



Blood and Transplant

ANNUAL REPORT ON LIVING DONOR KIDNEY TRANSPLANTATION

**REPORT FOR 2017/2018
(1 APRIL 2003 – 31 MARCH 2018)**

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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 2003. 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 940 adult living donor kidney transplants performed in the UK in 2017/18 an increase of 12 transplants compared to 2016/17. Of these, 449 (421 in 2016/17) were related, 237 (236 in 2016/17) were unrelated, 5 (18 in 2016/17) were HLAi, 41 (64 in 2016/17) were ABOi, 123 (109 in 2016/17) were paired/pooled and 85 (80 in 2016/17) were altruistic donor transplants. The equivalent number of paediatric transplants was 70, an 3% decrease from the previous year.
- The proportion of living donors across the UK being prescribed anti-hypertensive drugs is 5% 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 90-121) at one year, 96 (84-111) at five years and 93 (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%, related 92%, HLAi 81%, ABOi 87%, Paired exchange 95% and Altruistic 91%.
- 38% of registered patients 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 2017/18. NHS Blood and Transplant

Introduction

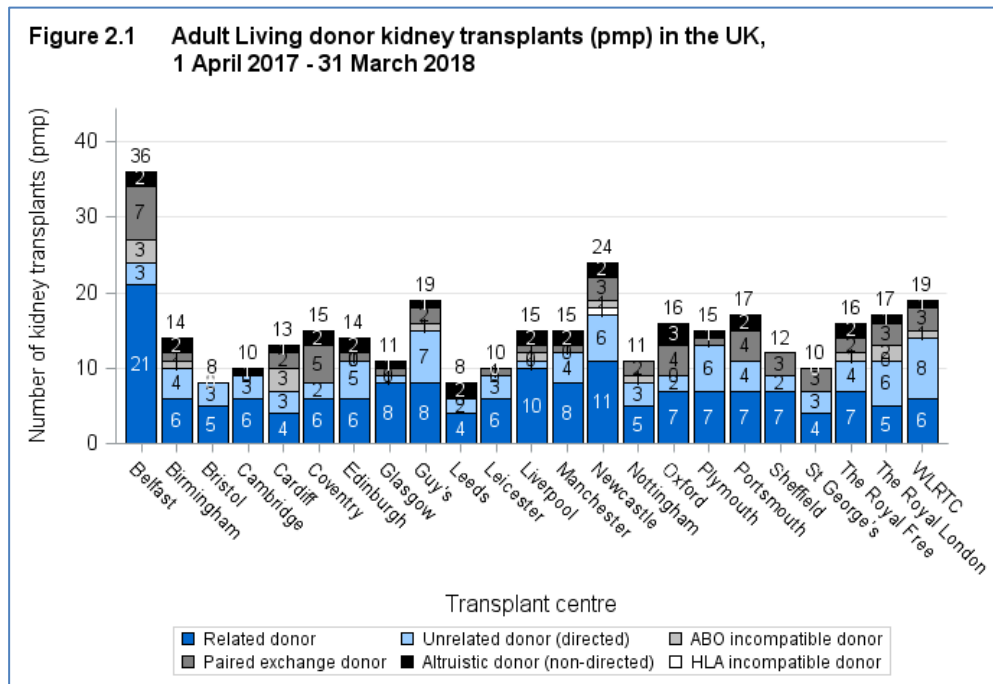
This report presents information on transplant activity between 1 April 2003 and 31 March 2018, for all 24 centres performing living donor kidney transplantation in the UK. Data were obtained from the UK Transplant Registry, at NHS Blood & Transplant, that holds information relating to donors, recipients 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 2013 to 31 March 2017 and five-year post-transplant for the period 1 April 2009 to 31 March 2013. 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 2 further transplants that occurred in Edinburgh and 1 more in Birmingham that were not added to the database in time for the report to be produced. Furthermore, there are 3 additional paediatric transplants performed at GOSH, one of which is reported as a transplant at Guy's.

Figure 2.1 shows the number of adult living donor kidney transplants per million population (pmp) that were performed in 2017/18 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 2003 and 31 March 2018. The number of transplants increased from 412 in 2003/04 to 940 in 2017/18.

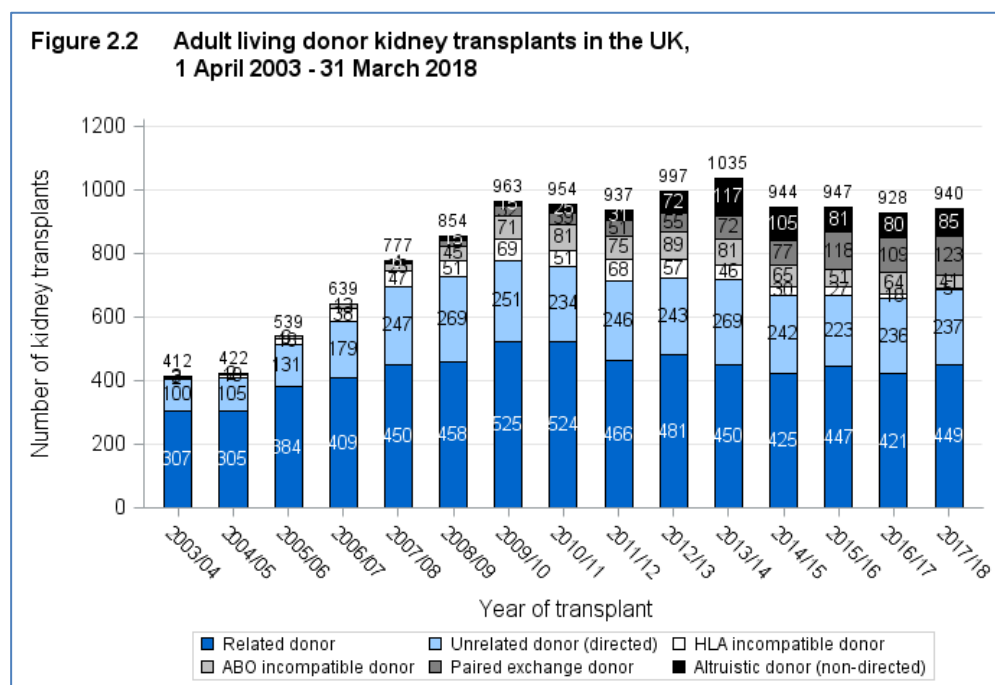


Figure 2.3 and **Table 2.1** show the number of adult living donor kidney transplants performed in 2017/18 in each transplant centre. Guy's performed the most adult living donor kidney transplants last year with 76 patients receiving a transplant. All centres perform non-directed altruistic kidney donation and participate in the UK Living Kidney Sharing Schemes. 17 centres (16 centres in 2016/17) performed ABO incompatible (ABOi) transplants and 4 centres (11 centres in 2016/17) performed HLA incompatible (HLAi) transplants in 2017/18.

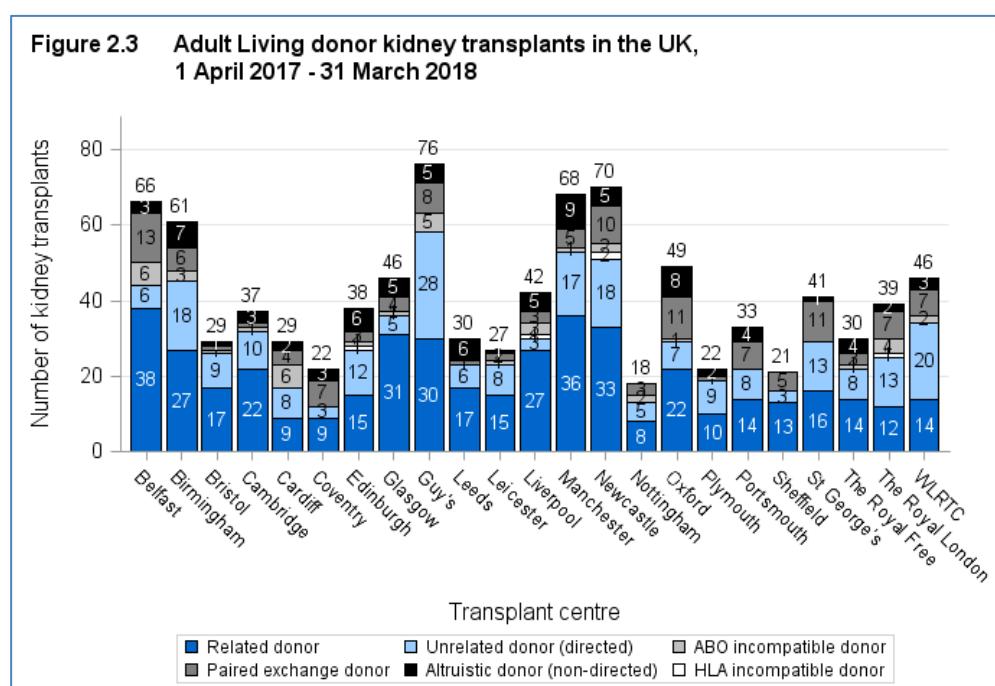


Table 2.1 Adult living donor kidney transplants in the UK, 1 April 2017 - 31 March 2018

Transplant Centre	Donor type					
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	Altruistic donor (non-directed)
Belfast	38	6	0	6	13	3
Birmingham	27	18	0	3	6	7
Bristol	17	9	0	1	1	1
Cambridge	22	10	0	1	1	3
Cardiff	9	8	0	6	4	2
Coventry	9	3	0	0	7	3
Edinburgh	15	12	1	1	3	6
Glasgow	31	5	0	1	4	5
Guy's	30	28	0	5	8	5
Leeds	17	6	0	0	1	6
Leicester	15	8	0	1	2	1
Liverpool	27	3	1	3	3	5
Manchester	36	17	0	1	5	9
Newcastle	33	18	2	2	10	5
Nottingham	8	5	0	2	3	0
Oxford	22	7	0	1	11	8
Plymouth	10	9	0	0	1	2
Portsmouth	14	8	0	0	7	4
Sheffield	13	3	0	0	5	0
St George's	16	13	0	0	11	1
The Royal Free	14	8	0	1	3	4
The Royal London	12	13	1	4	7	2
WLRTC	14	20	0	2	7	3

Figure 2.4 shows the proportion of adult living donor kidney transplants by donor type and centre in 2017/18.

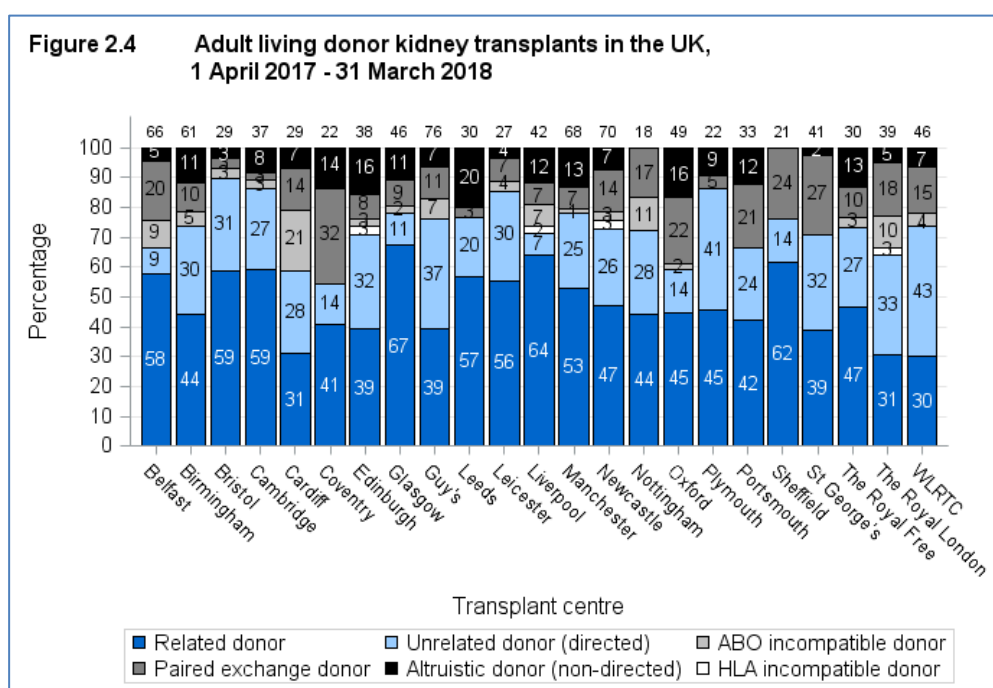
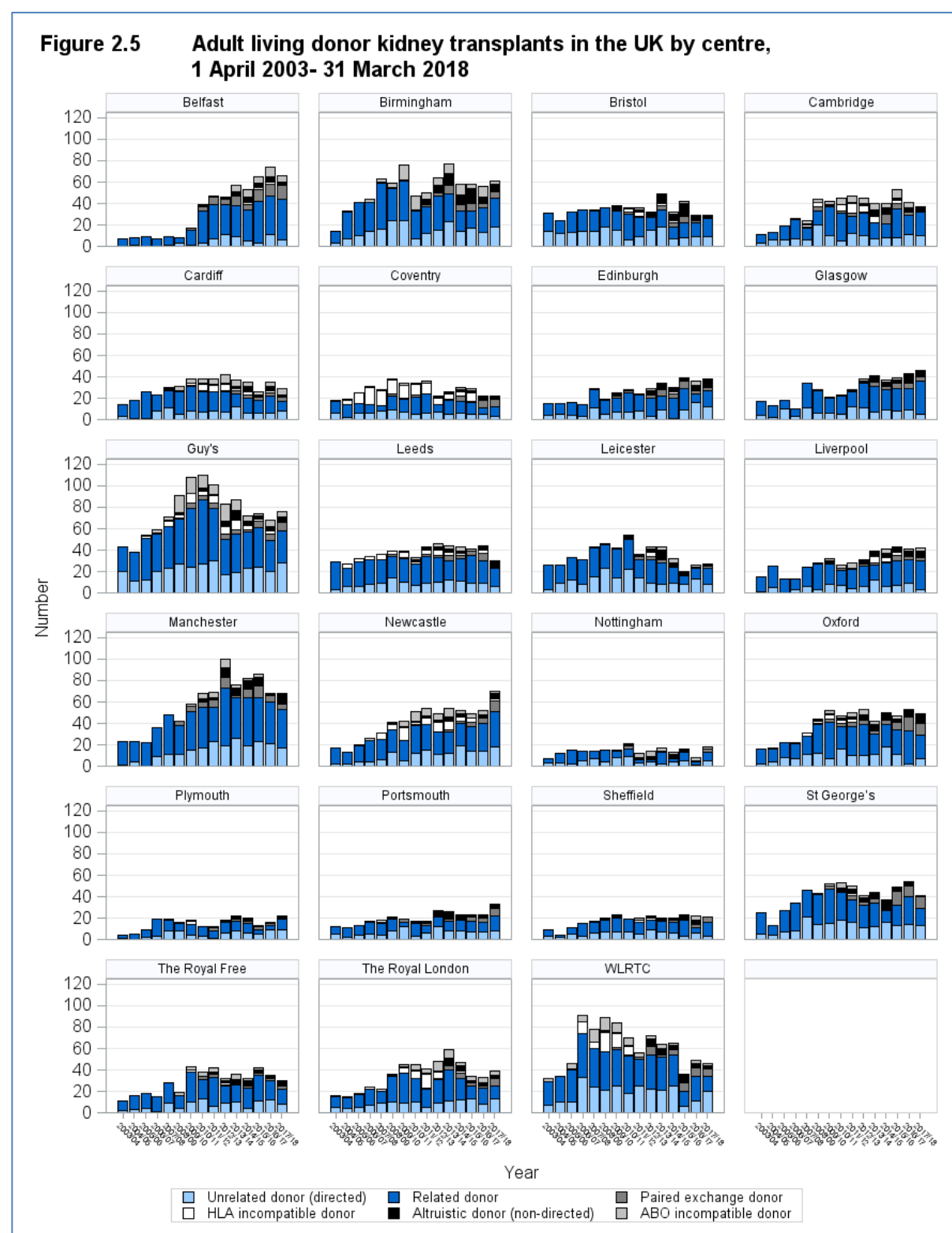


Figure 2.5 shows the number of adult living donor kidney transplants by donor type and centre between 1 April 2003 and 31 March 2018.



PAEDIATRIC

Figure 2.6 shows the number of paediatric living donor kidney transplants performed in the UK between 1 April 2003 and 31 March 2018. The number of transplants increased from 47 in 2003/04 to 70 in 2017/18.

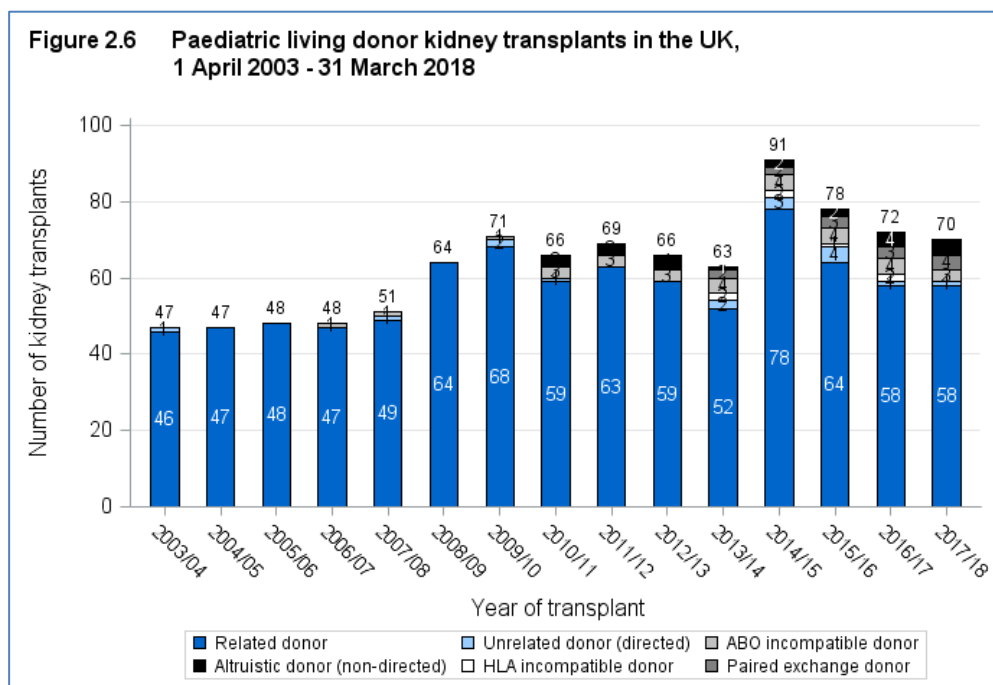


Figure 2.7 and **Table 2.2** show the number of paediatric living donor kidney transplants performed in 2017/18 in each transplant centre. Guy's transplant team performed the most living donor kidney transplants last year with 30 patients receiving a transplant (15 at GOSH and 15 at Guy's). Children are also benefitting from the UKLKSS and HLA and ABO antibody removal programmes to facilitate living donor transplants.

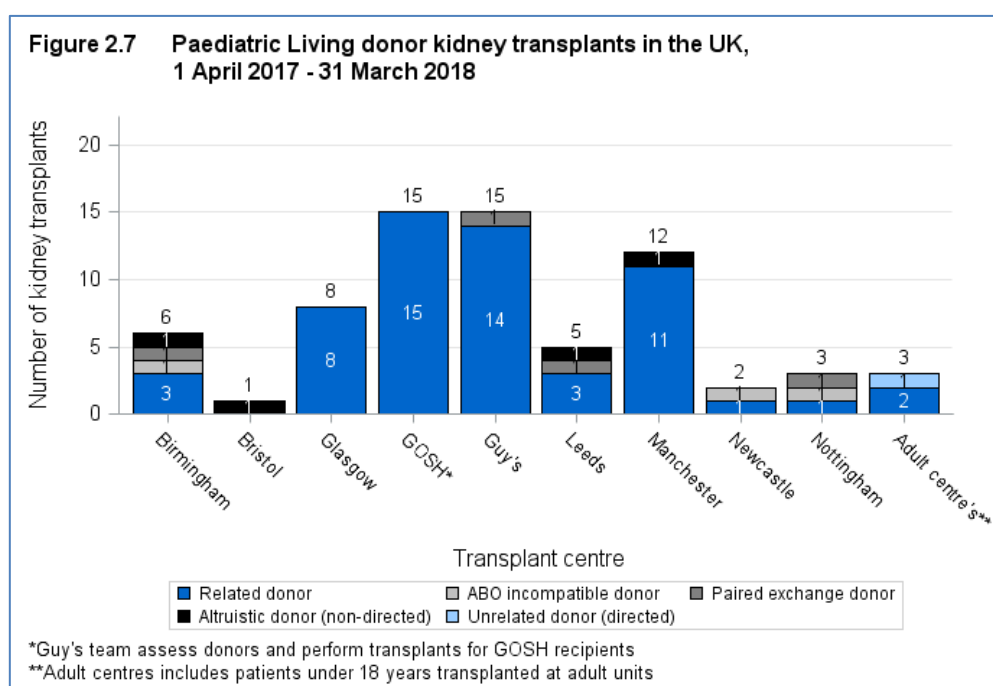


Table 2.2 Paediatric living donor kidney transplants in the UK, 1 April 2017 - 31 March 2018

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**	2	1	0	0	0	0
Birmingham	3	0	0	1	1	1
Bristol	0	0	0	0	0	1
GOSH*	15	0	0	0	0	0
Glasgow	8	0	0	0	0	0
Guy's	14	0	0	0	1	0
Leeds	3	0	0	0	1	1
Manchester	11	0	0	0	0	1
Newcastle	1	0	0	1	0	0
Nottingham	1	0	0	1	1	0

Figure 2.8 shows the proportion of paediatric living donor kidney transplants by donor type and centre in 2017/18.

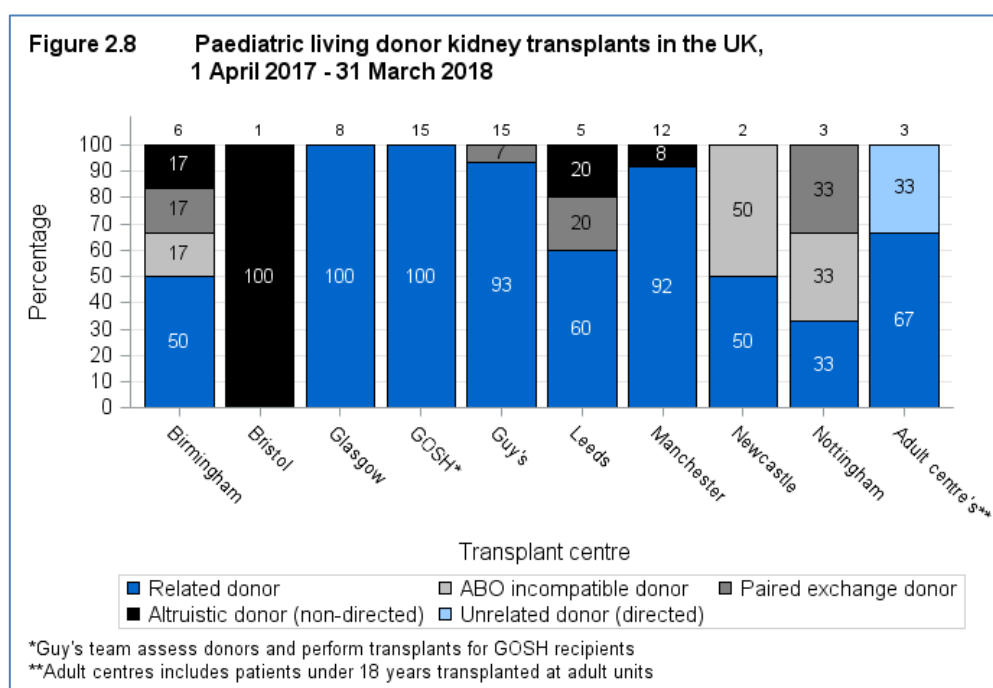
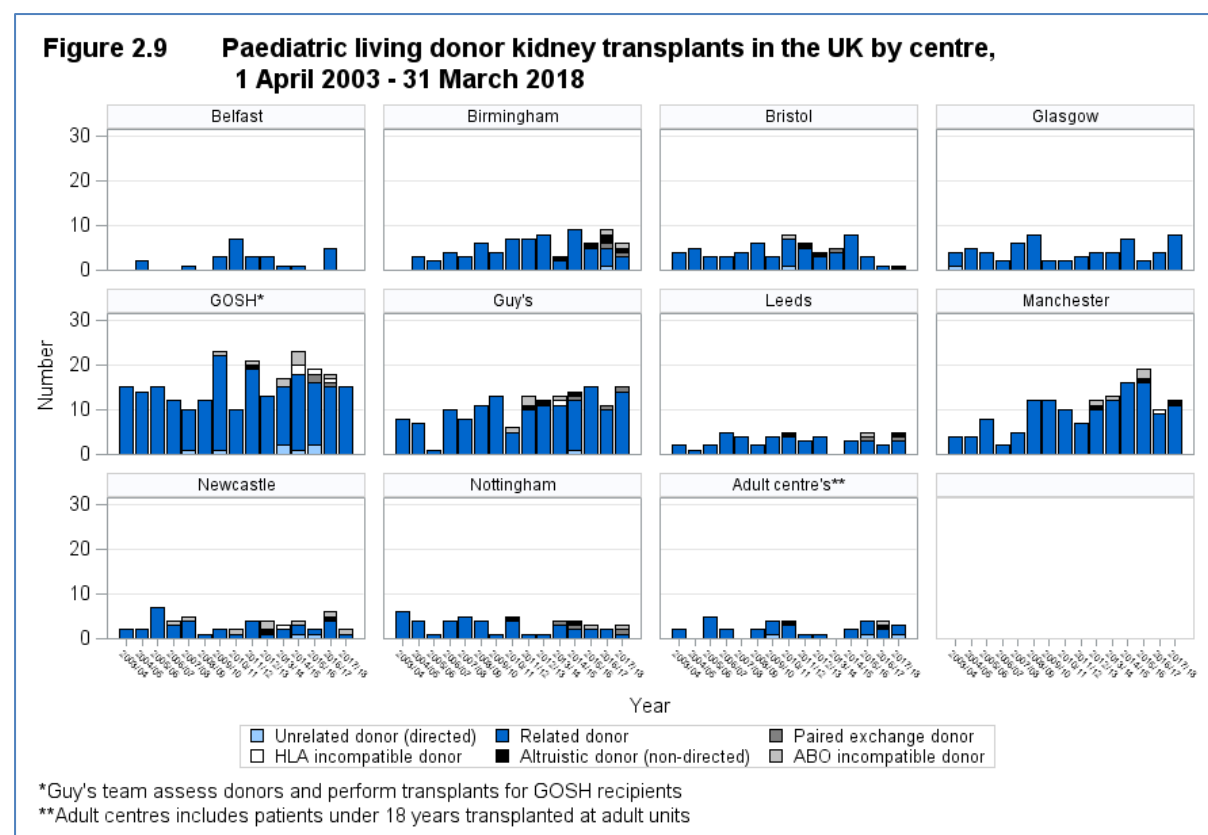


Figure 2.9 shows the number of paediatric living donor kidney transplants by donor type and centre between 1 April 2003 and 31 March 2018.



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.

82% of adult recipients of direct living donor kidney transplants are Caucasian and 18% are from Black, Asian or other minority ethnic groups (BAME). 1% of non-directed altruistic and 10% of paired/pooled donors are from BAME donors but 22% of adult BAME recipients receive a kidney from a non-directed altruistic donor and 18% 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 61% at Bristol to 24% at Coventry.

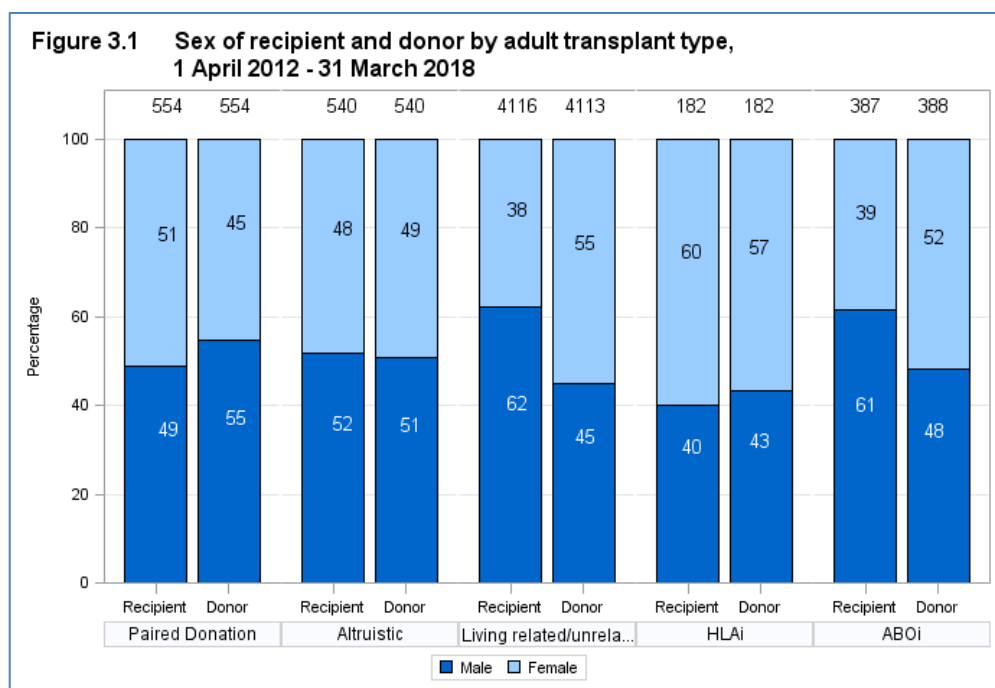


Figure 3.2 Ethnicity of recipient and donor by adult transplant type, 1 April 2012 - 31 March 2018

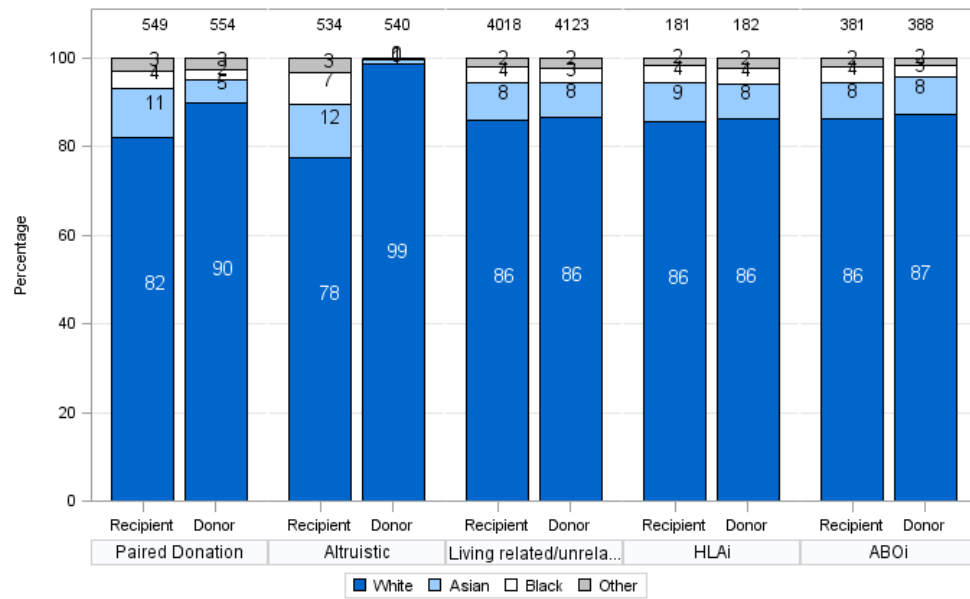


Figure 3.3 Age of recipient and donor by adult transplant type, 1 April 2012 - 31 March 2018

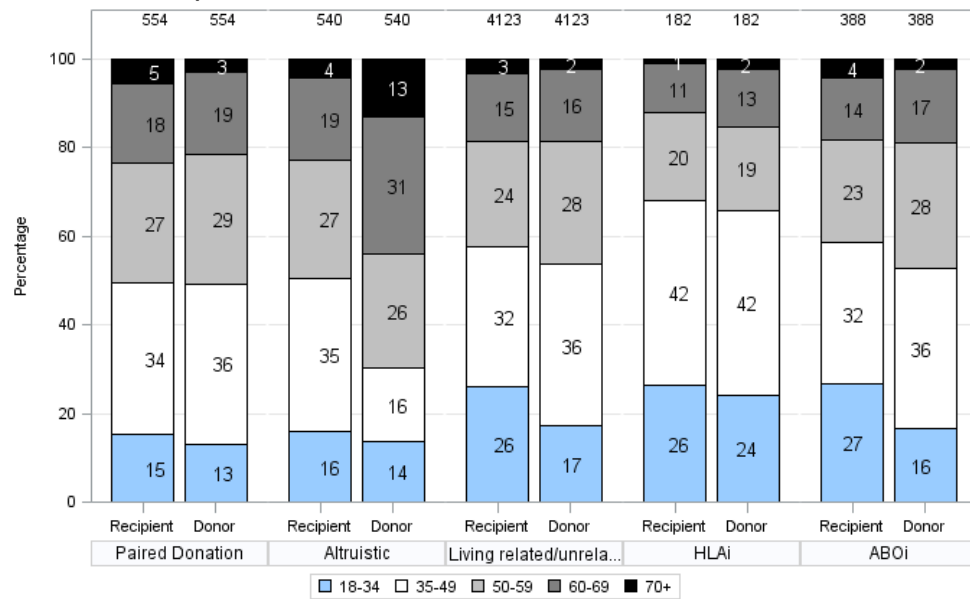


Figure 3.4 Recipient Calculated Reaction Frequency by adult transplant type
1 April 2012 - 31 March 2018

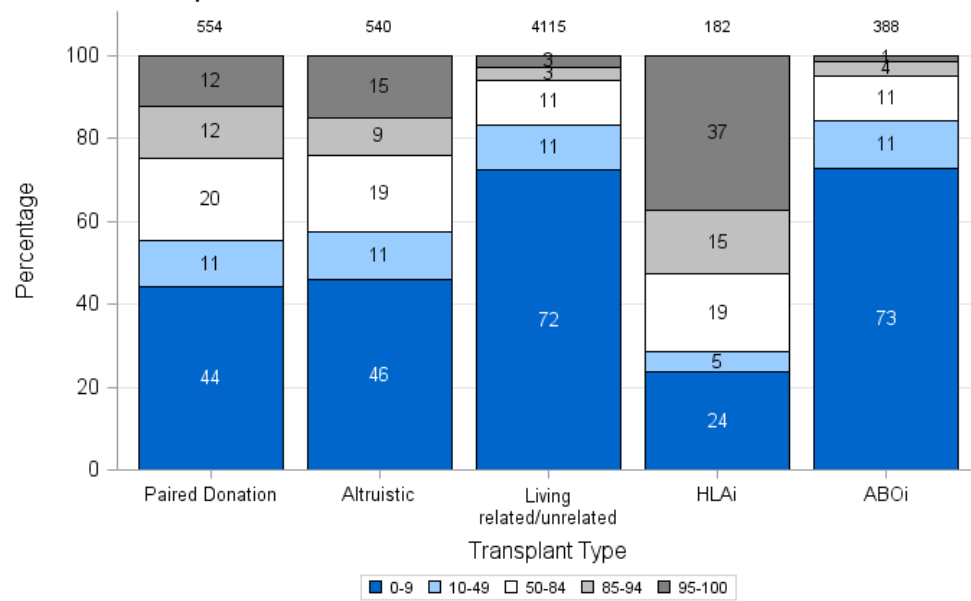


Figure 3.5 Adult HSP by transplant type and year of transplant,
1 April 2012 - 31 March 2018

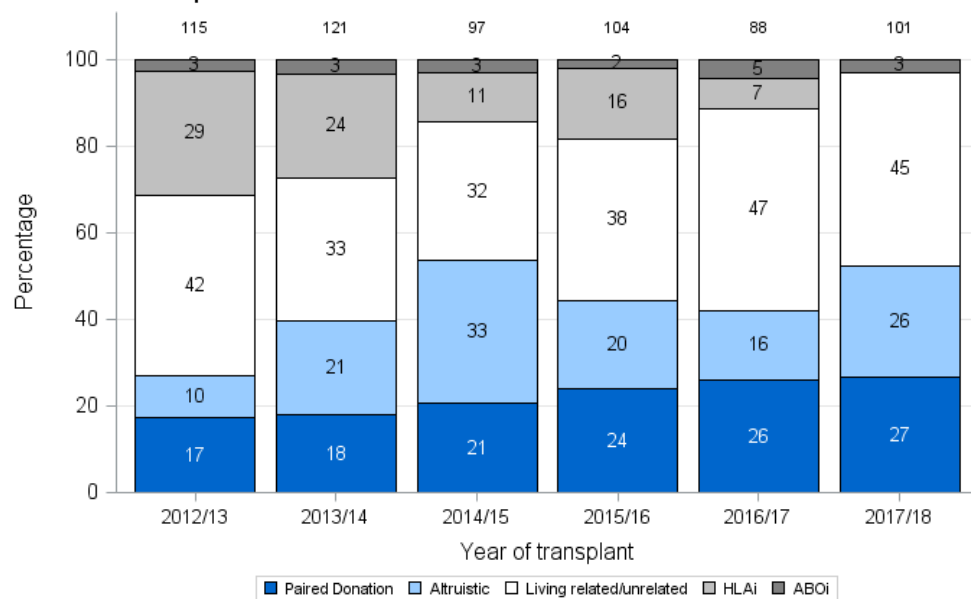


Figure 3.6 Recipient and donor blood group by adult transplant type, 1 April 2012 - 31 March 2018

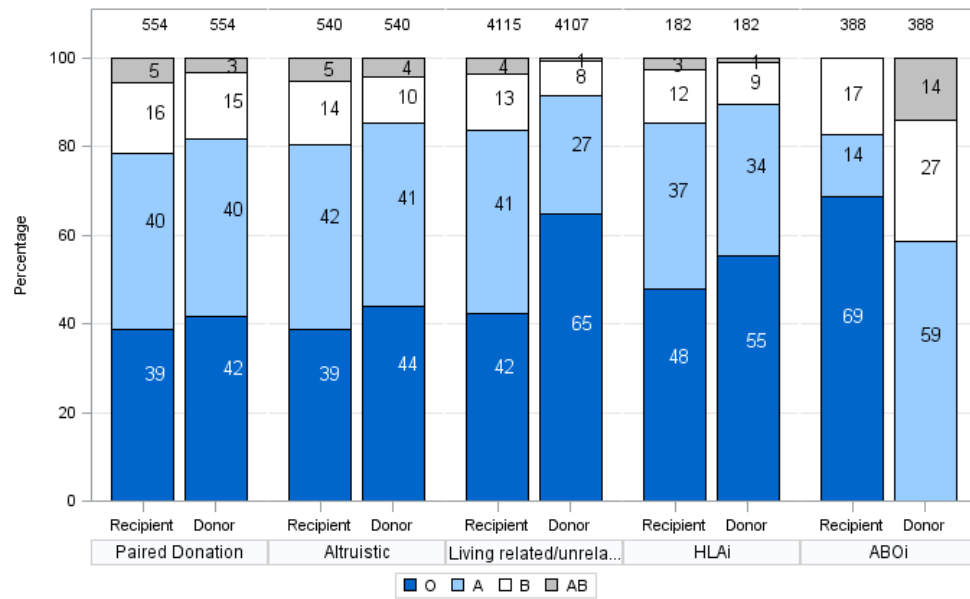


Figure 3.7 Dialysis status at transplant by adult transplant type, 1 April 2012 - 31 March 2018

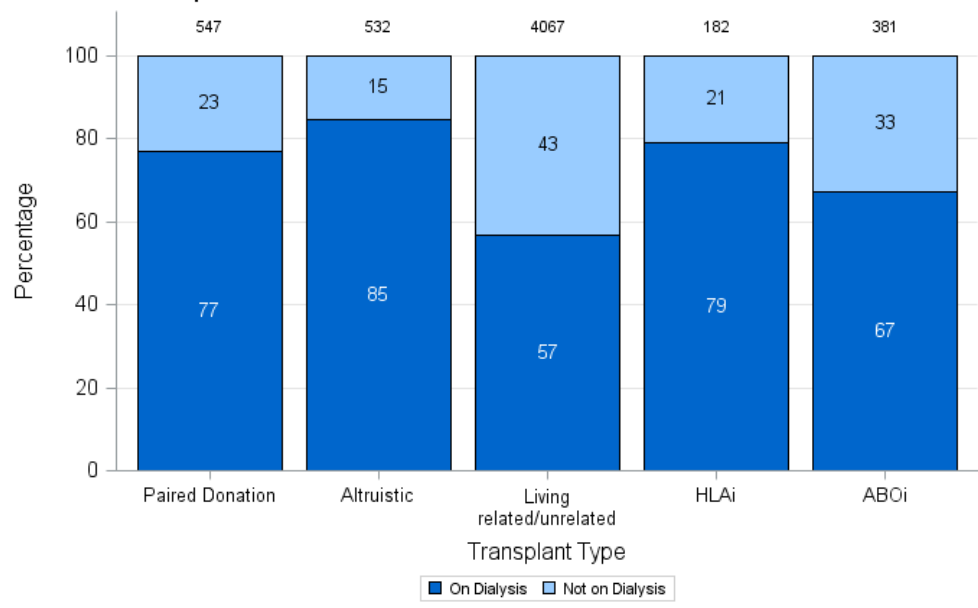
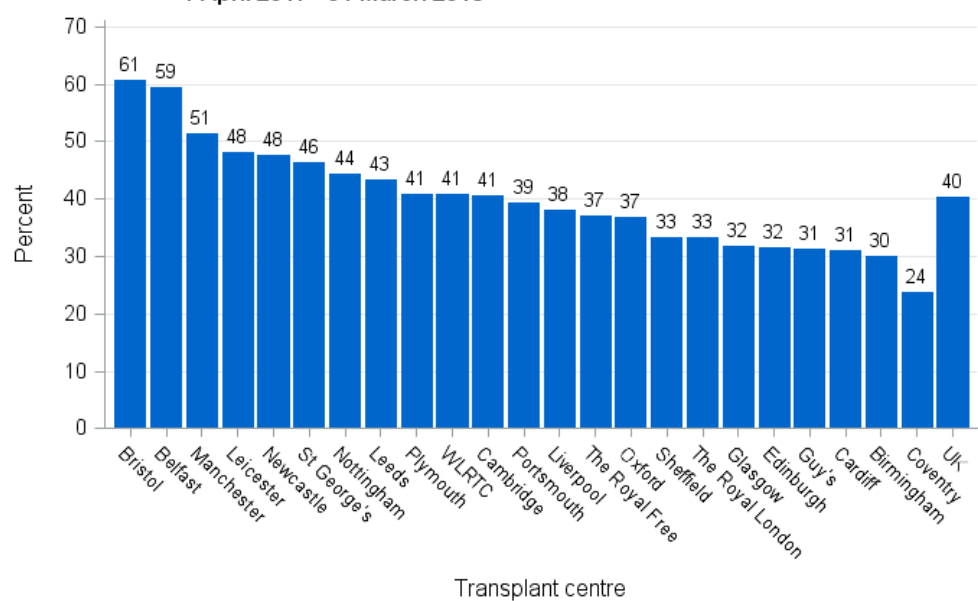


Figure 3.8 Adult living donor pre-emptive transplant rates by centre,
1 April 2017 - 31 March 2018



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.

71% of paediatric recipients of direct living donor kidney transplants are Caucasian and 28% are from Black, Asian or other minority ethnic groups (BAME). 6% of non-directed altruistic and 7% of paired/pooled donors are from BAME donors but 30% of paediatric BAME recipients receive a kidney from a non-directed altruistic donor and 28% from paired-pooled donors.

36% of children transplanted from a non-directed altruistic donor have a cRF ≥ 50 and 21% of children transplanted through the paired/pooled scheme have cRF ≥ 50 .

The paediatric living donor pre-emptive transplant rates ranged from 50% at Guy's to 0% at Bristol, Newcastle and Nottingham.

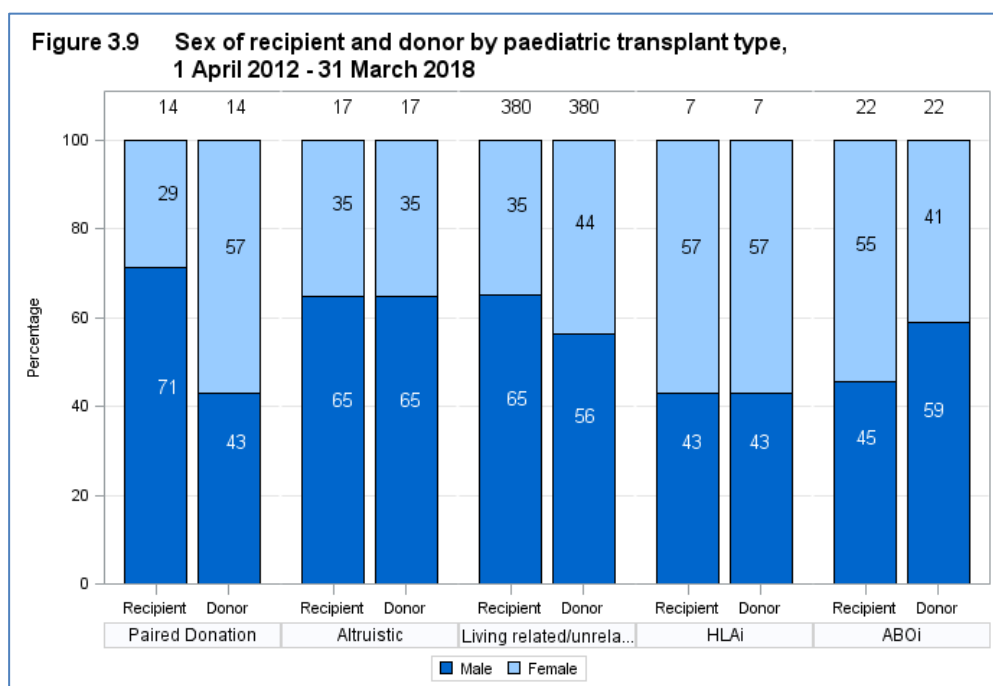


Figure 3.10 Ethnicity of recipient and donor by paediatric transplant type, 1 April 2012 - 31 March 2018

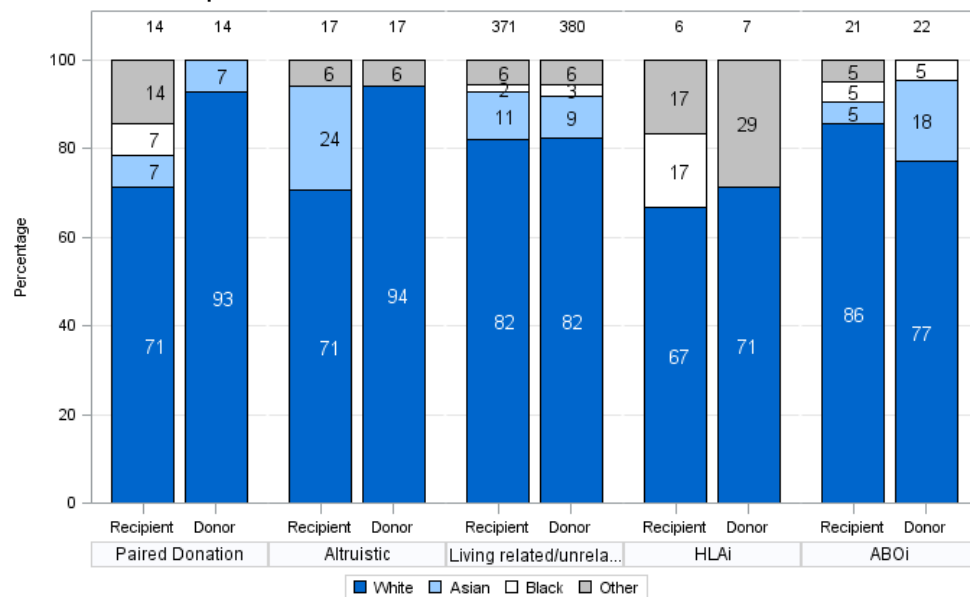


Figure 3.11 Age of recipient and donor by paediatric transplant type, 1 April 2012 - 31 March 2018

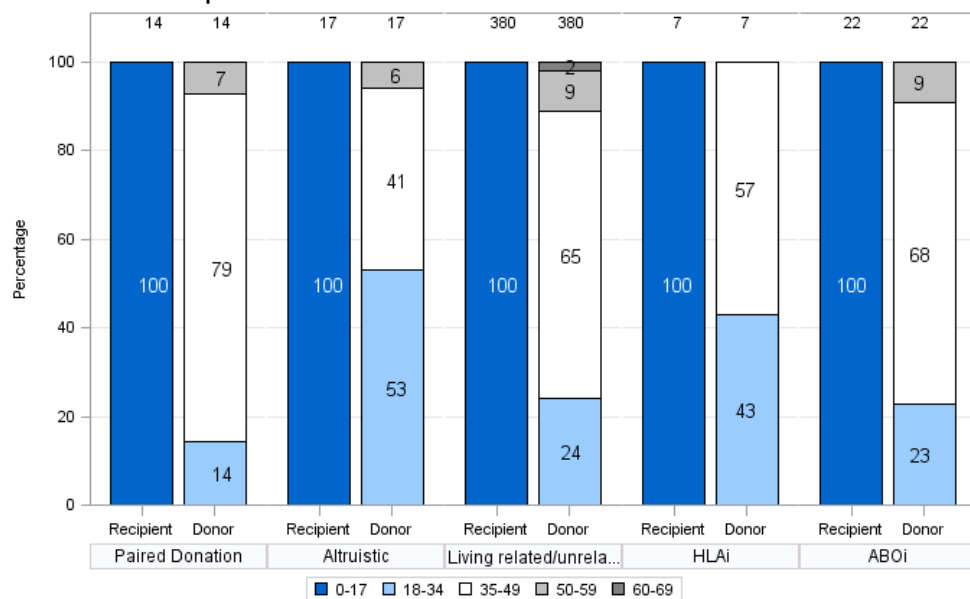


Figure 3.12 Recipient Calculated Reaction Frequency by paediatric transplant type
1 April 2012 - 31 March 2018

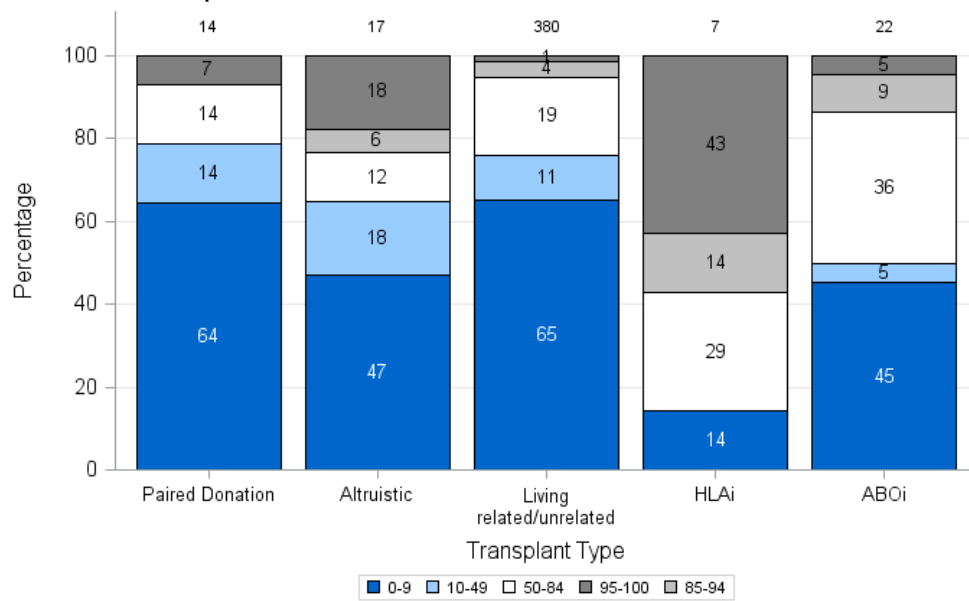


Figure 3.13 Paediatric HSP by transplant type and year of transplant,
1 April 2012 - 31 March 2018

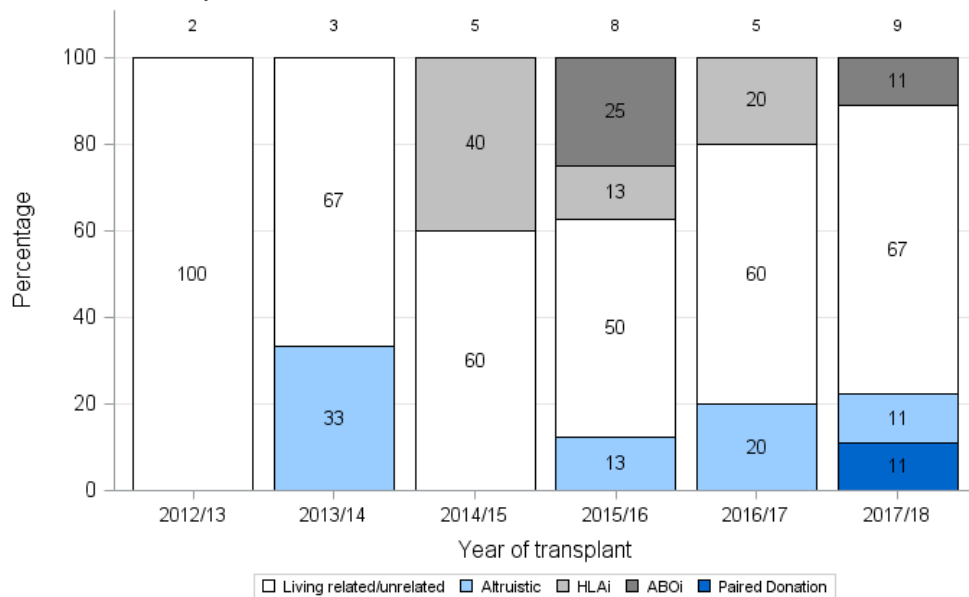


Figure 3.14 Recipient and donor blood group by paediatric transplant type, 1 April 2012 - 31 March 2018

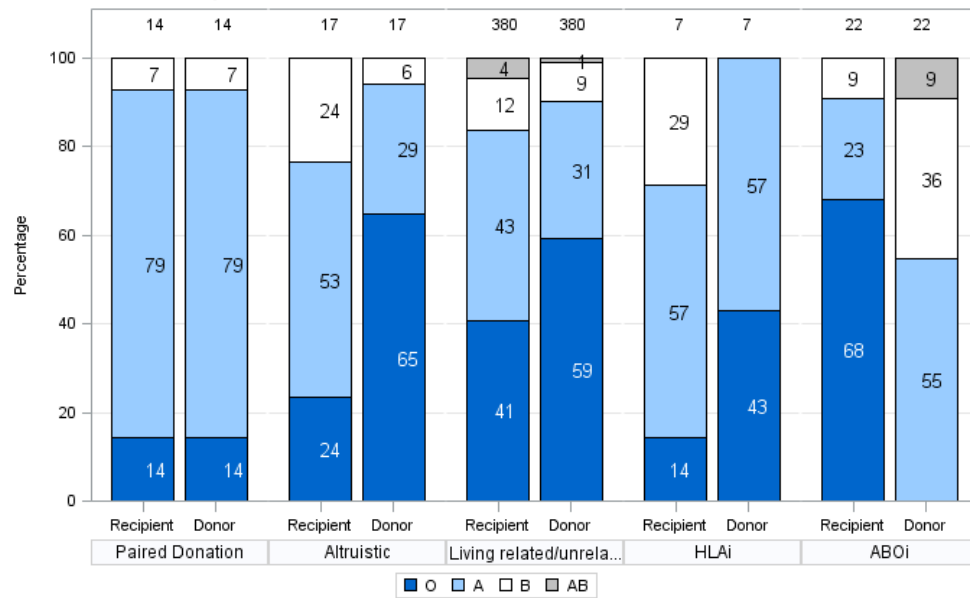


Figure 3.15 Dialysis status at transplant by paediatric transplant type, 1 April 2012 - 31 March 2018

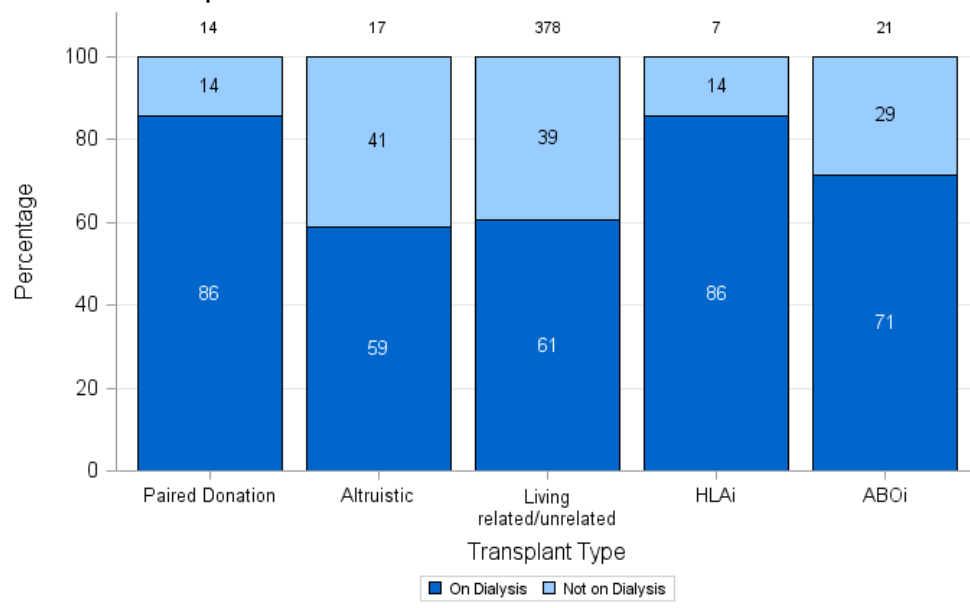
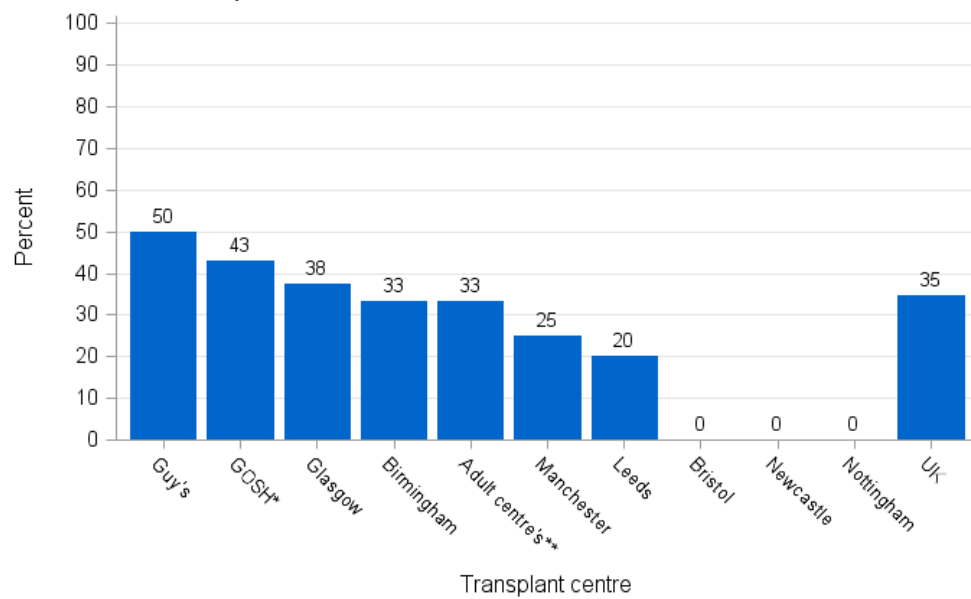


Figure 13.16 Paediatric living donor pre-emptive transplant rates by centre,
1 April 2017 - 31 March 2018



UK Living Kidney Sharing Schemes

4.1 Paired Donation Scheme

4.1.1 Registrations: Matching Runs, 1 April 2012 – 31 March 2018

Figure 4.1 shows the number of patients included in matching runs from 1 April 2012 to 31 March 2018. The number of patients included has increased over this period with 177 in April 2012 to 242 in January 2018. Overall, there were 1,425 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.

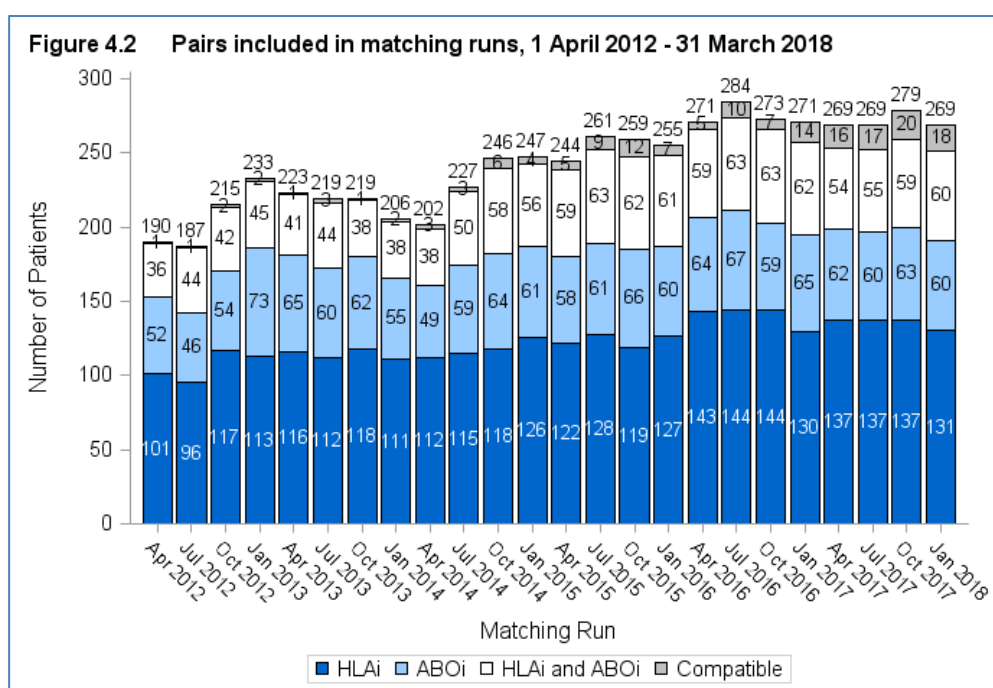
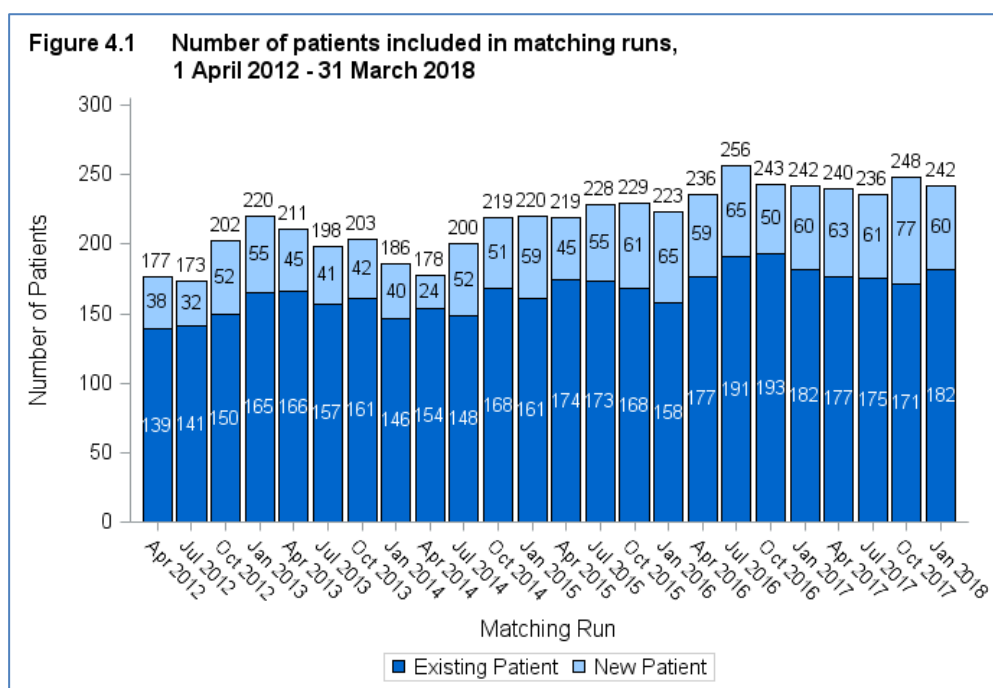


Figure 4.3 shows the number of patients included in matching runs from 1 April 2012 to 31 March 2018 by centre. This is broken down further by the nature of the incompatibility between the pair. It can be seen that Belfast has had the highest number of patients registered over this time period. Most pairs registered over this period were HLA incompatible (46%). This information is also shown in **Table 4.1**.

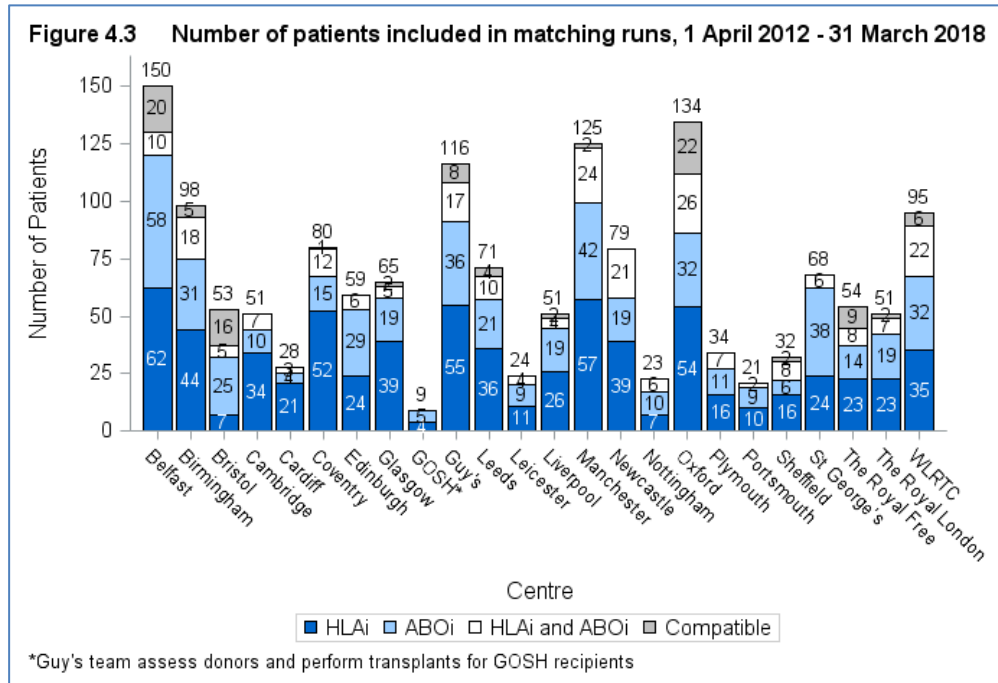


Table 4.1 Pairs included in matching runs by compatibility and Centre, April 2012 - March 2018					
Centre	Number of pairs	HLAi	ABOi	HLAi and ABOi	Compatible
Belfast	150	62	58	10	20
Birmingham	98	44	31	18	5
Bristol	53	7	25	5	16
Cambridge	51	34	10	7	0
Cardiff	28	21	4	3	0
Coventry	80	52	15	12	1
Edinburgh	59	24	29	6	0
Glasgow	65	39	19	5	2
GOSH*	9	4	5	0	0
Guy's	116	55	36	17	8
Leeds	71	36	21	10	4
Leicester	24	11	9	4	0
Liverpool	51	26	19	4	2
Manchester	125	57	42	24	2
Newcastle	79	39	19	21	0
Nottingham	23	7	10	6	0
Oxford	134	54	32	26	22
Plymouth	34	16	11	7	0
Portsmouth	21	10	9	2	0
Sheffield	32	16	6	8	2
St George's	68	24	38	6	0
The Royal Free	54	23	14	8	9
The Royal London	51	23	19	7	2
WLRTC	95	35	32	22	6
UK	1571	719	513	238	101
*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 2012 - 31 March 2018					
Year	Registered with different blood groups		Registered with unacceptable antigens		Total number of patients registered
	N	%	N	%	
12/13	1	0.5	15	8.2	182
13/14	2	1.3	22	14.2	155
14/15	0	-	24	11.8	203
15/16	3	1.2	33	13.6	243
16/17	3	1.2	51	21.1	242
17/18	1	0.4	33	13.8	240

4.1.2 Outcomes: Matching Runs, 1 April 2014 – 31 March 2018

Figure 4.4 shows the outcomes of patients included in matching runs from 1 April 2014 to 31 March 2018, split by centre. Overall, 39% of patients registered have had a transplant through the paired donation scheme.

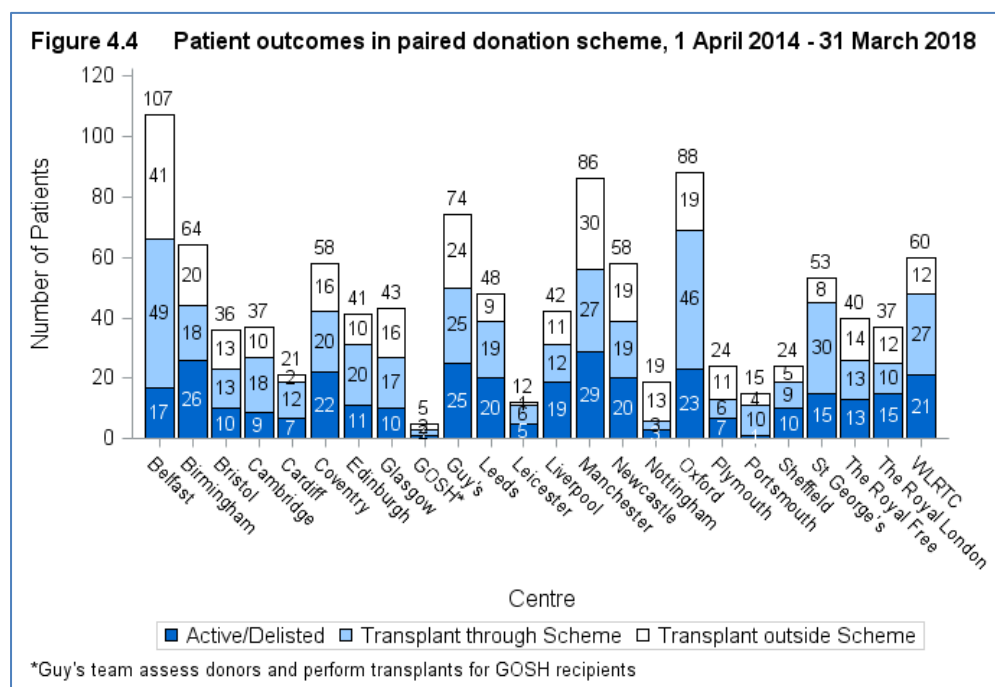
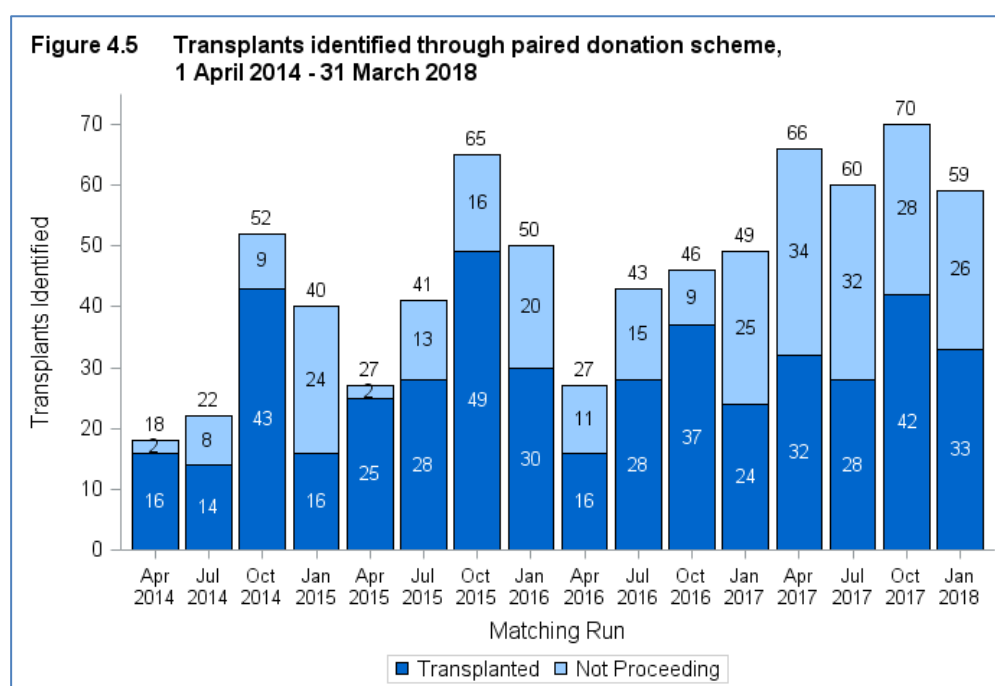


Figure 4.5 shows the transplants identified in each matching run from 1 April 2014 to 31 March 2018. The number of those that proceeded to transplant is also shown. Overall, 63% of transplants identified through the paired donation scheme have proceeded to transplant over this period.



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 2014 - 31 March 2018

Calculated Reaction Frequency	Patients Registered	Patients Transplanted	
		N	(%)
0-9%	346	166	(48)
10-84%	285	154	(54)
85-94%	122	62	(51)
95-99%	206	46	(22)
100%	133	3	(2)

Table 4.4 Transplants as a proportion of registered pairs by blood group, 1 April 2014 - 31 March 2018

Donor Blood Group	Patient Blood Group (Patients Transplanted/Pairs Registered (%))							
	O		A		B		AB	
O	81/ 245	(33%)	71/ 121	(59%)	21/ 36	(58%)	3/ 9	(33%)
A	96/ 356	(27%)	56/ 168	(33%)	26/ 45	(58%)	1/ 11	(9%)
B	27/ 90	(30%)	20/ 45	(44%)	13/ 37	(35%)	1/ 3	(33%)
AB	3/ 12	(25%)	8/ 18	(44%)	3/ 14	(21%)	1/ 5	(20%)

Figure 4.6 shows the number of patients transplanted from matching runs between 1 April 2014 and 31 March 2018. This is split by centre and exchange type.

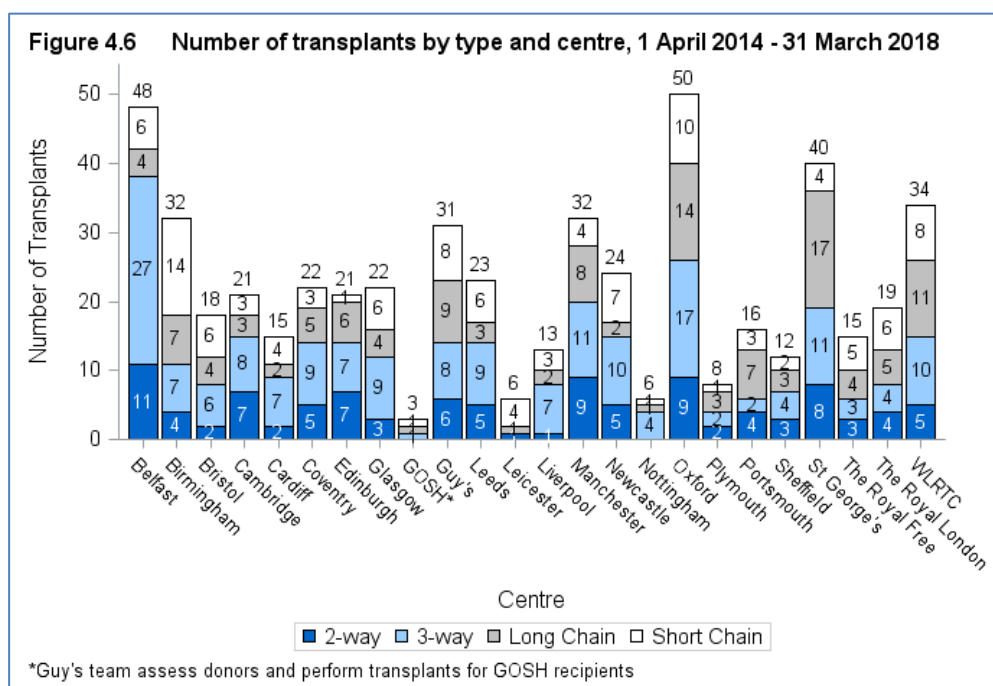


Figure 4.7 shows the patients transplanted from matching runs between 1 April 2014 and 31 March 2018. This is split by centre and the incompatibility of the patient with their registered donor. **Table 4.5** shows the percentage of pairs transplanted through paired donation given that they have been 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.

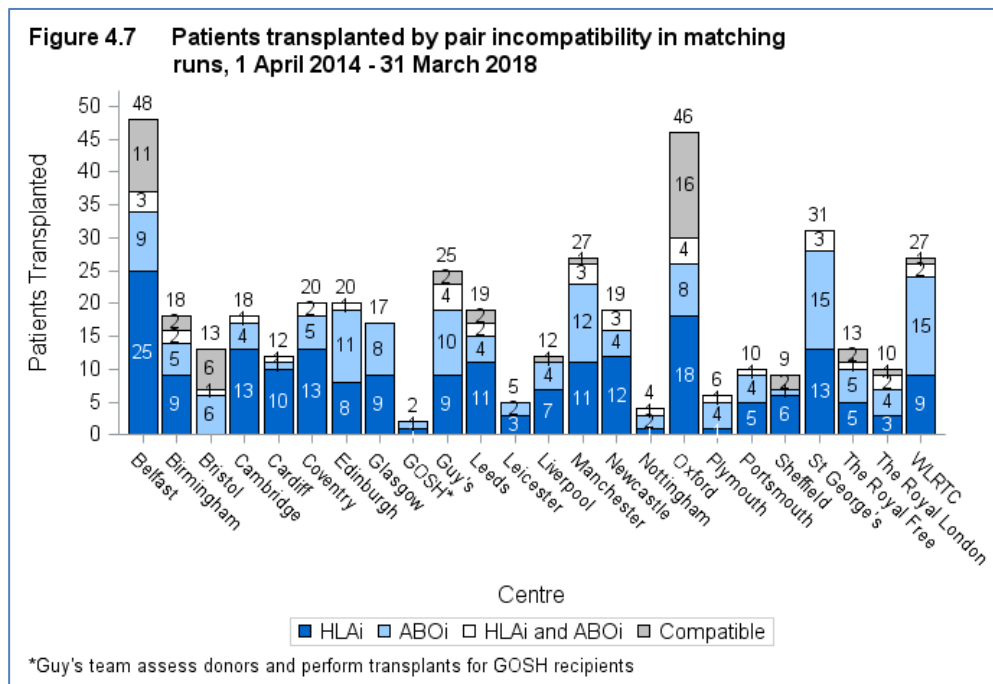
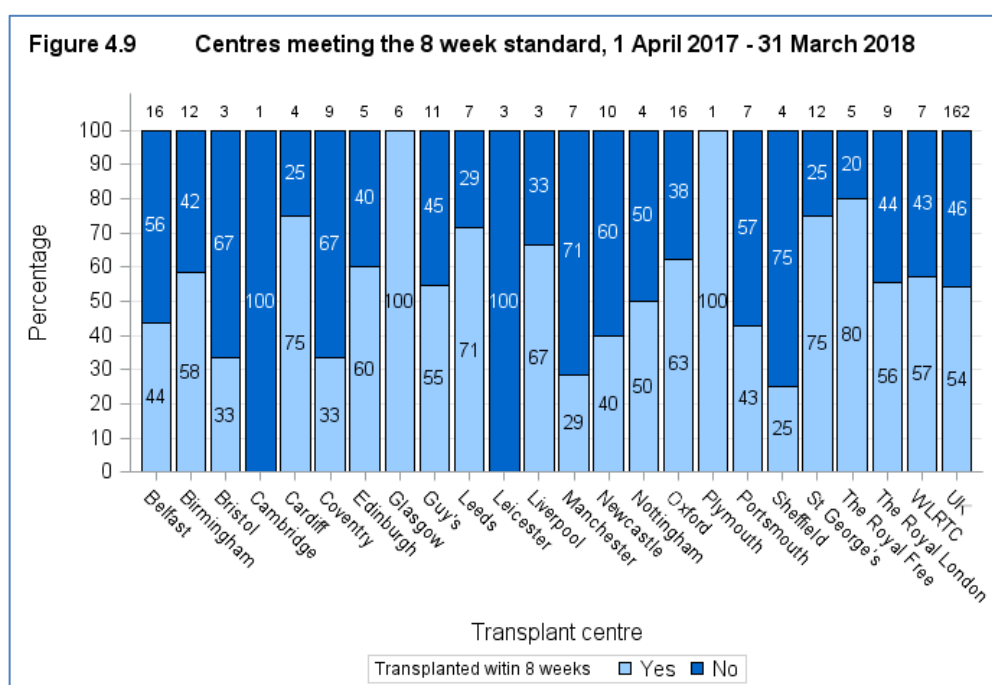
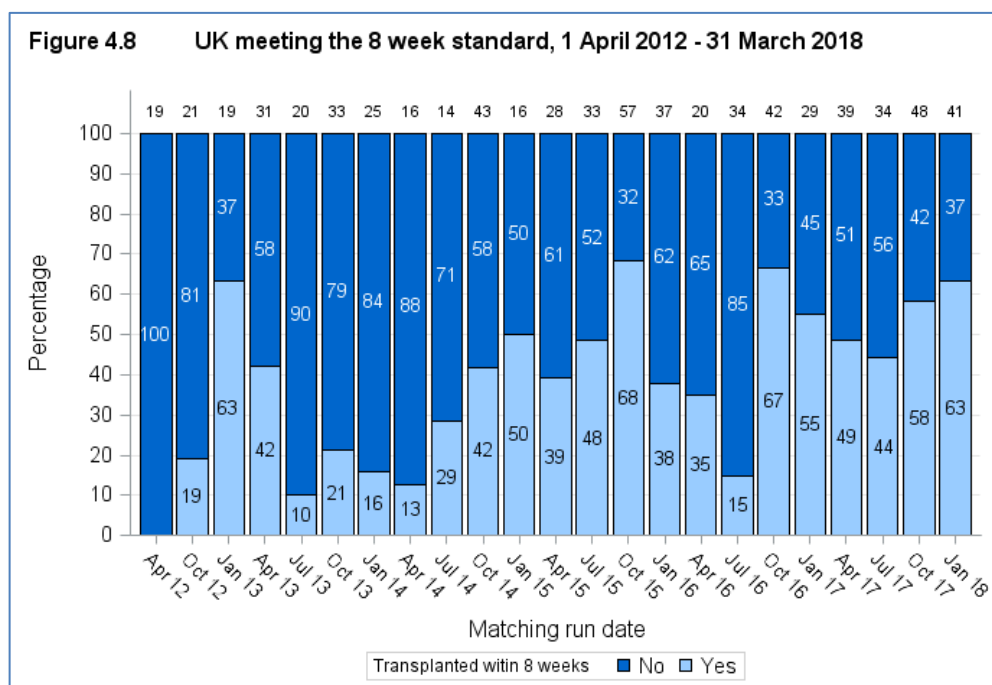


Table 4.5 Transplants by group type and Centre April 2014 - March 2018					
Centre	Number of Transplants	2-way	3-way	Short Chain	Long Chain
Belfast	48	11	27	4	6
Birmingham	32	4	7	7	14
Bristol	18	2	6	4	6
Cambridge	21	7	8	3	3
Cardiff	15	2	7	2	4
Coventry	22	5	9	5	3
Edinburgh	21	7	7	6	1
Glasgow	22	3	9	4	6
GOSH*	3	0	1	1	1
Guy's	31	6	8	9	8
Leeds	23	5	9	3	6
Leicester	6	1	0	1	4
Liverpool	13	1	7	2	3
Manchester	32	9	11	8	4
Newcastle	24	5	10	2	7
Nottingham	6	0	4	1	1
Oxford	50	9	17	14	10
Plymouth	8	2	2	3	1
Portsmouth	16	4	2	7	3
Sheffield	12	3	4	3	2
St George's	40	8	11	17	4
The Royal Free	15	3	3	4	5
The Royal London	19	4	4	5	6
WLRTC	34	5	10	11	8
UK	531	106	183	126	116

Table 4.6 Median waiting time to paired donation kidney transplant in the UK, for patients registered 1 April 2008 - 31 March 2014			
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	773 - 1505

4.1.3 Recipients transplanted within the 8 week standard, 1 April 2012 – 31 March 2018

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 2009 – 31 March 2018

Figure 4.10 shows the number of altruistic donor kidney transplants from 1 April 2009 to 31 March 2018. 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 15 in 2009/10 to 89 in 2017/18.

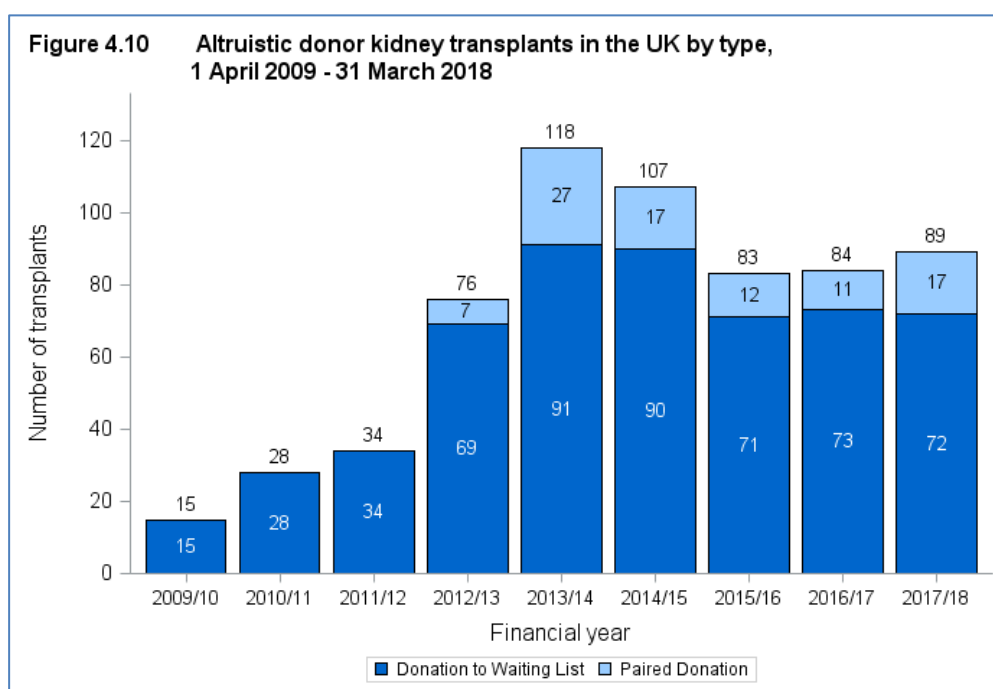
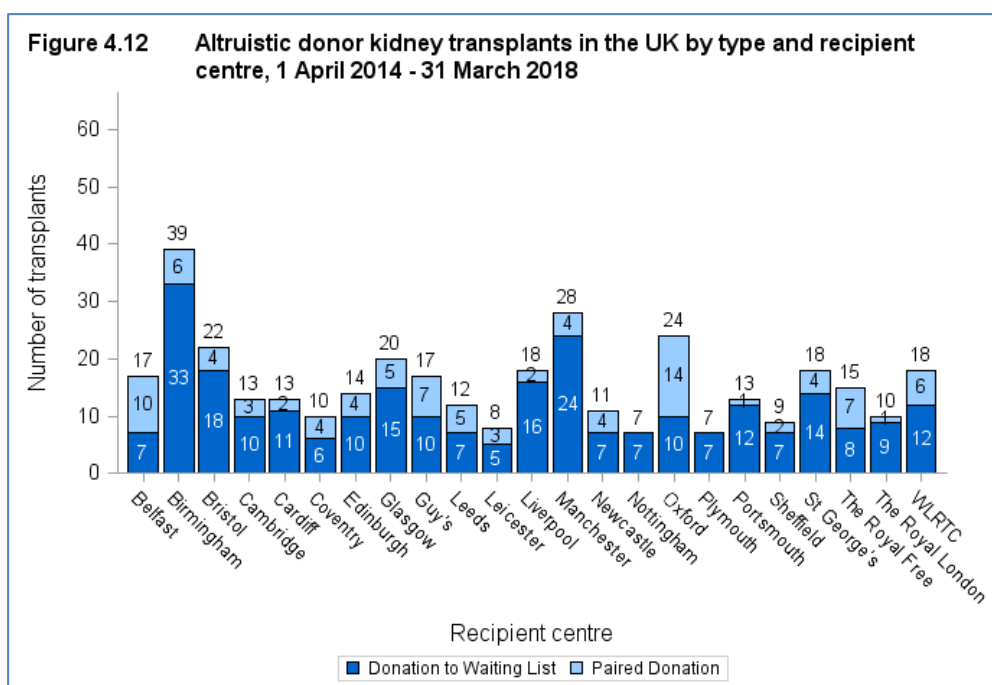
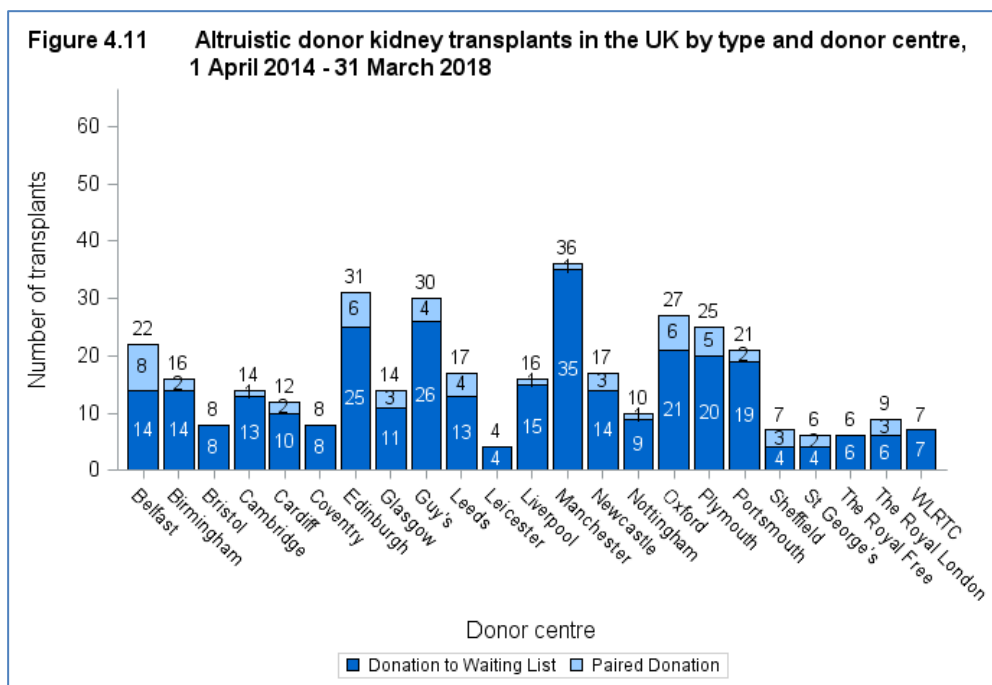
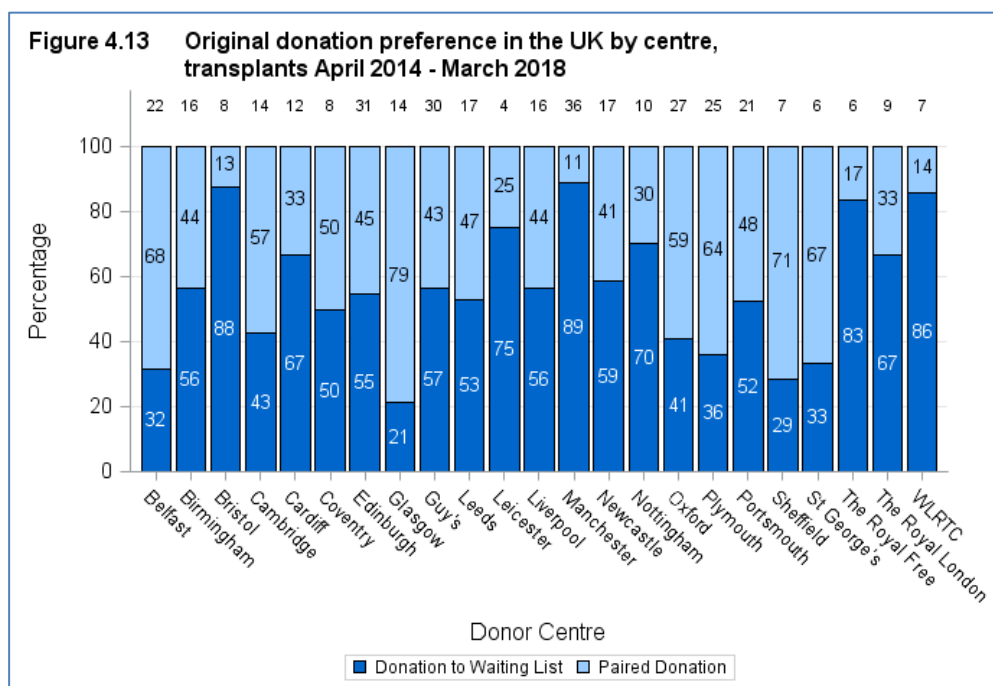


Figure 4.11 shows the number of altruistic donor kidney transplants from 1 April 2014 to 31 March 2018 by donor centre. Manchester had the highest number of altruistic donors. **Figure 4.12** shows the number of altruistic donor kidney transplant from 1 April 2014 to 31 March 2018 by recipient centre. Birmingham had the highest number of recipients of altruistic donors.



4.2.2 Donation Preference, 1 April 2014 – 31 March 2018

Figure 4.13 shows the original donation preference for altruistic donors from 1 April 2014 to 31 March 2018, by centre. The proportion indicating a preference for donating to the paired donation scheme varies from 11% in Manchester to 79% in Glasgow.



4.2.3 Time to donation, 1 April 2014 – 31 March 2018

Figure 4.14 shows the median time in months from notification to donation from 1 April 2014 to 31 March 2018, 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.

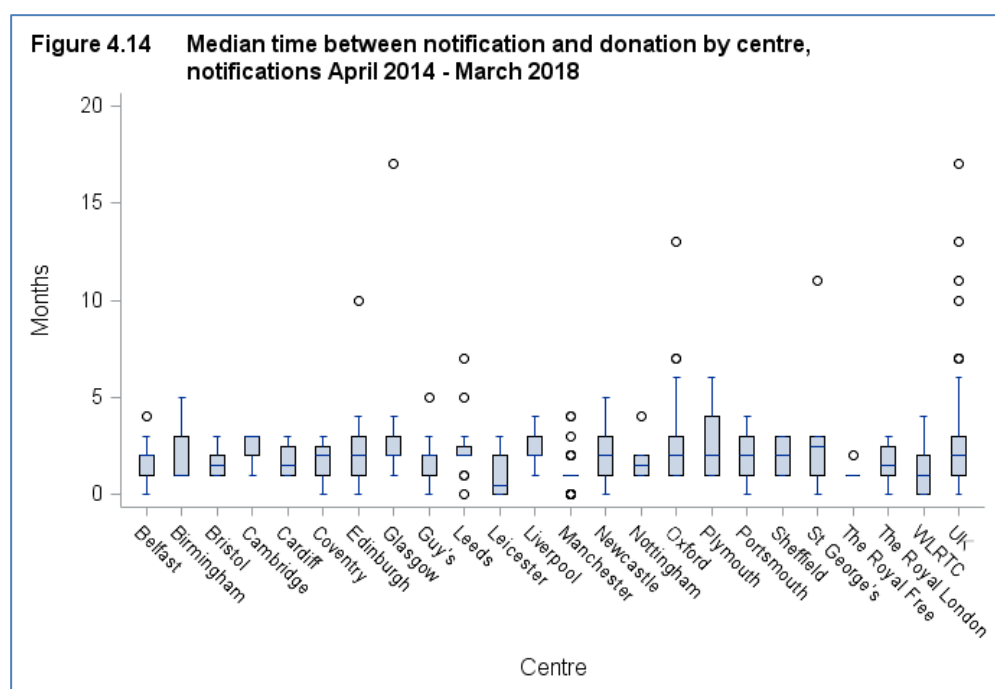


Table 4.7 Median time between notification and donation by Centre, Donations April 2014 - March 2018			
Centre	Number of donors	Median	Interquartile range
Belfast	19	2	1 - 2
Birmingham	15	1	1 - 3
Bristol	6	1	1 - 2
Cambridge	13	3	2 - 3
Cardiff	12	2	1 - 2
Coventry	8	2	1 - 2
Edinburgh	29	2	1 - 3
Glasgow	13	2	2 - 3
Guy's	30	2	1 - 2
Leeds	16	2	2 - 2
Leicester	4	1	0 - 2
Liverpool	14	2	2 - 3
Manchester	34	1	1 - 1
Newcastle	17	2	1 - 3
Nottingham	10	2	1 - 2
Oxford	26	2	1 - 3
Plymouth	23	2	1 - 4
Portsmouth	20	2	1 - 3
Sheffield	7	2	1 - 3
St George's	6	2	1 - 3
The Royal Free	6	1	1 - 1
The Royal London	8	1	1 - 2
WLRTC	7	1	0 - 2
UK	343	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.

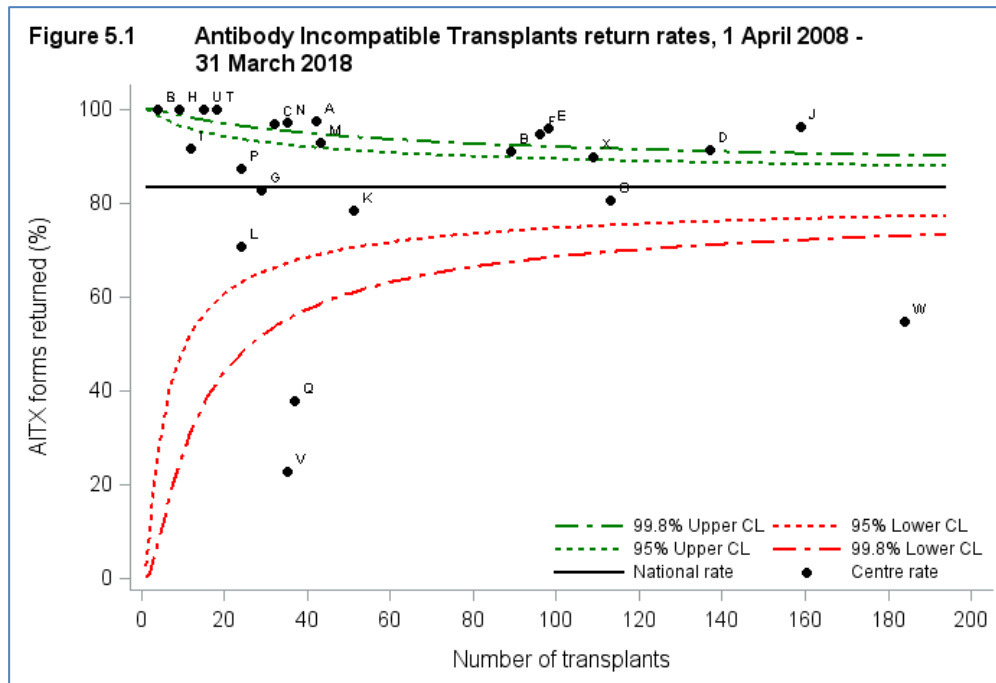


Table 5.1**Antibody incompatible transplant form return rates,
1 April 2008 – 31 March 2018**

Transplant Centre	Code	Number of transplants	AITX forms returned	
			N	%
Belfast	A	42	41	98
Birmingham	B	89	81	91
Bristol	C	32	31	97
Cambridge	D	137	125	91
Cardiff	E	98	94	96
Coventry	F	96	91	95
Edinburgh	G	29	24	83
Glasgow	H	9	9	100
GOSH*	I	12	11	92
Guy's	J	159	153	96
Leeds	K	51	40	78
Leicester	L	24	17	71
Liverpool	M	43	40	93
Manchester	N	35	34	97
Newcastle	O	113	91	81
Nottingham	P	24	21	88
Oxford	Q	37	14	38
Plymouth	R	4	4	100
Portsmouth	S	4	4	100
Sheffield	T	18	18	100
St George's	U	15	15	100
The Royal Free	V	35	8	23
The Royal London	W	184	101	55
WLRTC	X	109	98	90
UK		1399	1165	83

*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 46 in the latest financial year.

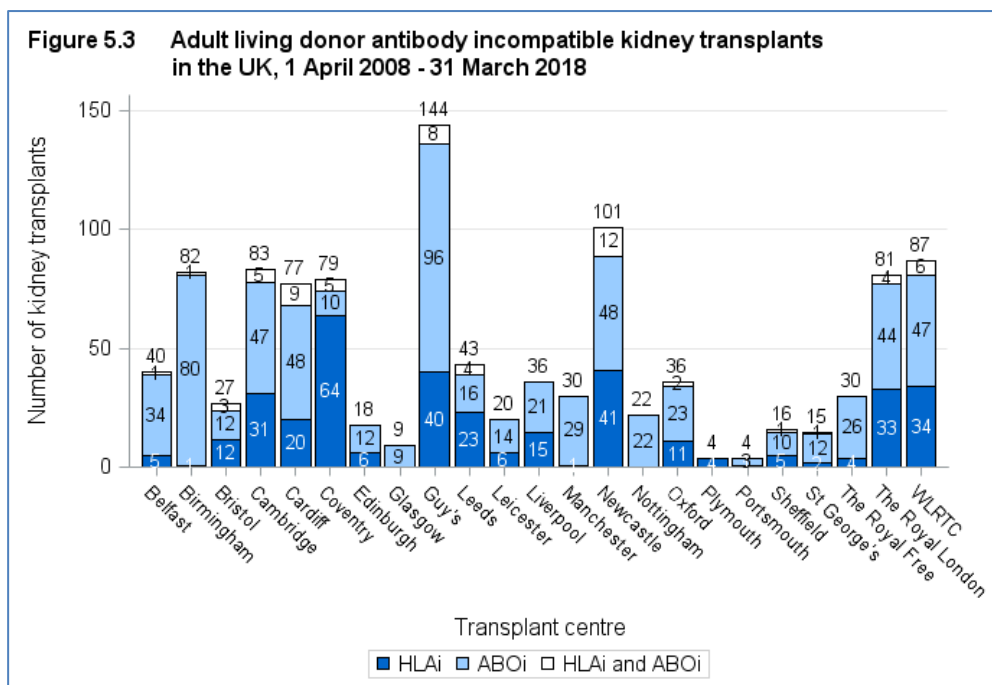
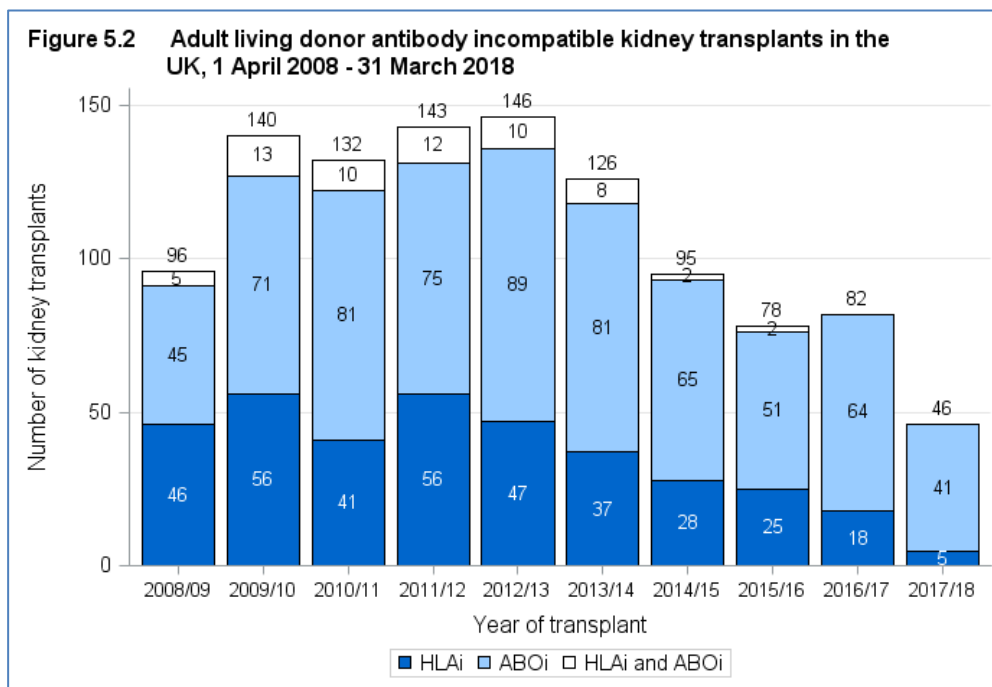


Table 5.2 shows the donor and recipient blood group for all ABOi transplants.

Table 5.2 Donor and recipient blood group for all adult ABOi transplants, 1 April 2008 - 31 March 2018						
Recipient blood group	Donor blood group					
	A		B		AB	
	N	(%)	N	(%)	N	(%)
A	1	(<1)	72	(10)	51	(7)
B	95	(13)	1	(<1)	35	(5)
O	327	(45)	126	(17)	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 2008 - 31 March 2018								
Donor-Recipient ABO	Recipient CRF at transplant							
	0-9		10-84		85-94		95-100	
	N	(%)	N	(%)	N	(%)	N	(%)
A-A	22	(2)	22	(2)	14	(1)	35	(3)
A-AB	2	(<1)	2	(<1)	1	(<1)	1	(<1)
A-B	64	(6)	16	(2)	3	(<1)	12	(1)
A-O	221	(20)	73	(7)	13	(1)	21	(2)
AB-A	36	(3)	10	(1)	3	(<1)	2	(<1)
AB-AB	1	(<1)	-		1	(<1)	3	(<1)
AB-B	27	(3)	5	(1)	1	(<1)	2	(<1)
AB-O	8	(1)	1	(<1)	2	(<1)	1	(<1)
B-A	52	(5)	12	(1)	3	(<1)	5	(1)
B-AB	1	(<1)	-		-		1	(<1)
B-B	6	(1)	4	(<1)	3	(<1)	9	(1)
B-O	81	(8)	33	(3)	8	(1)	4	(<1)
O-A	22	(2)	10	(1)	6	(1)	14	(1)
O-AB	3	(<1)	1	(<1)	-		-	
O-B	1	(<1)	10	(1)	2	(<1)	6	(1)
O-O	37	(3)	41	(4)	25	(2)	57	(5)

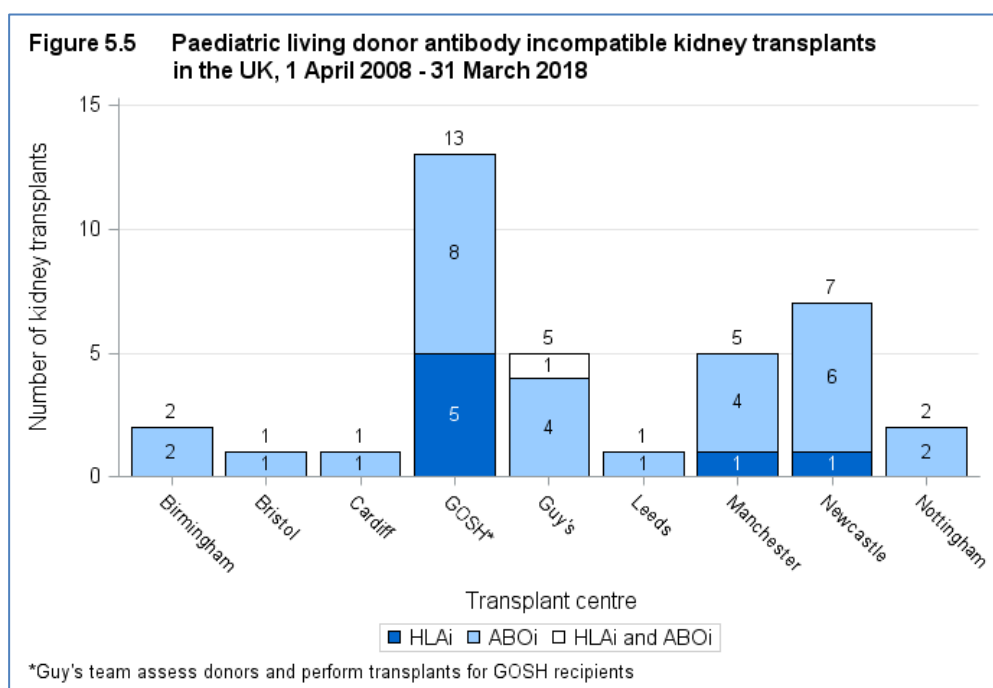
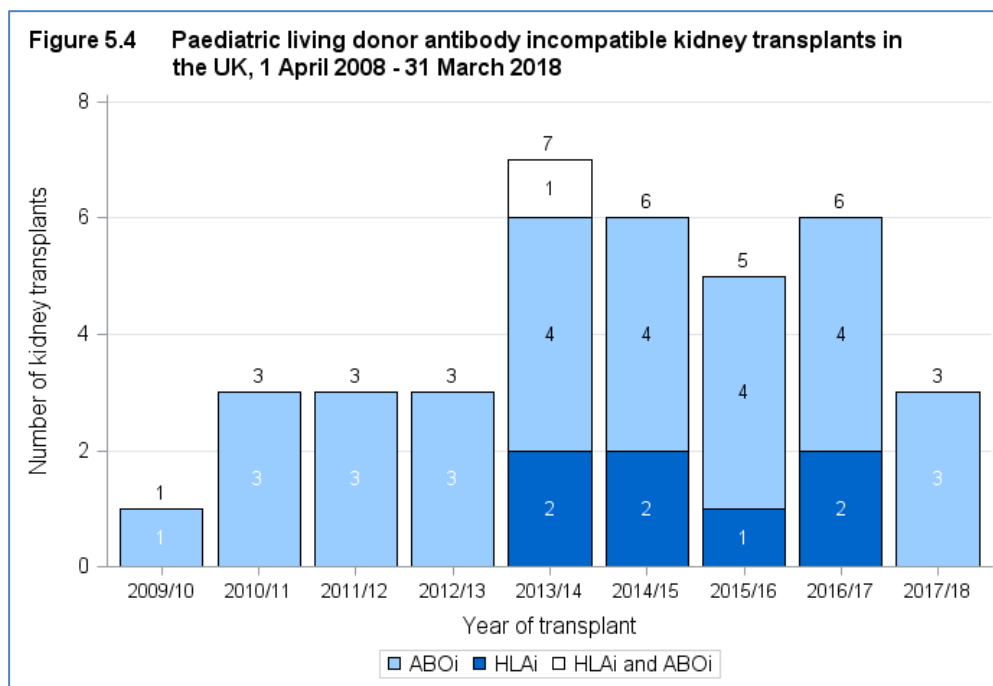
Table 5.4 shows the pre and at transplant level group for all HLAi transplants. Data are only presented for cases where an antibody incompatible form has been completed and returned. **Table 5.5** shows the calculated reaction frequency by incompatibility type.

Table 5.4 Pre and at transplant antibody level group for all adult HLAi transplants, 1 April 2008 - 31 March 2018												
Pre treatment antibody level group	At Transplant antibody level group										Unknown	
	CDC pos, Flow pos, DSA SPA pos N (%)	CDC neg, Flow pos, DSA SPA pos N (%)	CDC neg, Flow neg, DSA SPA pos N (%)	CDC neg, Flow neg, DSA SPA neg N (%)	CDC NT, Flow pos, DSA SPA pos N (%)							
CDC NT, Flow pos, DSA SPA pos	-	-	21 (5)	1 (<1)	16 (4)	1 (<1)						
CDC neg, Flow neg, DSA SPA pos	-	1 (<1)	113 (26)	22 (5)	-	1 (<1)						
CDC neg, Flow pos, DSA SPA pos	-	87 (20)	52 (12)	39 (9)	-	20 (5)						
CDC pos, Flow pos, DSA SPA pos	12 (3)	17 (4)	12 (3)	5 (1)	1 (<1)	2 (1)						
Unknown	-	1 (<1)	-	1 (<1)	-	10 (2)						

Table 5.5 At transplant calculated reaction frequency by incompatibility type, 1 April 2008 - 31 March 2018						
Calculated Reaction Frequency	ABOi		HLAi		HLAi and ABOi	
	N	%	N	%	N	%
0-9	485	(73)	90	(25)	10	(16)
10-84	136	(21)	89	(25)	15	(24)
85-94	24	(4)	53	(15)	9	(15)
95-100	18	(3)	127	(35)	28	(45)

PAEDIATRIC

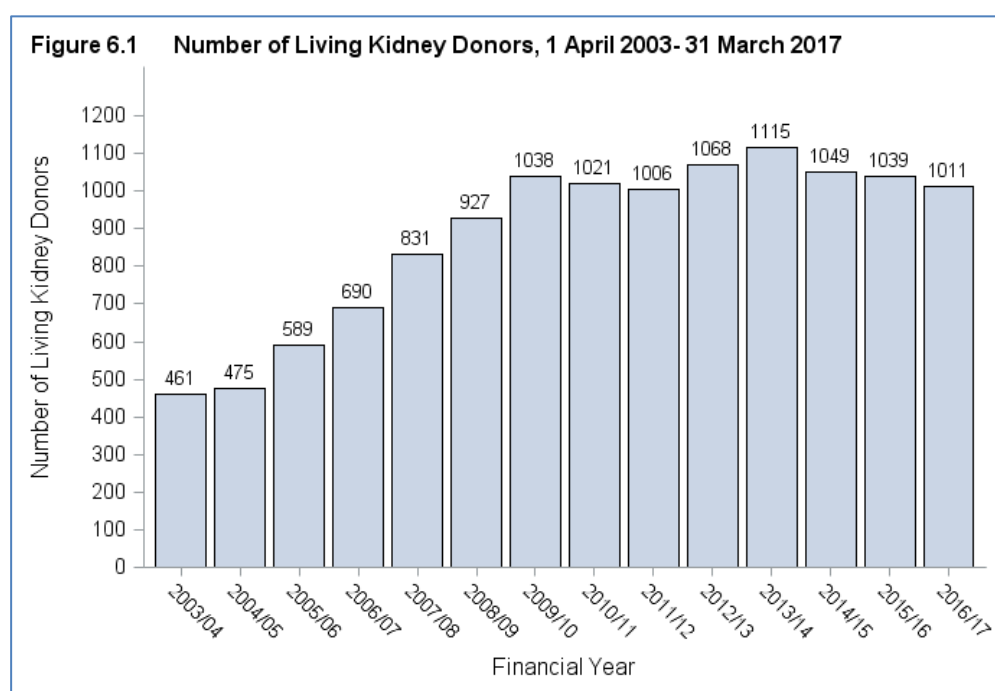
Figures 5.4 and 5.5 show the number of living donor antibody incompatible kidney transplants by financial year and centre respectively.



Living Donor Follow-Up

This section contains information on all living donors who have donated to both adult and paediatric recipients from 2003/04 to 2016/17. 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 2003/04 to 2016/17. The number of living donors has increased from 461 in 2003/04 to 1011 in 2016/17.



Of the living donors over this period, 75 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 2003 – 31 March 2017		
Cause of Death	N	%
Cancer	33	44
Bowel	2	3
Breast	3	4
Colonic	1	1
Gastric	1	1
Liver	1	1
Lung	3	4
Oesophagus	3	4
Pancreatic	5	7
Prostate	1	1
Throat	2	3
Uterus	1	1
Other	10	13
Brain Tumor	4	5
Intracranial hemorrhage	4	5
Myocardial infarction	1	1
Parkinson's disease	1	1
Pulmonary embolism	1	1
Bronchopneumonia	2	3
Other	10	13
Unknown	19	25
TOTAL	75	100

6.1 Prescription of Antihypertensive drugs, 1 April 2003 – 31 March 2017

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 5% at one year, 7% at five years and 11% at ten years post donation.

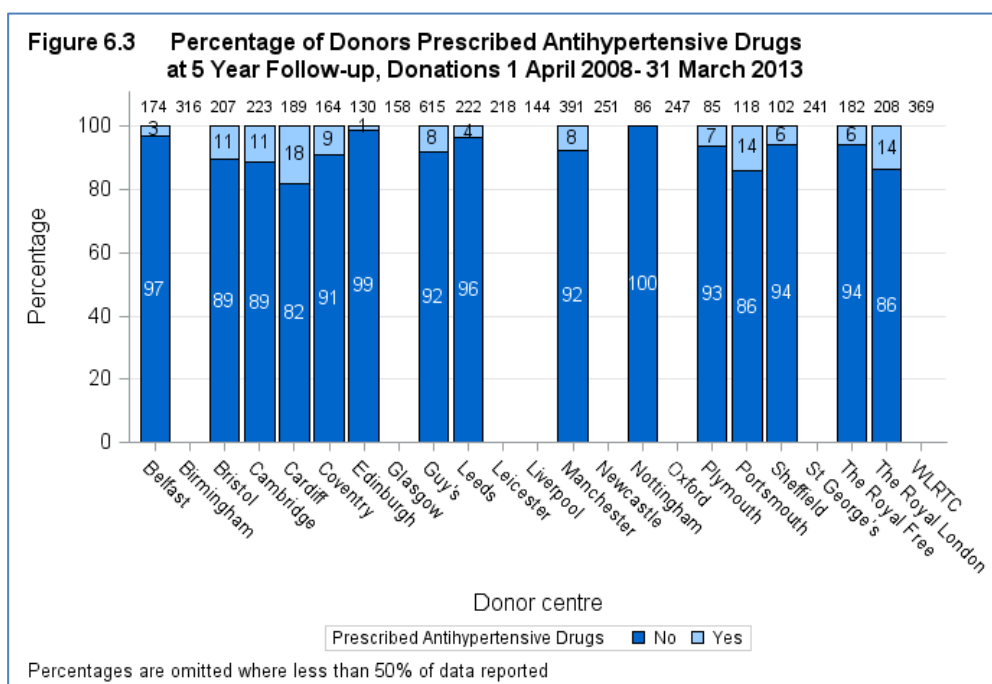
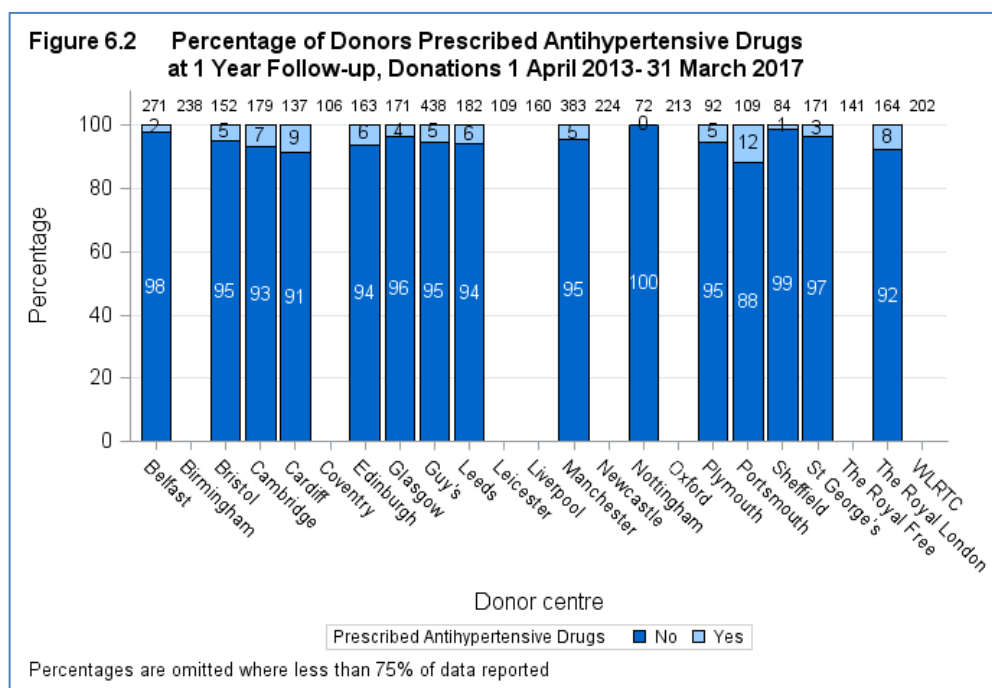


Figure 6.4 Percentage of Donors Prescribed Antihypertensive Drugs at 10 Year Follow-up, Donations 1 April 2003- 31 March 2008

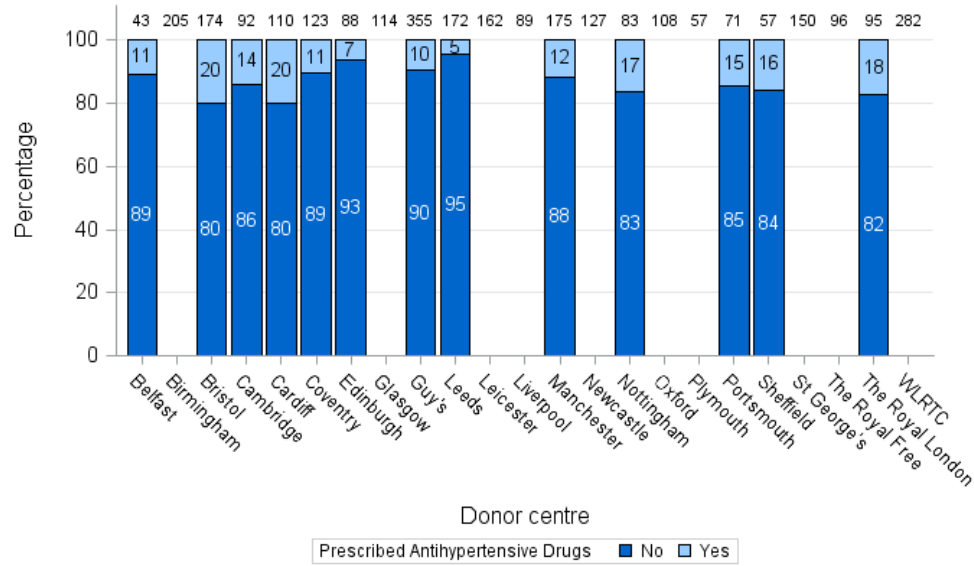


Table 6.2 Percentage of Donors Prescribed Antihypertensive Drugs by Centre, Donations April 2003 - March 2017

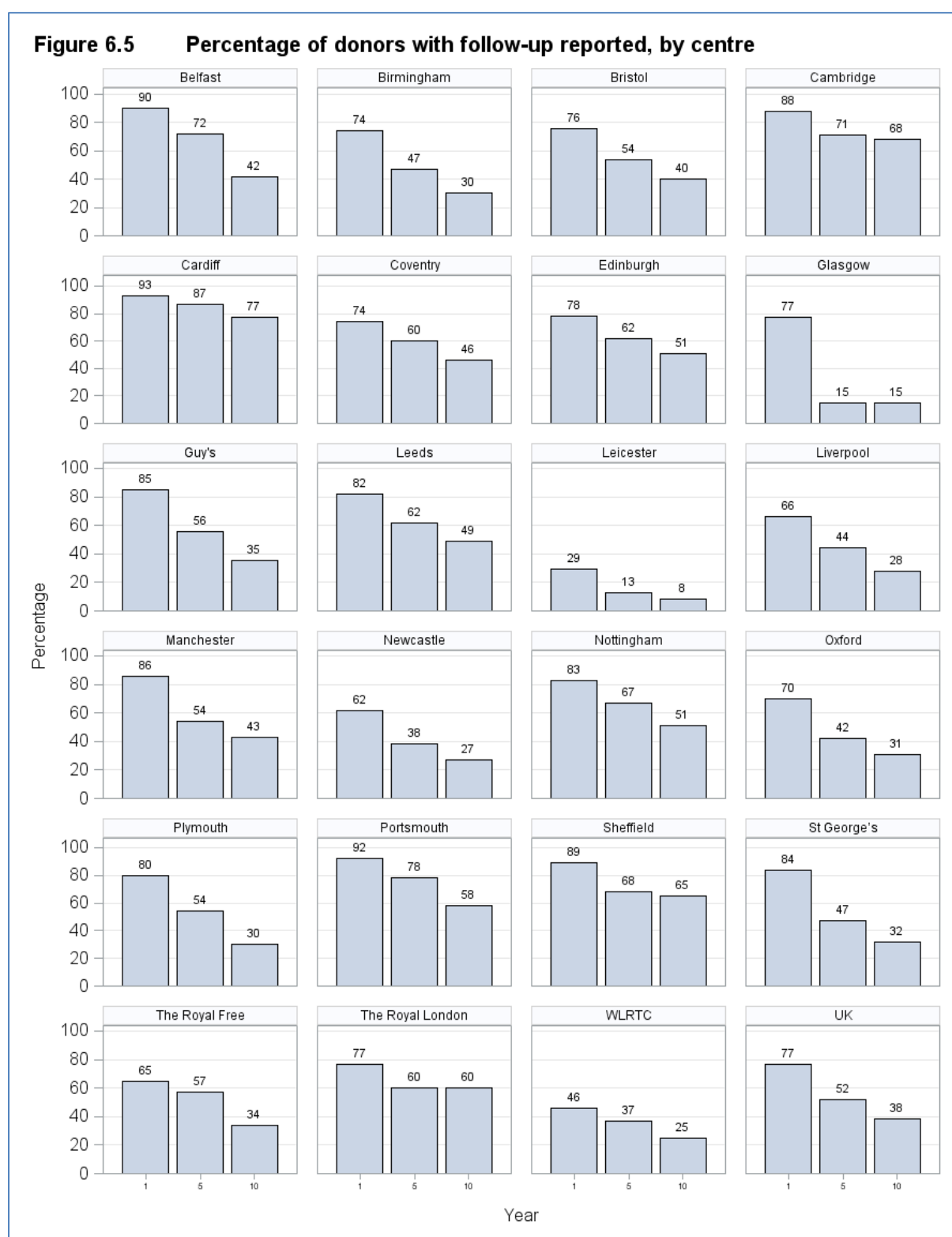
Centre	1 Year			5 Year			10 Year		
	N	% ¹	% ²	N	% ¹	% ²	N	% ¹	% ²
Belfast	271	90	2	174	72	3	43	42	-
Birmingham	238	74	-	316	47	-	205	30	-
Bristol	152	76	5	207	54	11	174	40	20
Cambridge	179	88	7	223	71	11	92	68	14
Cardiff	137	93	9	189	87	18	110	77	20
Coventry	106	74	-	164	60	9	123	46	11
Edinburgh	163	78	6	130	62	1	88	51	7
Glasgow	171	77	4	158	15	-	114	15	-
Guy's	438	85	5	615	56	8	355	35	10
Leeds	182	82	6	222	62	4	172	49	5
Leicester	109	29	-	218	13	-	162	8	-
Liverpool	160	66	-	144	44	-	89	28	-
Manchester	383	86	5	391	54	8	175	43	12
Newcastle	224	62	-	251	38	-	127	27	-
Nottingham	72	83	0	86	67	0	83	51	17
Oxford	213	70	-	247	42	-	108	31	-
Plymouth	92	80	5	85	54	7	57	30	-
Portsmouth	109	92	12	118	78	14	71	58	15
Sheffield	84	89	1	102	68	6	57	65	16
St George's	171	84	3	241	47	-	150	32	-
The Royal Free	141	65	-	182	57	6	96	34	-
The Royal London	164	77	8	208	60	14	95	60	18
WLRTC	202	46	-	369	37	-	282	25	-
UK	4161	77	5	5040	52	7	3028	38	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 2003 - March 2017.



6.2 Serum creatinine, 1 April 2003 – 31 March 2017

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 90-121) at one year, 96 (84-111) at five years and 93 (81-106) at ten years post donation

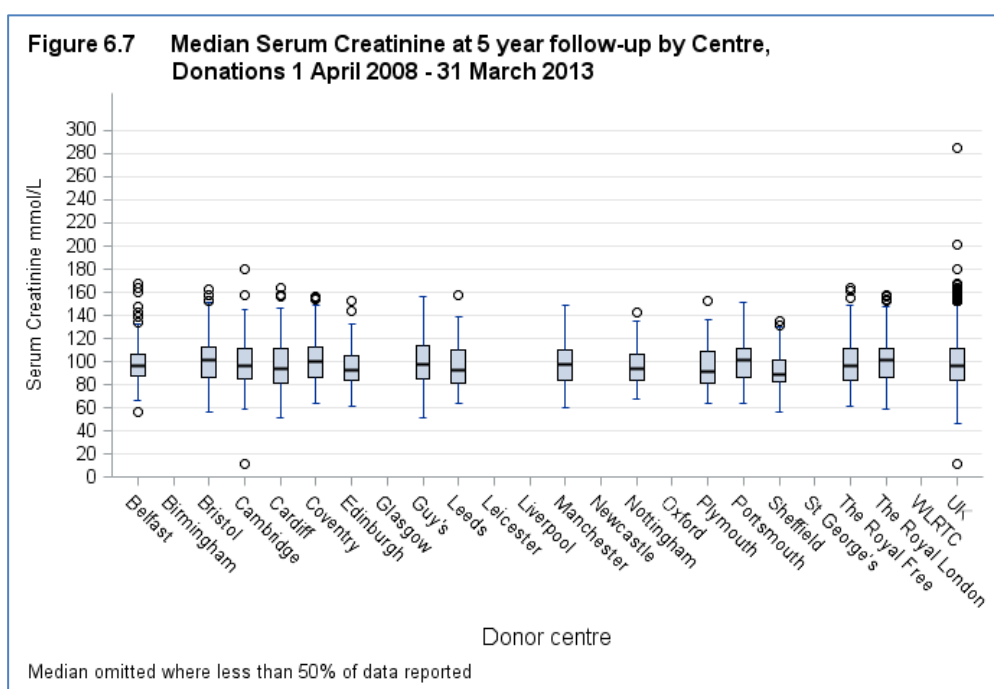
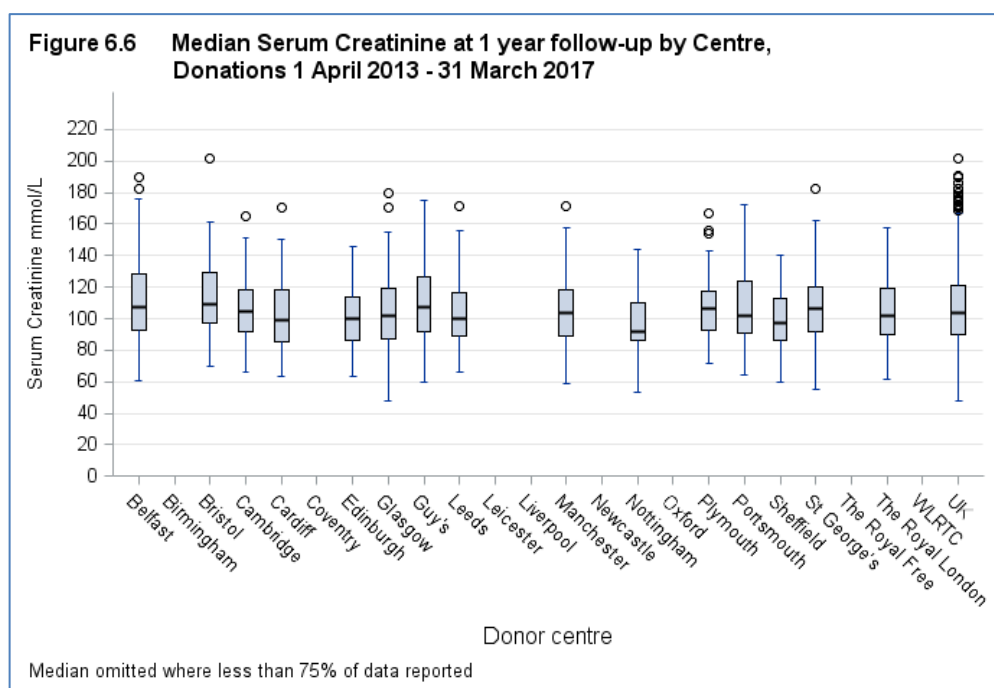


Figure 6.8 Median Serum Creatinine at 10 year follow-up by Centre,
Donations 1 April 2003 - 31 March 2008

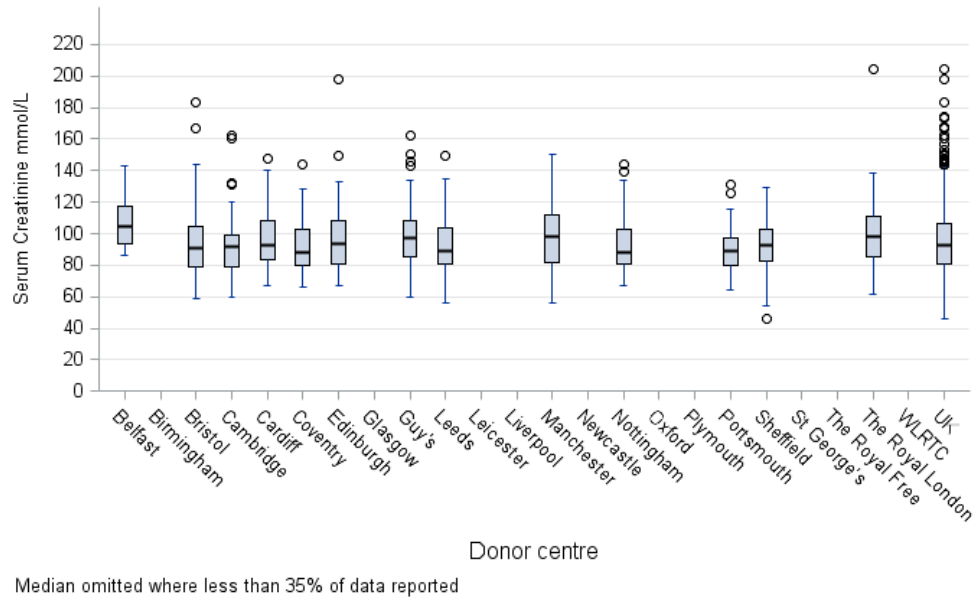


Table 6.3 Median Serum Creatinine at 1, 5 and 10 year follow up by Centre, Donations 1 April 2003 - 31 March 2017

Centre	1 Year			5 Year			10 Year		
	N	% ¹	Median (IQ range)	N	% ¹	Median (IQ range)	N	% ¹	Median (IQ range)
Belfast	271	89	107 (93-128)	174	72	96 (88-106)	43	42	105 (94-117)
Birmingham	238	72	- (-)	316	47	(-)	205	29	(-)
Bristol	152	76	109.5 (97-129)	207	54	102 (87-113)	174	40	91 (79-105)
Cambridge	179	87	104.5 (92-118)	223	70	97 (85-112)	92	68	92 (79-99)
Cardiff	137	92	99.5 (85-118)	189	87	94 (82-111)	110	77	93 (84-108)
Coventry	106	75	106 (94-122)	164	60	100 (86-113)	123	46	88 (80-103)
Edinburgh	163	78	100 (86-114)	130	62	93 (84.5-105.5)	88	51	94 (81-108)
Glasgow	171	76	102 (87-119)	158	15	(-)	114	15	(-)
Guy's	438	85	107 (92-127)	615	55	98 (85-114)	355	35	97 (85-108)
Leeds	182	81	100 (89-116.5)	222	60	93 (81-110)	172	49	89 (81-104)
Leicester	109	28	- (-)	218	13	(-)	162	8	(-)
Liverpool	160	60	- (-)	144	43	(-)	89	28	(-)
Manchester	383	86	103.5 (89-118)	391	52	98 (84-110)	175	43	98 (82-112)
Newcastle	224	62	- (-)	251	38	(-)	127	27	(-)
Nottingham	72	83	92 (86-110)	86	67	94.5 (84-107)	83	51	88 (81-103)
Oxford	213	69	- (-)	247	42	(-)	108	31	(-)
Plymouth	92	80	106 (93-117)	85	54	92 (82-109)	57	30	(-)
Portsmouth	109	91	102 (91-124)	118	75	102 (86-112)	71	58	89 (80-97)
Sheffield	84	89	97 (86-113)	102	68	89 (83-102)	57	65	93 (83-103)
St George's	171	82	106 (92-120)	241	46	(-)	150	32	(-)
The Royal Free	141	65	- (-)	182	57	96 (84-112)	96	34	(-)
The Royal London	164	77	101.5 (90-119)	208	59	101 (87-111)	95	60	98 (85-111)
WLRTC	202	46	- (-)	369	37	(-)	282	25	(-)
UK	4161	76	104 (90-121)	5040	52	96 (84-111)	3028	38	93 (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 2003 – 31 March 2017

Figure 6.9 shows the median time (in months) to return to normal activity after donation, by centre. The median ranged from 1 to 3 months post-transplant.

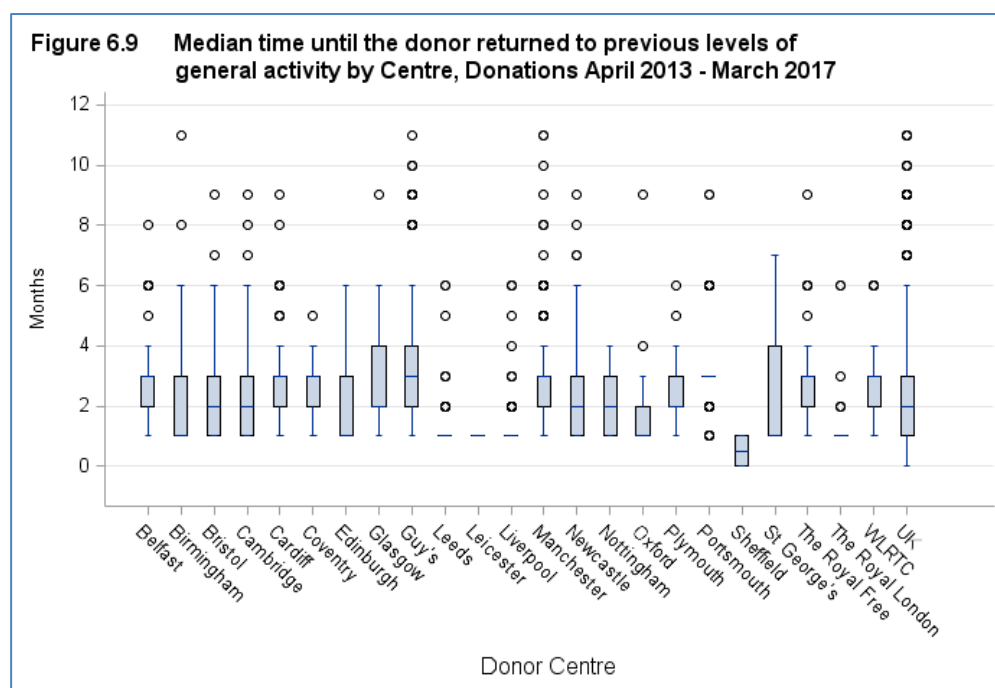


Figure 6.10 shows the median time (in months) to return to normal activity after donation in the UK, by financial year.



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.

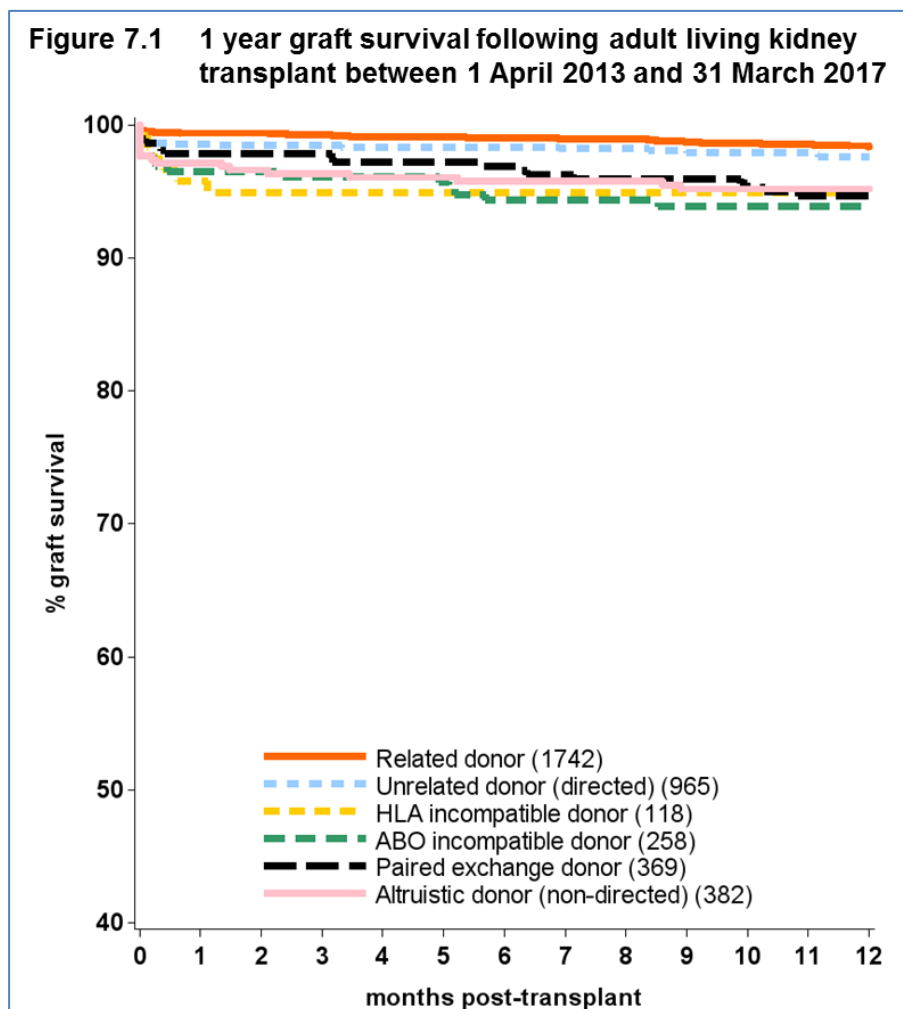


Table 7.1 1 year graft survival following living kidney transplant between 1 April 2013 and 31 March 2017 (p<0.0001)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1742	98.3	(98-99)
Unrelated donor (directed)	965	97.6	(96-98)
Altruistic donor (non-directed)	382	95.2	(92-97)
HLA incompatible donor	118	94.9	(89-98)
Paired exchange donor	369	94.6	(92-97)
ABO incompatible donor	258	93.9	(90-96)

Figure 7.2 5 year graft survival following adult living kidney transplant between 1 April 2009 and 31 March 2013

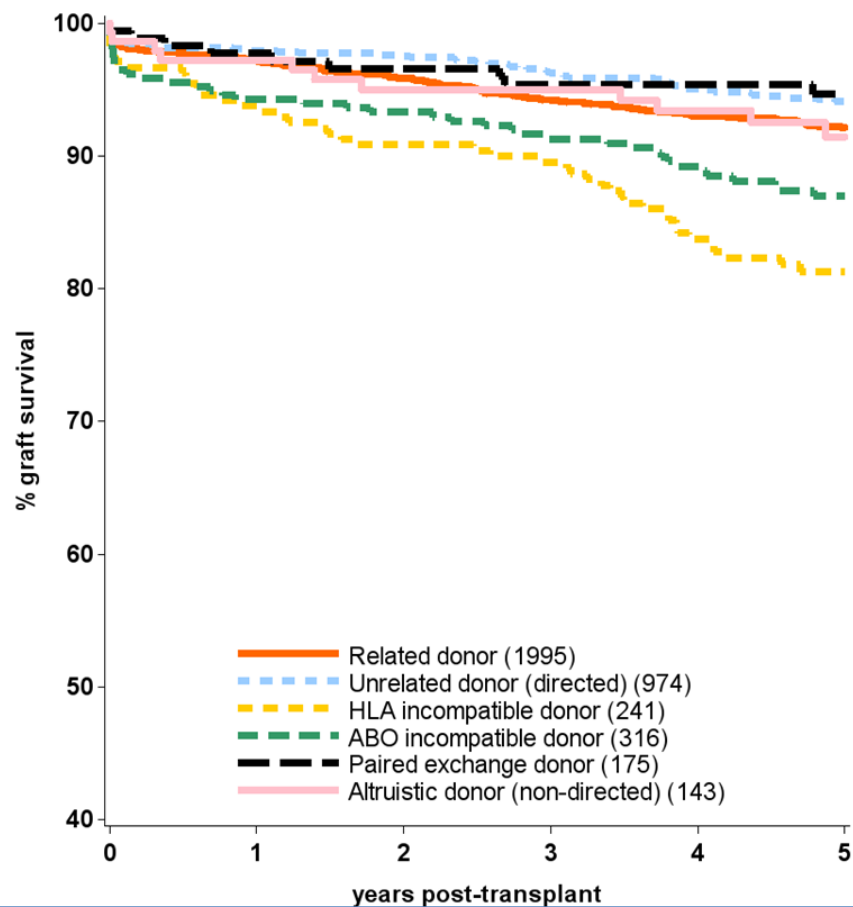


Table 7.2 5 year graft survival following living kidney transplant between 1 April 2009 and 31 March 2013 (p<0.0001)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Paired exchange donor	175	94.7	(90-97)
Unrelated donor (directed)	974	94.1	(92-95)
Related donor	1995	92.2	(91-93)
Altruistic donor (non-directed)	143	91.4	(85-95)
ABO incompatible donor	316	87.0	(83-90)
HLA incompatible donor	241	81.3	(76-86)

Figure 7.3 1 year patient survival following adult living kidney transplant between 1 April 2013 and 31 March 2017

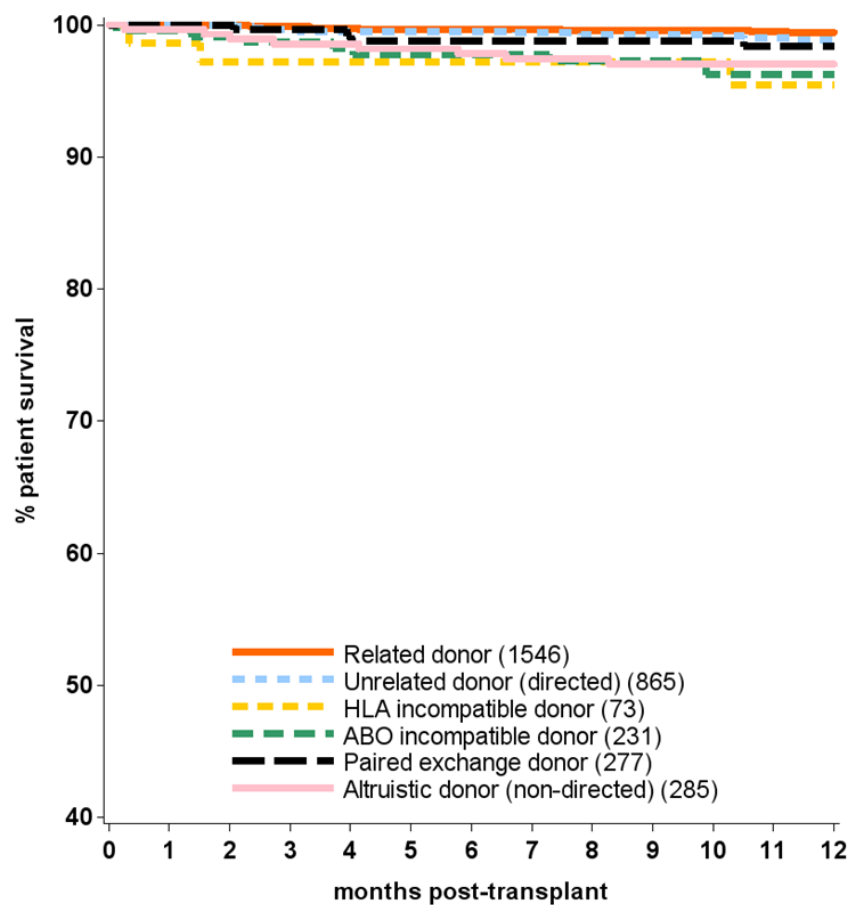


Table 7.3 1 year patient survival following living kidney transplant between 1 April 2013 and 31 March 2017 (p<0.0001)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1546	99.4	(99-100)
Unrelated donor (directed)	865	98.9	(98-99)
Paired exchange donor	277	98.4	(96-99)
Altruistic donor (non-directed)	285	97.0	(94-98)
ABO incompatible donor	231	96.3	(93-98)
HLA incompatible donor	73	95.5	(87-99)

Figure 7.4 5 year patient survival following adult living kidney transplant between 1 April 2009 and 31 March 2013

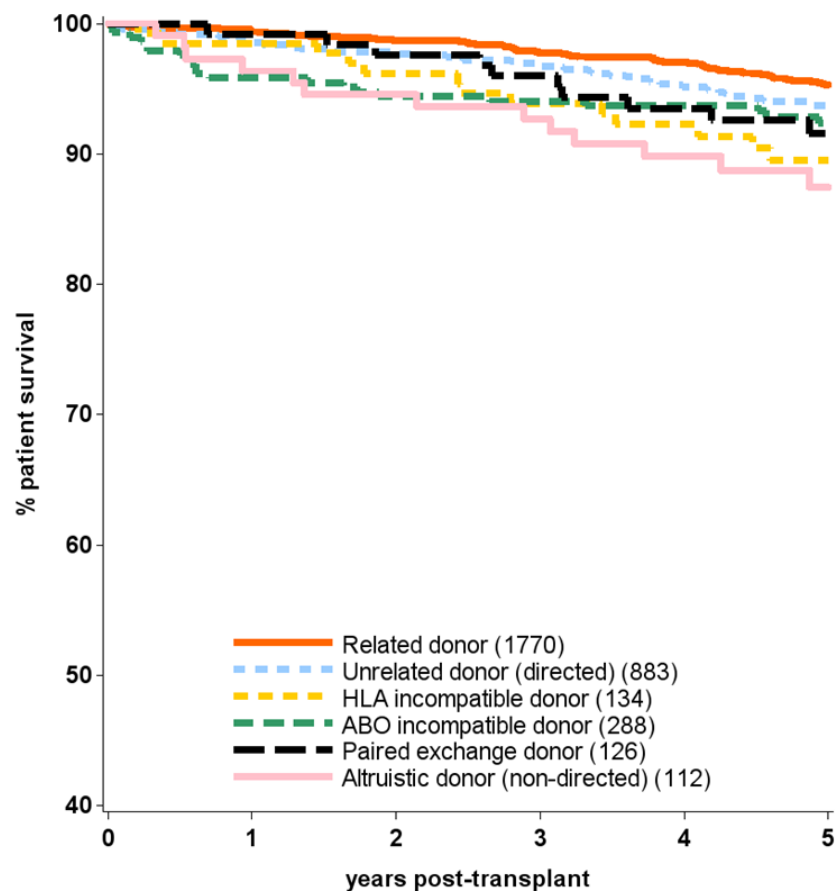


Table 7.4 5 year patient survival following living kidney transplant between 1 April 2009 and 31 March 2013 (p=0.0006)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1770	95.3	(94-96)
Unrelated donor (directed)	883	93.7	(92-95)
ABO incompatible donor	288	92.4	(89-95)
Paired exchange donor	126	91.6	(85-95)
HLA incompatible donor	134	89.5	(83-94)
Altruistic donor (non-directed)	112	87.4	(79-93)

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 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, 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 7.10 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.

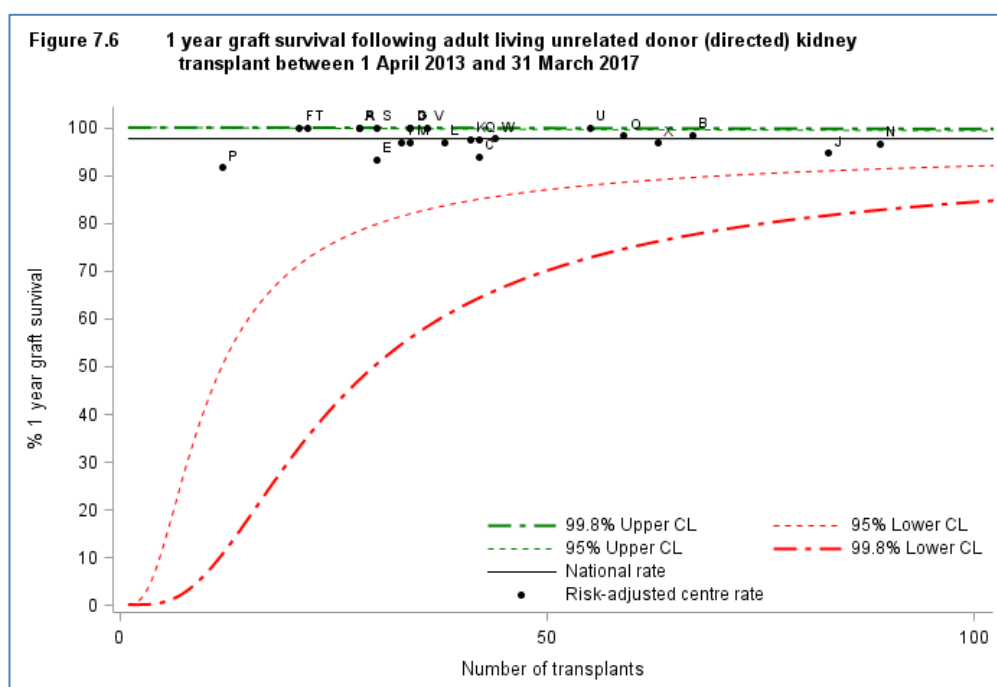
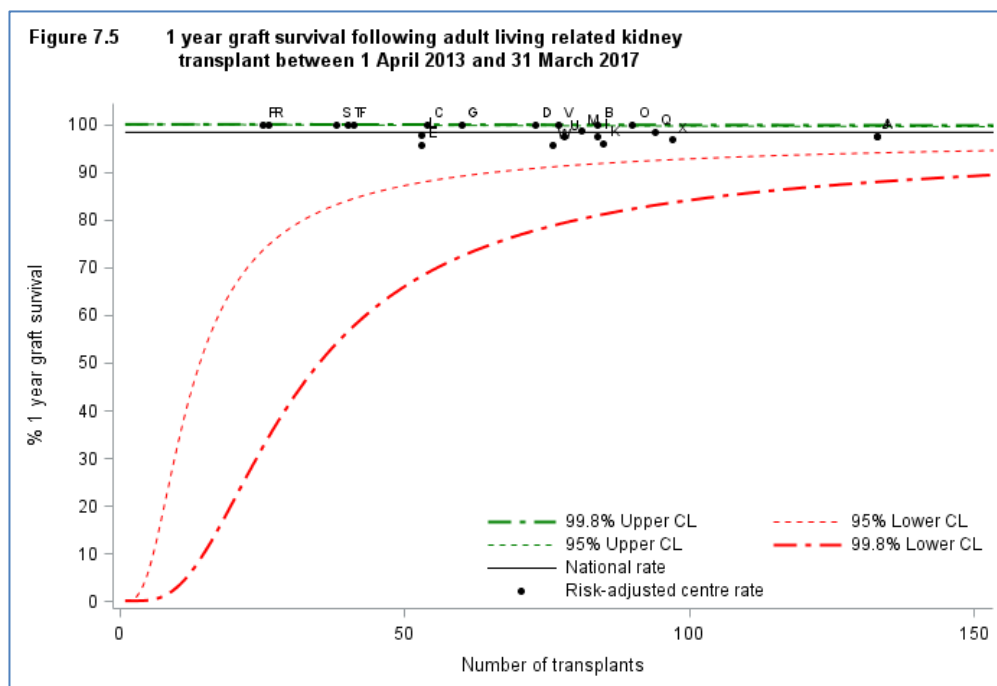


Figure 7.7 1 year graft survival following adult living HLAi donor kidney transplant between 1 April 2013 and 31 March 2017

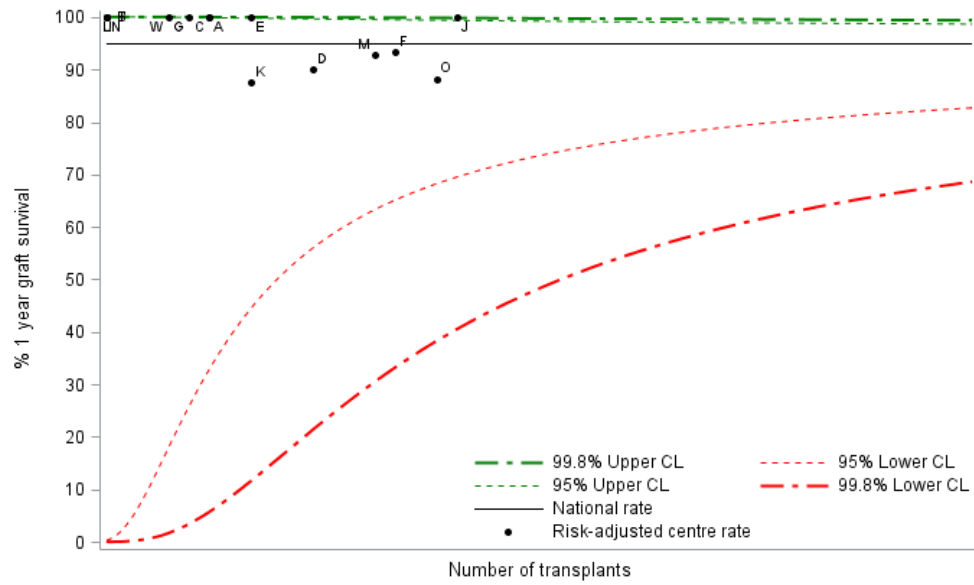


Figure 7.8 1 year graft survival following adult living ABOi donor kidney transplant between 1 April 2013 and 31 March 2017

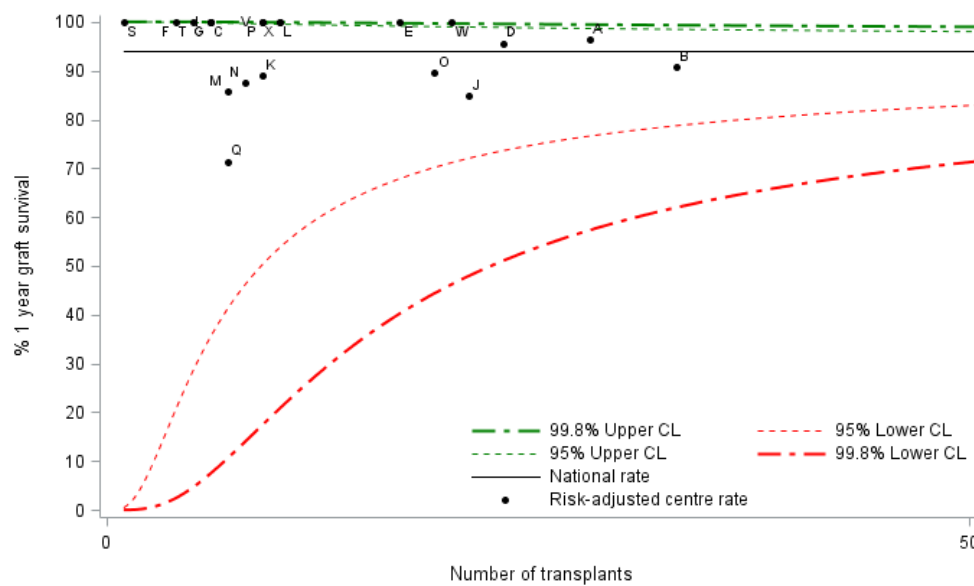


Figure 7.9 1 year graft survival following adult living paired exchange donor kidney transplant between 1 April 2013 and 31 March 2017

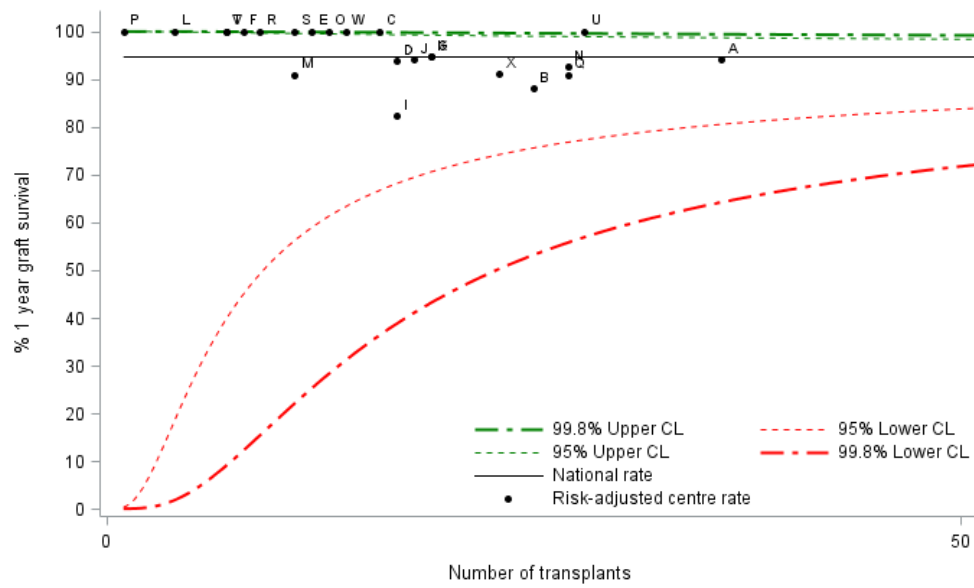


Figure 7.10 1 year graft survival following adult living altruistic donor (non-directed) kidney transplant between 1 April 2013 and 31 March 2017

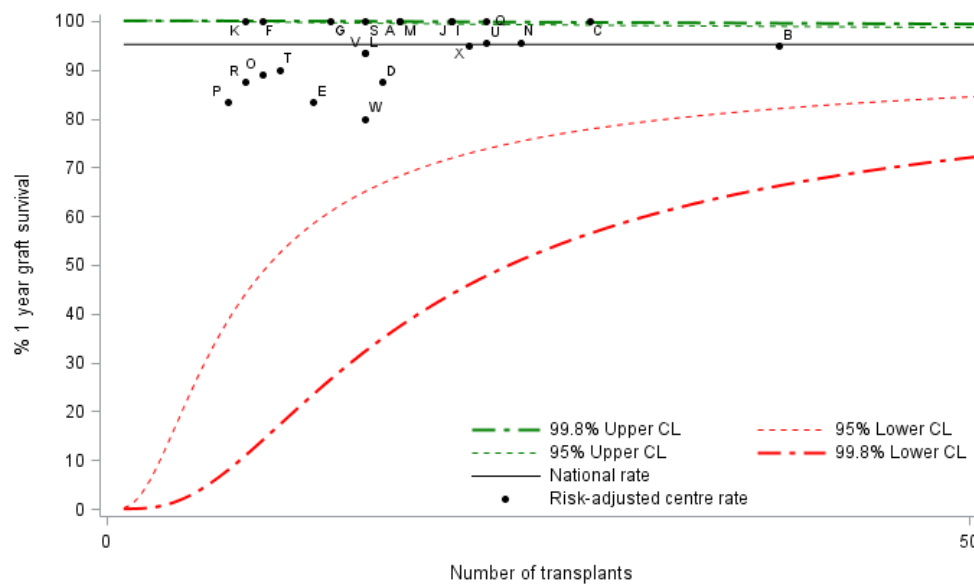


Table 7.5 1 year graft survival following adult living donor kidney transplant between 1 April 2013 and 31 March 2017, by donor type and centre													
Centre	Code	Related		Unrelated		HLAi		ABOi		Paired		Altruistic	
		N	% ¹	N	% ¹	N	% ¹	N	% ¹	N	% ¹	N	% ¹
Belfast	A	133	98	28	100	6	100	28	96	36	94	17	100
Birmingham	B	84	100	67	99	1	100	33	91	25	88	39	95
Bristol	C	54	100	42	94	6	100	6	100	16	100	28	100
Cambridge	D	73	100	34	100	11	90	23	96	17	94	16	88
Cardiff	E	53	96	30	93	8	100	17	100	12	100	12	83
Coventry	F	41	100	21	100	15	93	4	100	8	100	9	100
Edinburgh	G	60	100	34	100	5	100	6	100	19	95	13	100
Glasgow	I	84	98	33	97	0	-	6	100	17	82	20	100
Guy's	J	133	98	83	95	18	100	21	85	18	94	20	100
Leeds	K	85	96	41	98	8	88	9	89	19	95	8	100
Leicester	L	53	98	38	97	1	100	10	100	4	100	15	93
Liverpool	M	81	99	34	97	14	93	7	86	11	91	17	100
Manchester	N	162	98	89	97	1	100	8	88	27	93	24	96
Newcastle	O	90	100	59	98	17	88	19	89	13	100	9	89
Nottingham	P	25	100	12	92	0	-	9	100	1	100	7	83
Oxford	Q	94	99	42	98	0	-	7	71	27	91	22	100
Plymouth	R	26	100	28	100	0	-	0	-	9	100	8	88
Portsmouth	S	38	100	30	100	0	-	1	100	11	100	15	100
Sheffield	T	40	100	22	100	1	100	5	100	7	100	10	90
St George's	U	78	97	55	100	1	100	0	-	28	100	22	95
The Royal Free	V	77	100	36	100	0	-	9	100	7	100	15	93
The Royal London	W	76	96	44	98	4	100	20	100	14	100	15	80
WLRTC	X	97	97	63	97	0	-	10	100	23	91	21	95
UK		1737	98	965	98	117	95	258	94	369	95	382	95
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.

Prepared by:

Statistics and Clinical Studies, NHS Blood and Transplant

Dr Mathew Robb
Miss Chloe Brown
Miss Lisa Mumford