	13	100	21	100	11	100
Nottingham	P	22	100	15	93	0	-	8	100	4	100	6	83
Oxford	Q	96	99	38	100	0	-	5	80	34	97	24	95
Plymouth	R	27	100	29	92	0	-	0	-	8	100	7	100
Portsmouth	S	43	100	30	100	0	-	0	-	16	100	13	100
Sheffield	T	43	100	18	100	0	-	5	100	11	100	9	89
St George's	U	72	97	56	100	0	-	0	-	35	100	18	100
The Royal Free	V	83	100	29	100	0	-	5	100	9	100	15	100
The Royal London	W	59	98	46	100	5	100	17	100	17	100	10	80
WLRTC	X	80	96	64	97	0	-	8	100	28	93	18	94
UK		1738	99	925	98	80	95	218	96	416	97	349	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 patient will be rapidly rejected.

Active transplant list

When a patient 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 patient 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 patient off the transplant list, either temporarily or permanently. This may be done, for example, if someone becomes too ill to receive a transplant. The patient is told about the decision to suspend them from the list and is informed whether the suspension is temporary or permanent. If a patient is suspended from the list, they are not included in the matching of any donor kidneys that become available.

Case mix

The types of patients 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 patient a person is depends on the patient characteristics that influence the outcome of the treatment. For example the case mix for patients registered for a kidney transplant is defined in terms of various factors such as the blood group, tissue type and age of the patient. These factors have an influence on the chance of a patient 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 patients whose data were used. If, by chance, data from a different set of patients 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 patients 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 patient death, across different groups of patients.

Cross-match

A cross-match is a test for patient antibodies against donor antigens. A positive cross-match shows that the donor and patient are incompatible. A negative cross-match means there is no reaction between donor and patient 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 patients 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 patient was followed up for only nine months before they relocated. If we calculated a crude survival estimate using the number of patients who survived for at least a year, this patient would have to be excluded as it is not known whether or not the patient was still alive at one year after transplant. The Kaplan-Meier method allows information about such patients 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.

Live donor

A donor who is a living person and who is usually, but not always, a relative of the transplant patient. 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 patient receives more than one organ. For example, a patient 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 patients 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 patients 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

Patients that are placed on the kidney transplant list or receive a transplant prior to the need for dialysis are termed as pre-emptive. Patients 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 patients. A risk-adjusted survival rate for a centre is the expected survival rate for that centre given the case mix of their patients. 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 patient, transplant or donor that influence the length of time that a graft is likely to function or a patient 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 patients 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 patients with incomplete follow-up information to be included in the computation. For example, in a cohort for estimating one-year patient survival rates, a patient was followed up for only nine months before they relocated. If we calculated a crude survival estimate using the number of patients who survived for at least a year, this patient would have to be excluded, as it is not known whether or not the patient was still alive one year after transplant. The Kaplan-Meier method allows information about such patients 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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