NHS
Blood and Transplant

ANNUAL REPORT ON LIVING DONOR KIDNEY TRANSPLANTATION

REPORT FOR 2019/2020
(1 APRIL 2005 – 31 MARCH 2020)

PUBLISHED OCTOBER 2020

Contents

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 2005. 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 942 adult living donor kidney transplants performed in the UK in 2019/20, an increase of 6 transplants compared to 2018/19. Of these, 434 (455 in 2018/19) were genetically related, 213 (232 in 2018/19) were unrelated, 7 (8 in 2018/19) were HLAi, 30 (33 in 2018/19) were ABOi, 164 (146 in 2018/19) were paired/pooled and 94 (62 in 2018/19) were non-directed altruistic donor transplants. The equivalent number of paediatric transplants was 71, an 10% decrease 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 90-119) at one year, 96 (84-112) 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 93%, genetically related 93%, non-directed altruistic 90%, paired exchange 89%, ABOi 84% and HLAi 81%.

- 41% of registered patients in the UK Living Kidney Sharing Scheme have been transplanted and 59% of identified transplants proceed.

Use of the contents of this report should be acknowledged as follows:
Annual Report on Living Donor Kidney Transplantation 2019/20. NHS Blood and Transplant

Introduction

This report presents information on transplant activity between 1 April 2005 and 31 March 2020, 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.

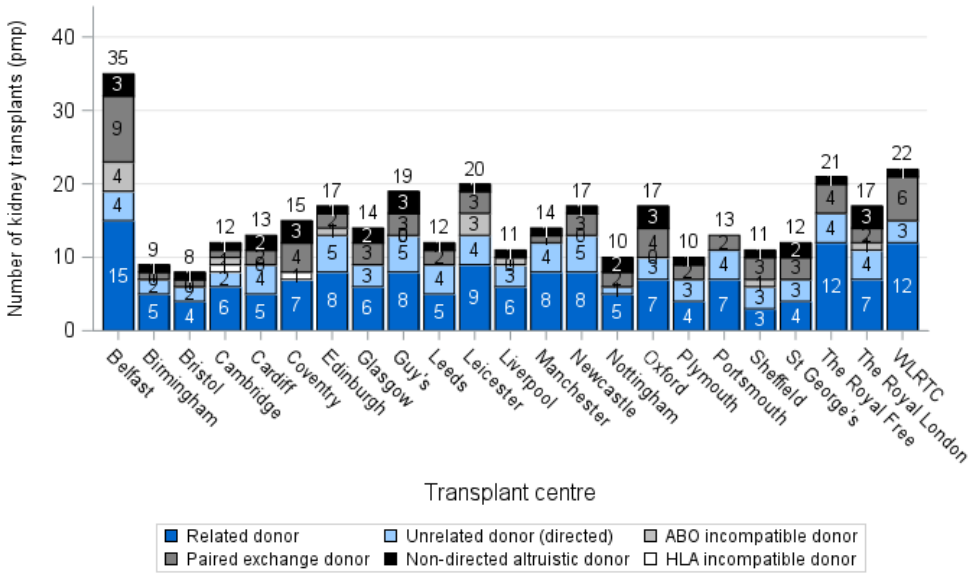
Graft and patient survival estimates are reported at one-year post transplant for the period 1 April 2015 to 31 March 2019 and five-year post-transplant for the period 1 April 2011 to 31 March 2015. Results are described separately according to the type of donor.

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

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

Figure 2.1 shows the number of adult living donor kidney transplants per million population (pmp) that were performed in 2019/20 in each transplant centre. Belfast had the highest rate of adult living donor kidney transplants per million population.

Figure 2.1 Adult Living donor kidney transplants (pmp) in the UK, 1 April 2019 - 31 March 2020



ADULT

Figure 2.2 shows the number of adult living donor kidney transplants performed in the UK between 1 April 2005 and 31 March 2020. The number of transplants increased from 539 in 2005/06 to 942 in 2019/20.

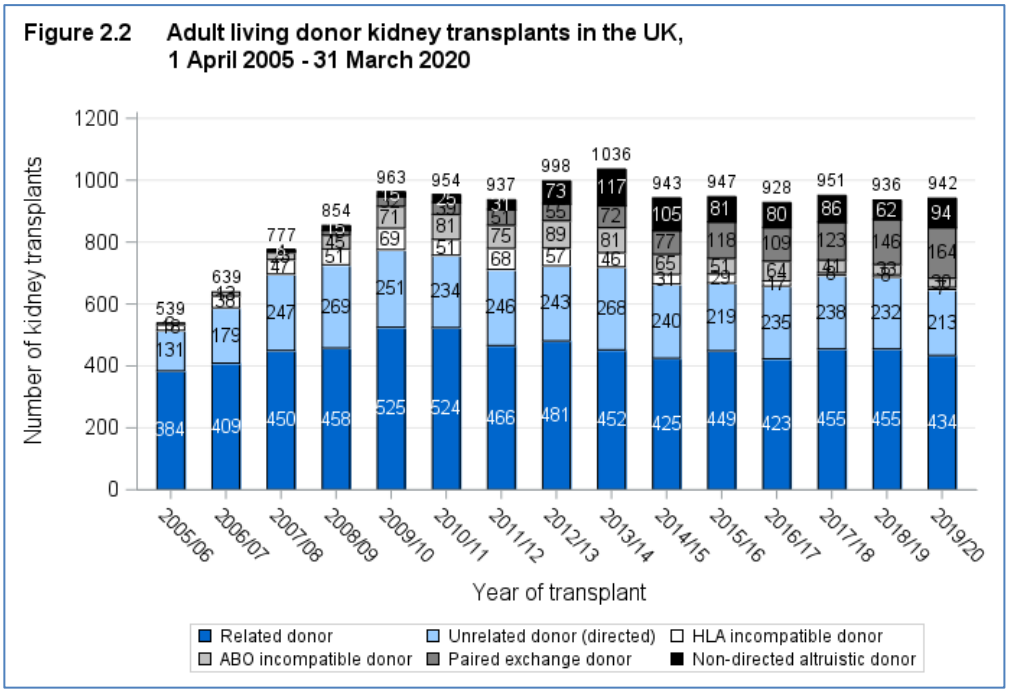


Figure 2.3 and **Table 2.1** show the number of adult living donor kidney transplants performed in 2019/20 in each transplant centre. Guy's performed the most adult living donor kidney transplants last year with 77 patients receiving a transplant. All centres perform non-directed altruistic kidney donation and participate in the UK Living Kidney Sharing Scheme. 11 centres (14 centres in 2018/19) performed ABO incompatible (ABOi) transplants and 6 centres (5 centres in 2018/19) performed HLA incompatible (HLAi) transplants in 2019/20.

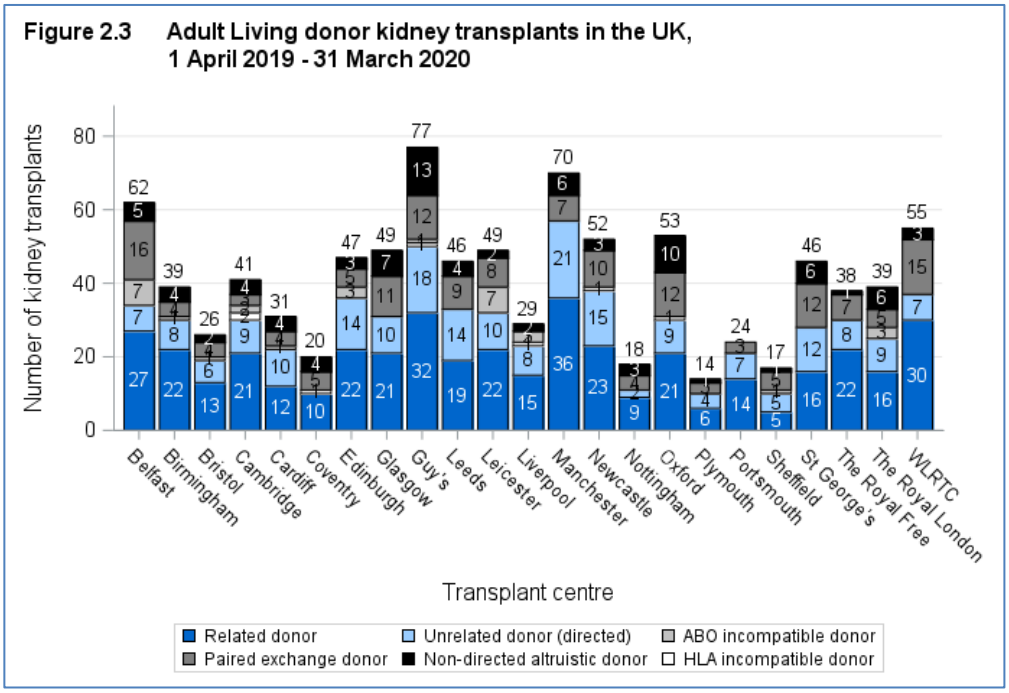


Table 2.1 Adult living donor kidney transplants in the UK, 1 April 2019 - 31 March 2020

Transplant Centre	Donor type					
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	Non-directed altruistic donor
Belfast	27	7	0	7	16	5
Birmingham	22	8	0	1	4	4
Bristol	13	6	0	1	4	2
Cambridge	21	9	2	2	3	4
Cardiff	12	10	0	1	4	4
Coventry	10	0	1	0	5	4
Edinburgh	22	14	0	3	5	3
Glasgow	21	10	0	0	11	7
Guy's	32	18	1	1	12	13
Leeds	19	14	0	0	9	4
Leicester	22	10	0	7	8	2
Liverpool	15	8	1	3	0	2
Manchester	36	21	0	0	7	6
Newcastle	23	15	1	0	10	3
Nottingham	9	2	0	0	4	3
Oxford	21	9	1	0	12	10
Plymouth	6	4	0	0	3	1
Portsmouth	14	7	0	0	3	0
Sheffield	5	5	0	1	5	1
St George's	16	12	0	0	12	6
The Royal Free	22	8	0	0	7	1
The Royal London	16	9	0	3	5	6
WLRTC	30	7	0	0	15	3

Figure 2.4 shows the proportion of adult living donor kidney transplants by donor type and centre in 2019/20.

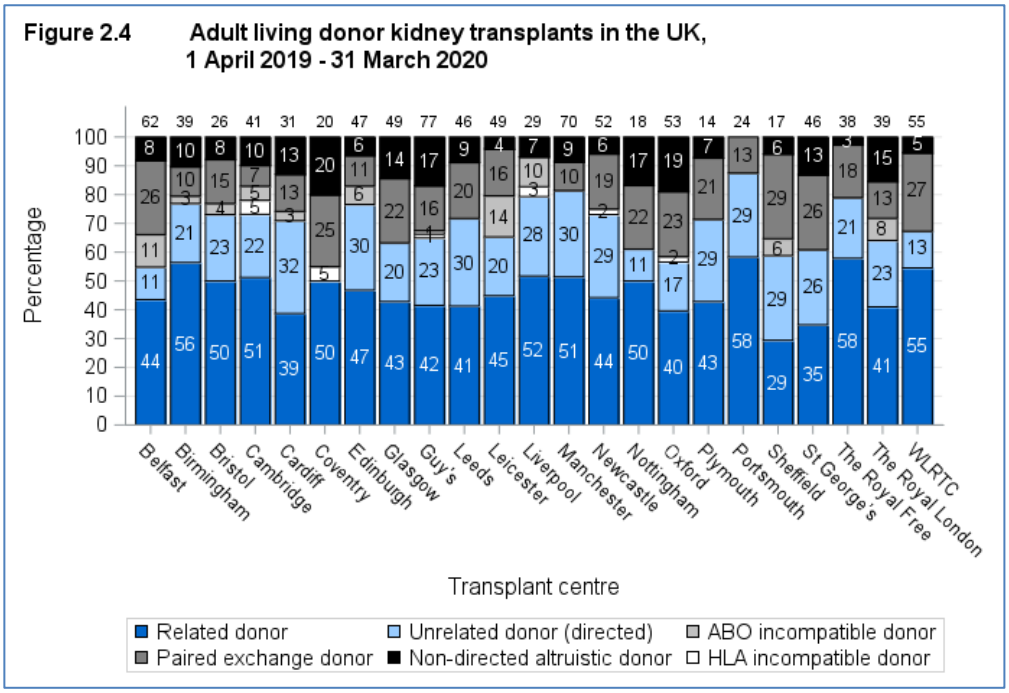
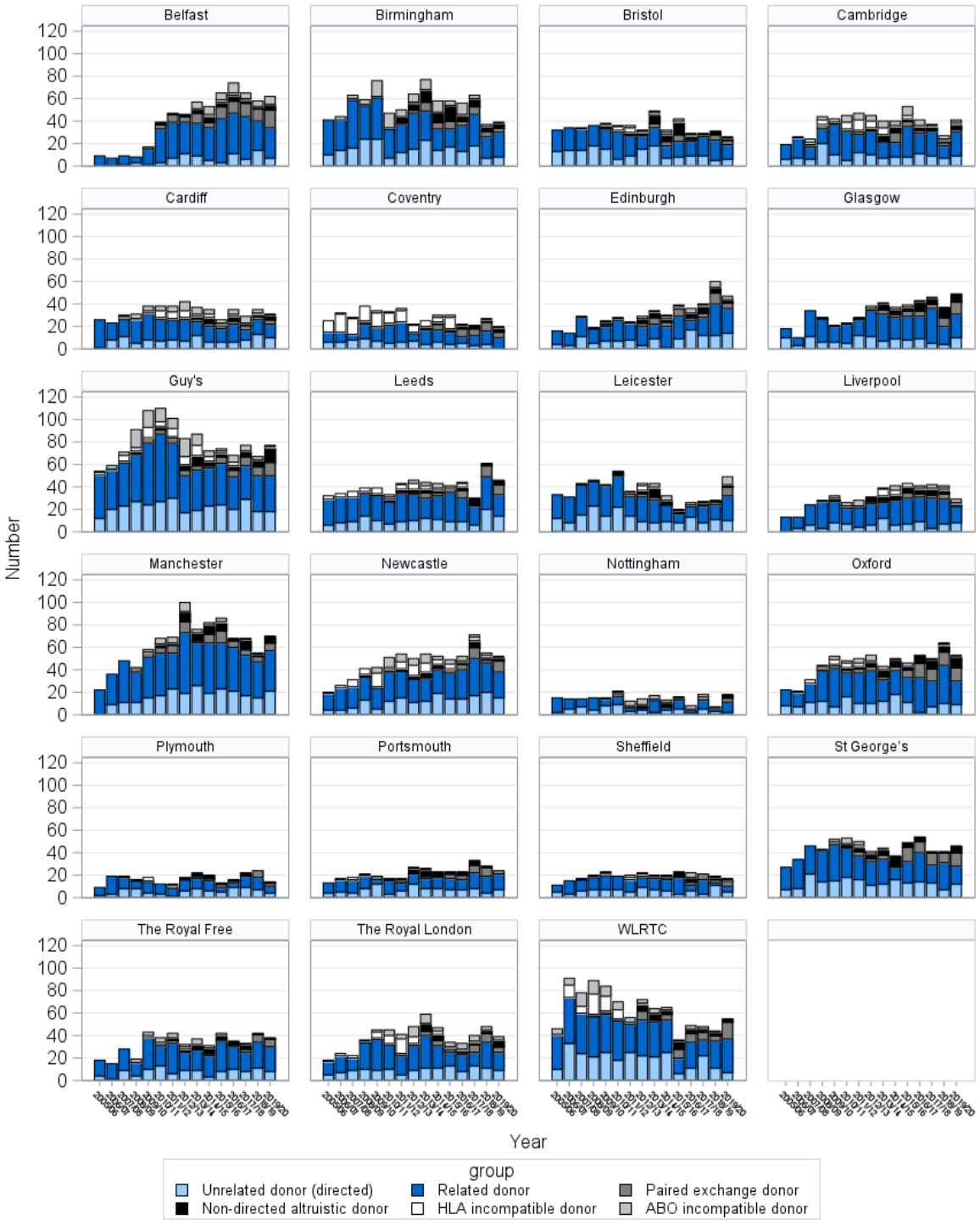


Figure 2.5 shows the number of adult living donor kidney transplants by donor type and centre between 1 April 2005 and 31 March 2020.

Figure 2.5 Adult living donor kidney transplants in the UK by centre, 1 April 2005- 31 March 2020



PAEDIATRIC

Figure 2.6 shows the number of paediatric living donor kidney transplants performed in the UK between 1 April 2005 and 31 March 2020. The number of transplants increased from 48 in 2005/06 to 71 in 2019/20. This includes one kidney and parathyroid gland transplant performed at Guy's.

Figure 2.6 Paediatric living donor kidney transplants in the UK, 1 April 2005 - 31 March 2020

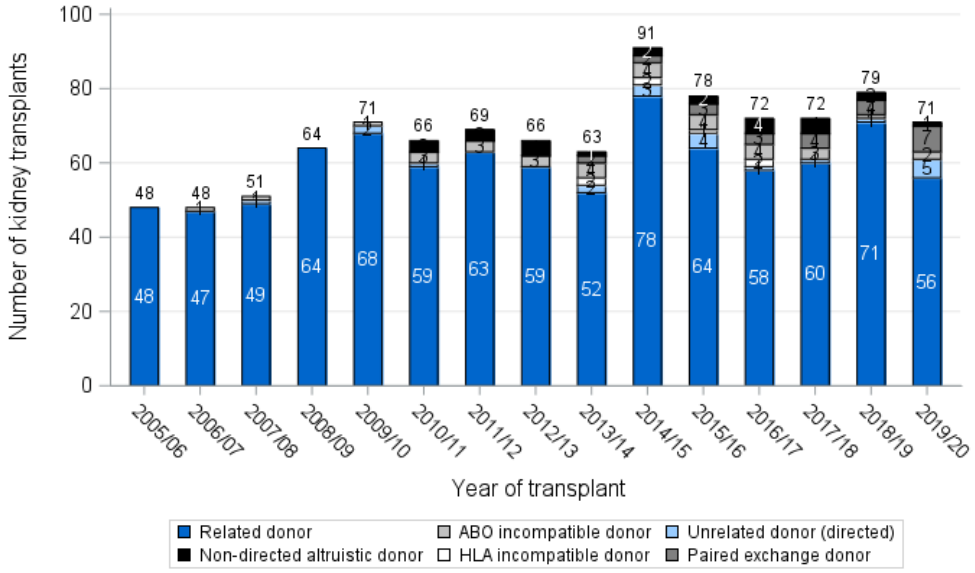
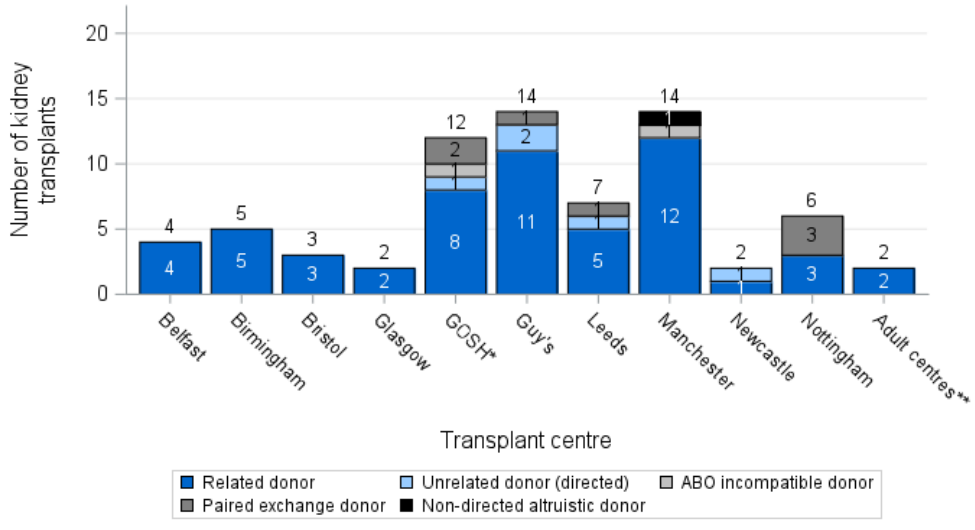


Figure 2.7 and **Table 2.2** show the number of paediatric living donor kidney transplants performed in 2019/20 in each transplant centre. Guy's transplant team performed the most living donor kidney transplants last year with 26 patients receiving a transplant (12 at GOSH and 14 at Guy's). Children are also benefitting from the UKLKSS and antibody removal programmes to facilitate living donor transplants.

Figure 2.7 Paediatric Living donor kidney transplants in the UK, 1 April 2019 - 31 March 2020



*Guy's team assess donors and perform transplants for GOSH recipients
**Adult centres includes patients under 18 years transplanted at adult units

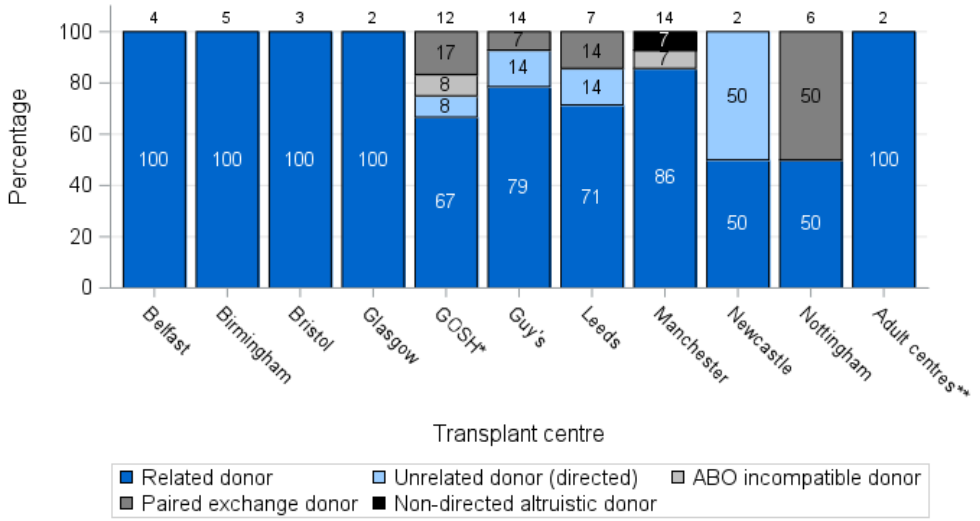
Table 2.2 Paediatric living donor kidney transplants in the UK, 1 April 2019 - 31 March 2020

Transplant Centre	Donor type					
	Related donor	Unrelated donor (directed)	HLA incompatible donor	ABO incompatible donor	Paired exchange donor	Non-directed altruistic donor
Adult centres**	2	0	0	0	0	0
Belfast	4	0	0	0	0	0
Birmingham	5	0	0	0	0	0
Bristol	3	0	0	0	0	0
GOSH*	8	1	0	1	2	0
Glasgow	2	0	0	0	0	0
Guy's	11	2	0	0	1	0
Leeds	5	1	0	0	1	0
Manchester	12	0	0	1	0	1
Newcastle	1	1	0	0	0	0
Nottingham	3	0	0	0	3	0

*Guy's team assess donors and perform transplants for GOSH recipients
**Adult centres includes patients under 18 years transplanted at adult units

Figure 2.8 shows the proportion of paediatric living donor kidney transplants by donor type and centre in 2019/20.

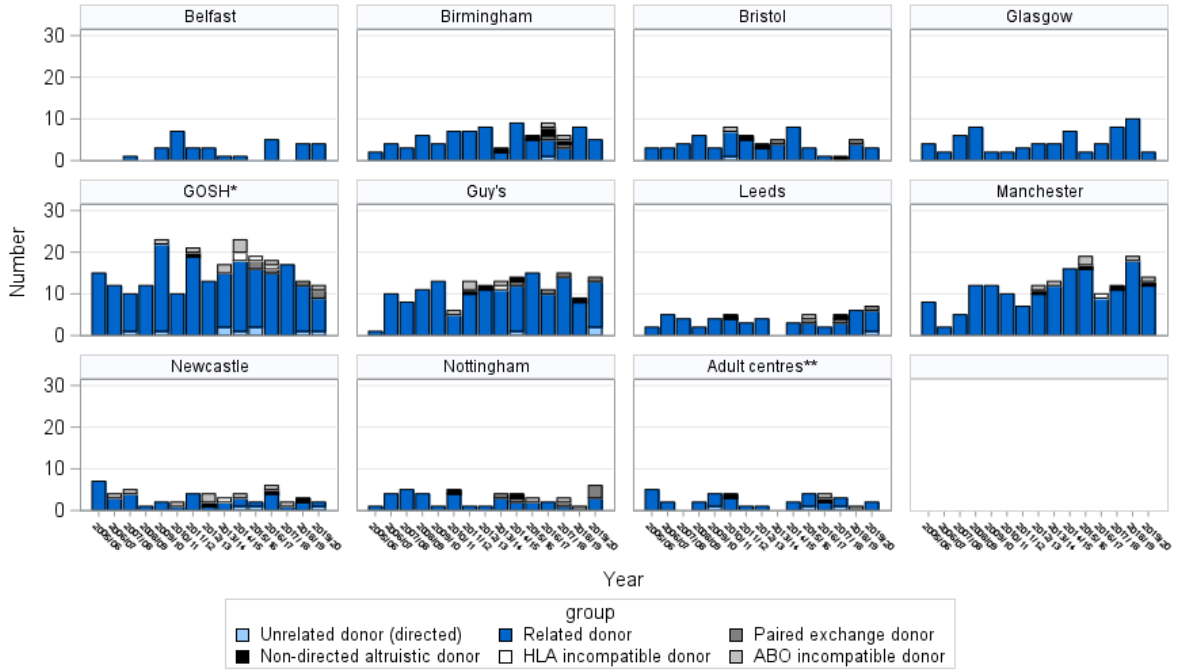
Figure 2.8 Paediatric living donor kidney transplants in the UK, 1 April 2019 - 31 March 2020



*Guy's team assess donors and perform transplants for GOSH recipients
**Adult centres includes patients under 18 years transplanted at adult units

Figure 2.9 shows the number of paediatric living donor kidney transplants by donor type and centre between 1 April 2005 and 31 March 2020.

Figure 2.9 Paediatric living donor kidney transplants in the UK by centre, 1 April 2005 - 31 March 2020



*Guy's team assess donors and perform transplants for GOSH recipients
**Adult centres includes patients under 18 years transplanted at adult units

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). 2% of non-directed altruistic and 11% 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 52% at Cardiff to 19% at Sheffield.

Figure 3.1 Sex of recipient and donor by adult transplant type, 1 April 2014 - 31 March 2020

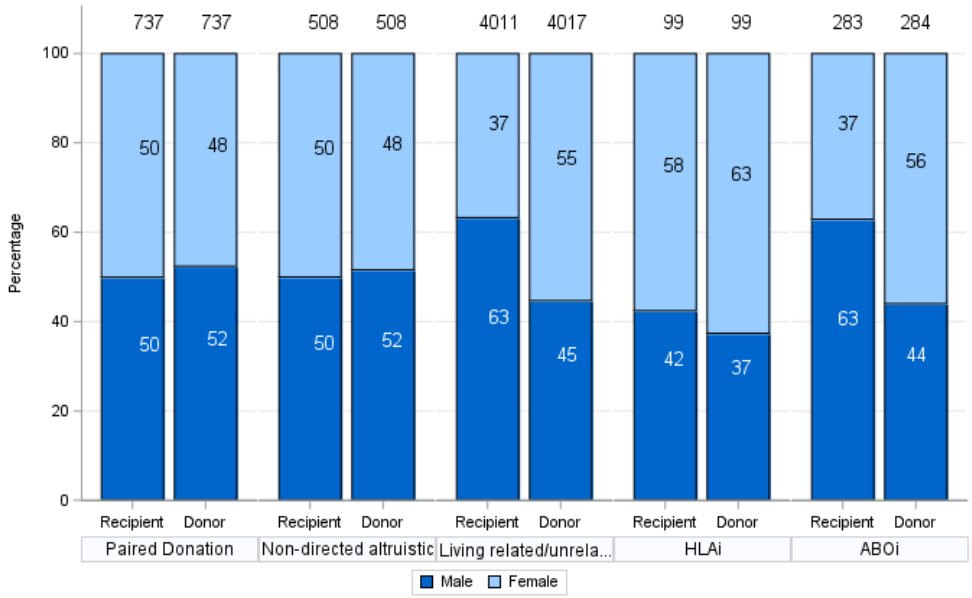


Figure 3.2 Ethnicity of recipient and donor by adult transplant type, 1 April 2014 - 31 March 2020

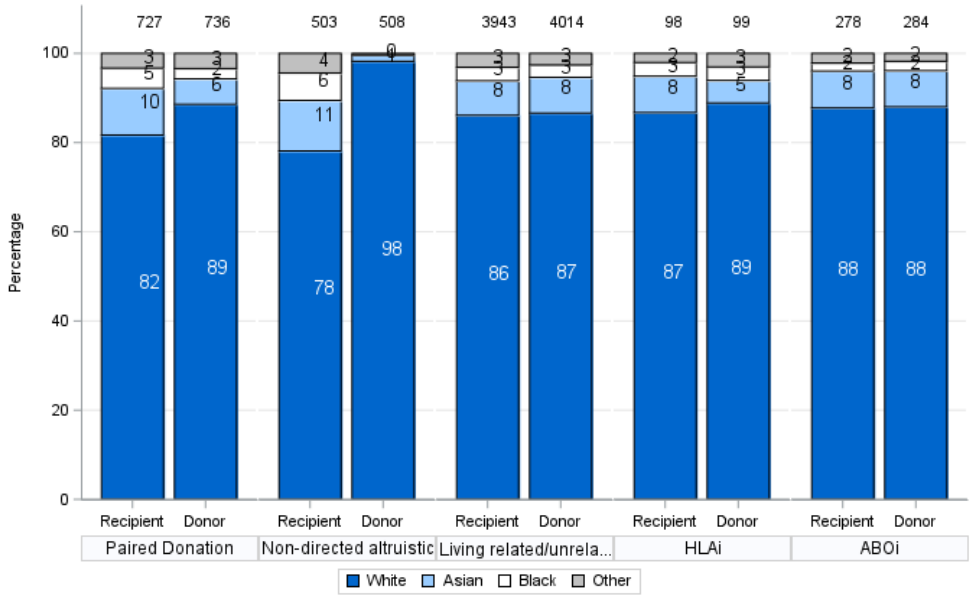


Figure 3.3 Age of recipient and donor by adult transplant type, 1 April 2014 - 31 March 2020

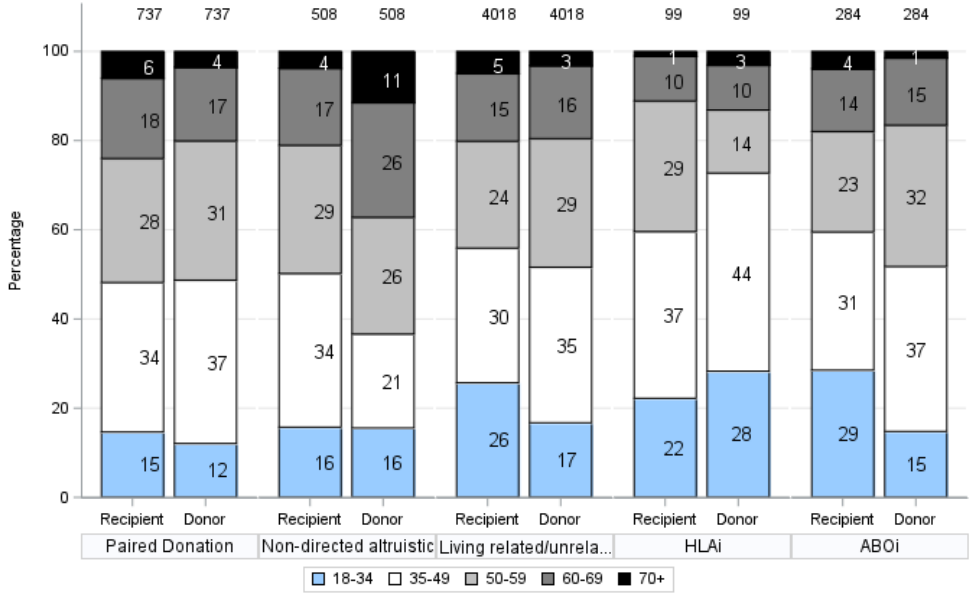


Figure 3.4 Recipient Calculated Reaction Frequency by adult transplant type 1 April 2014 - 31 March 2020

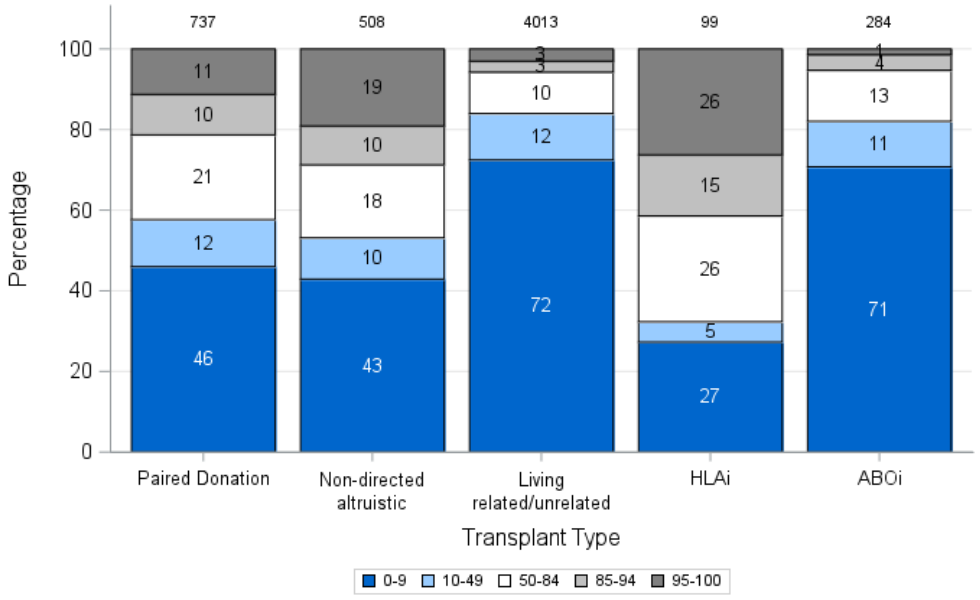


Figure 3.5 Adult HSP by transplant type and year of transplant, 1 April 2014 - 31 March 2020

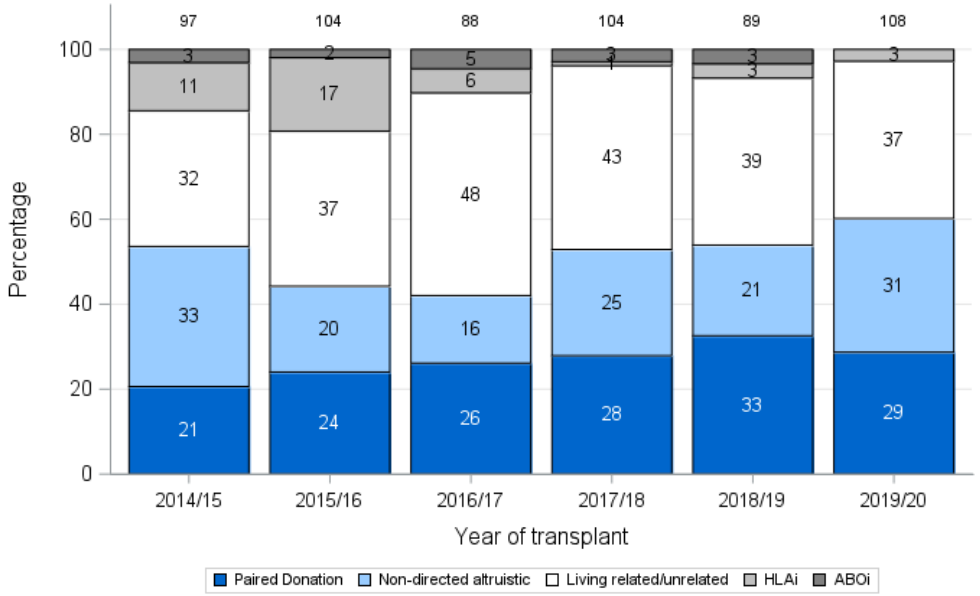


Figure 3.6 Recipient and donor blood group by adult transplant type, 1 April 2014 - 31 March 2020

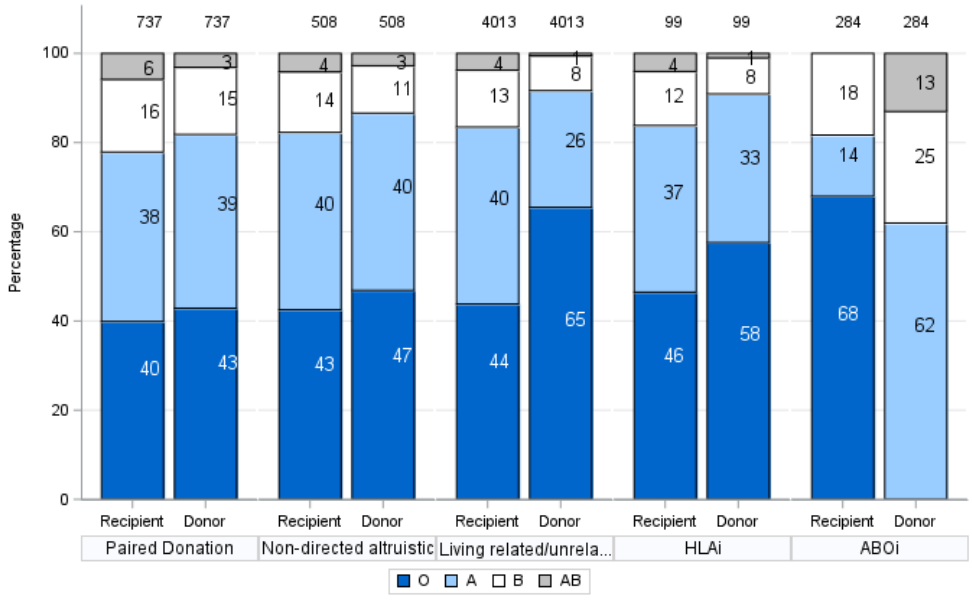


Figure 3.7 Dialysis status at transplant by adult transplant type, 1 April 2014 - 31 March 2020

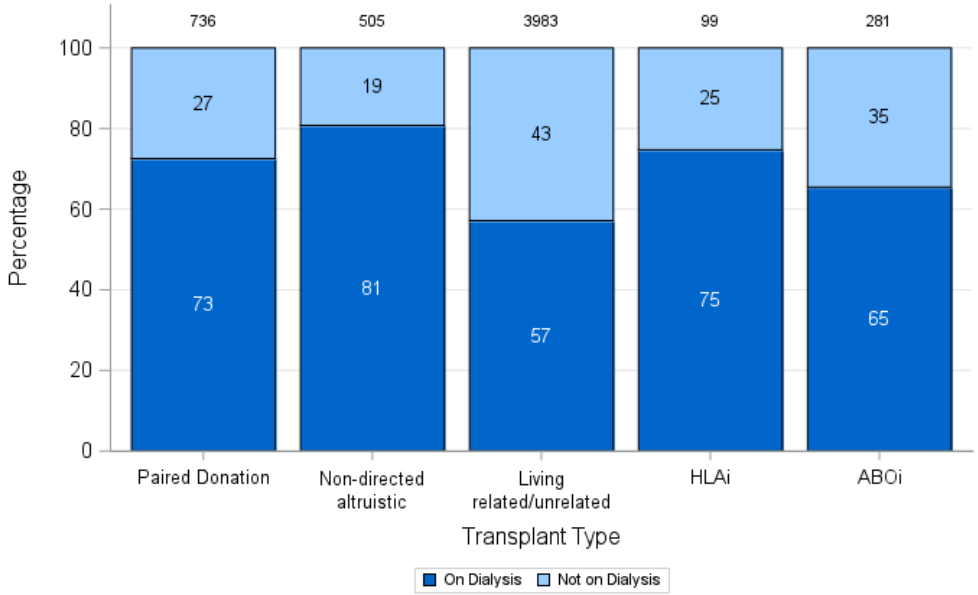
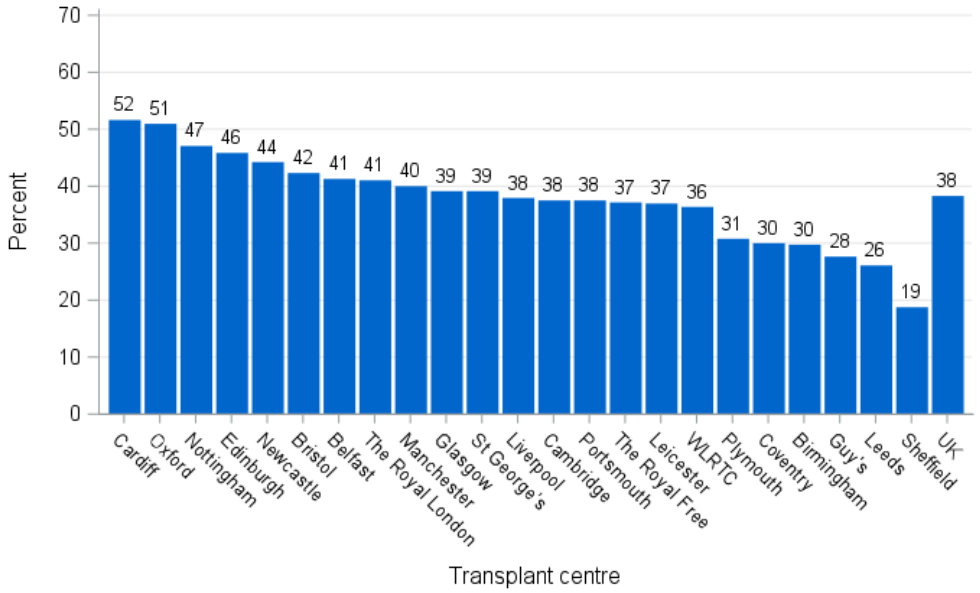


Figure 3.8 **Adult living donor pre-emptive transplant rates by centre, 1 April 2019 - 31 March 2020**



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 13% of paired/pooled donors are from BAME donors but 40% of paediatric BAME recipients receive a kidney from a non-directed altruistic donor and 30% from paired/pooled donors.

53% of children transplanted from a non-directed altruistic donor have a cRF ≥ 50 and 13% of children transplanted through the paired/pooled scheme have cRF ≥ 50.

The paediatric living donor pre-emptive transplant rates ranged from 75% at Belfast to 0% at Bristol, Glasgow, Leeds and Newcastle.

Figure 3.9 Sex of recipient and donor by paediatric transplant type, 1 April 2014 - 31 March 2020

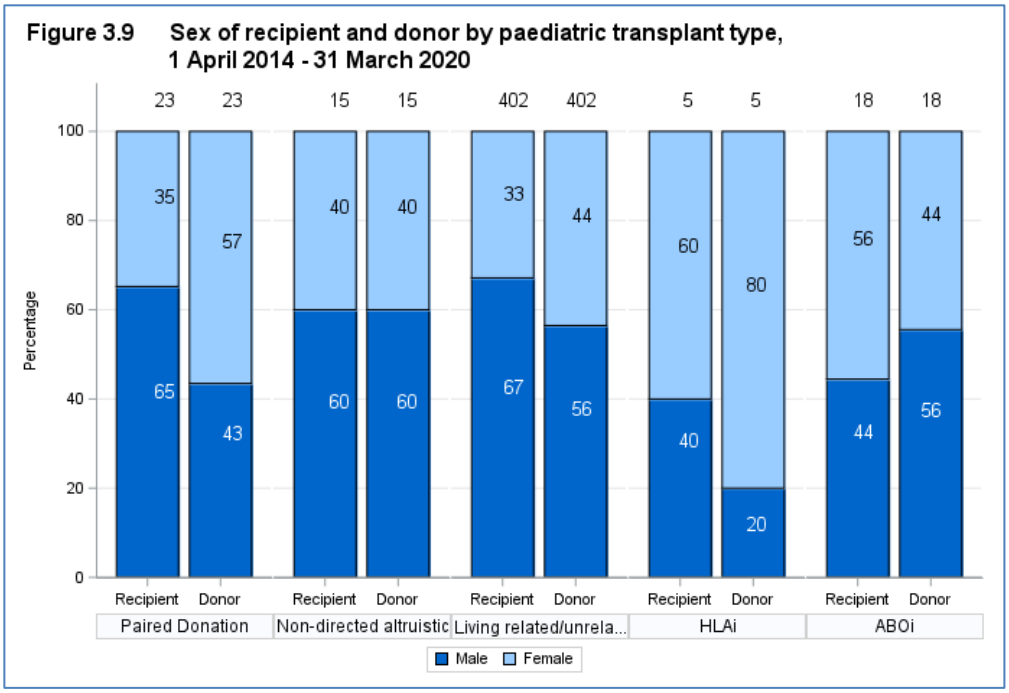


Figure 3.10 Ethnicity of recipient and donor by paediatric transplant type, 1 April 2014 - 31 March 2020

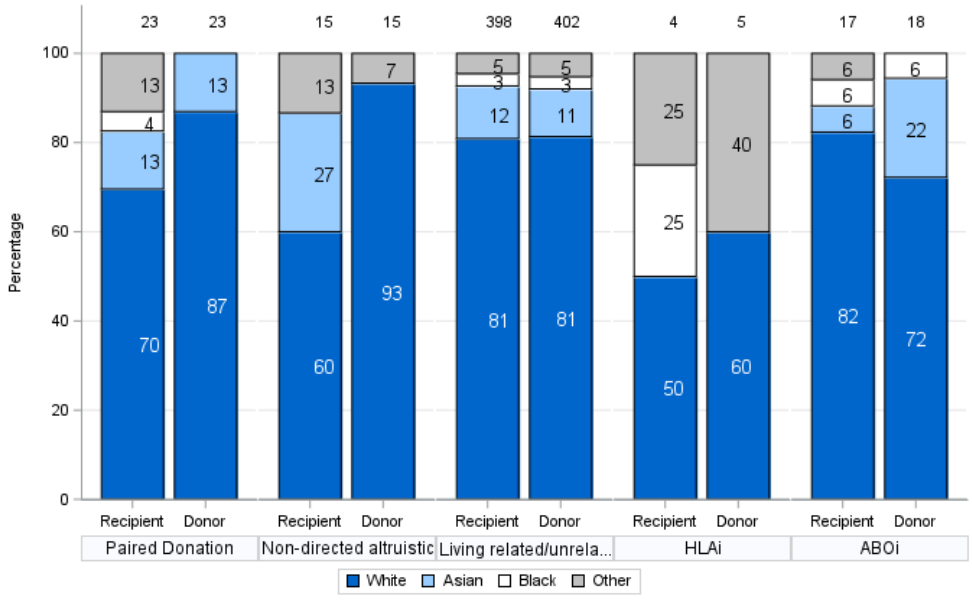


Figure 3.11 Age of recipient and donor by paediatric transplant type, 1 April 2014 - 31 March 2020

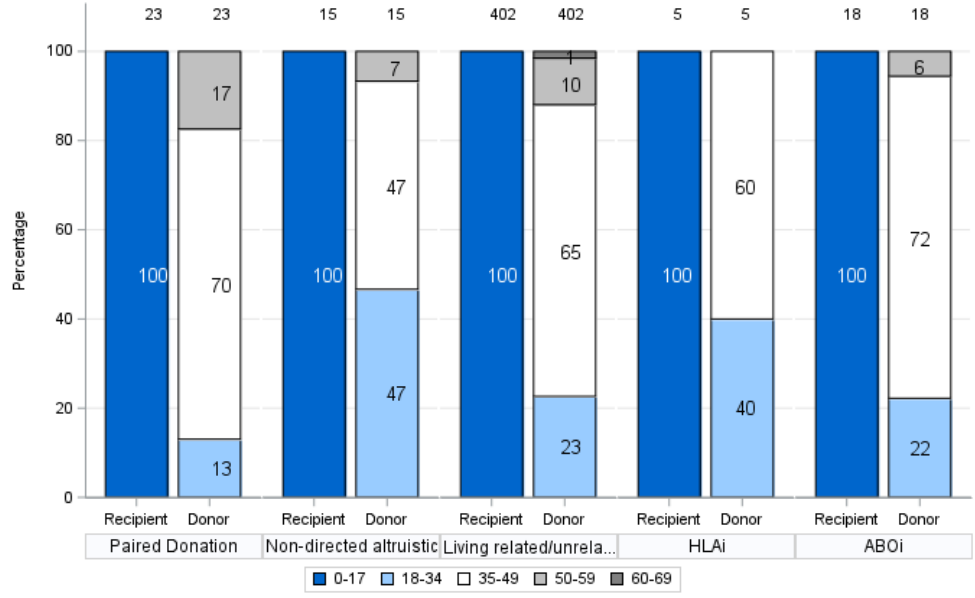


Figure 3.12 Recipient Calculated Reaction Frequency by paediatric transplant type 1 April 2014 - 31 March 2020

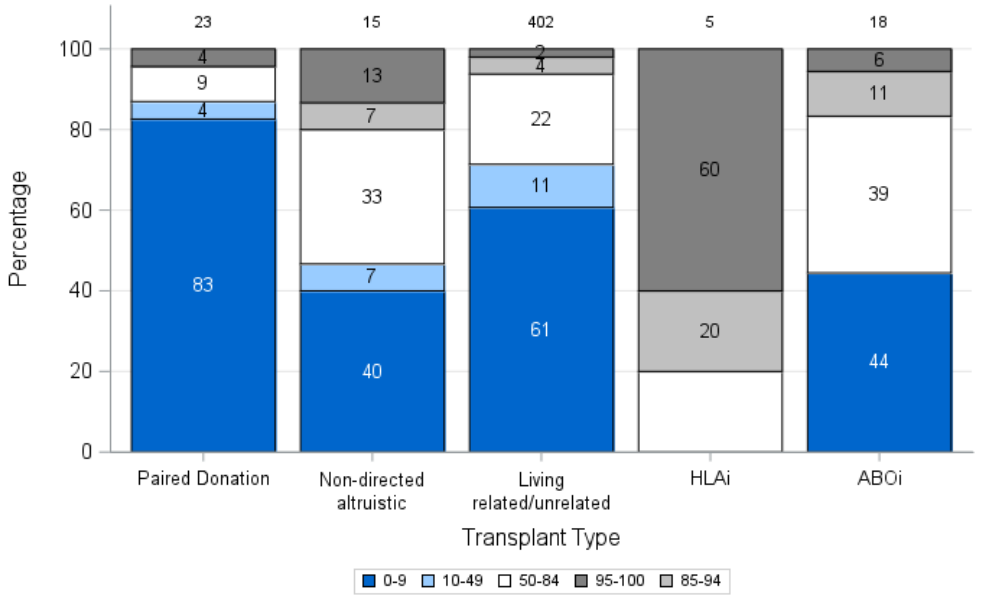


Figure 3.13 Paediatric HSP by transplant type and year of transplant, 1 April 2014 - 31 March 2020

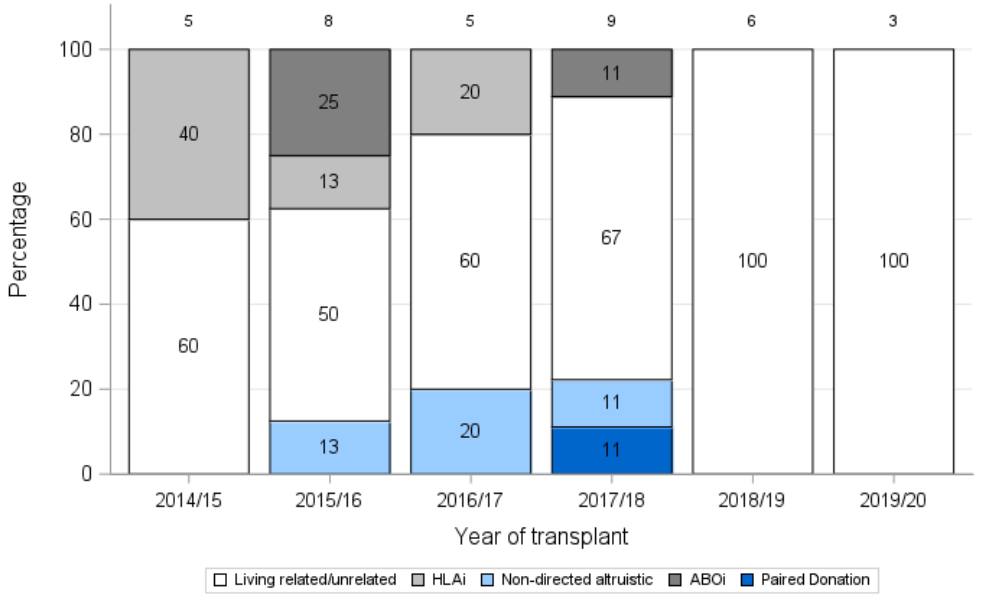


Figure 3.14 Recipient and donor blood group by paediatric transplant type, 1 April 2014 - 31 March 2020

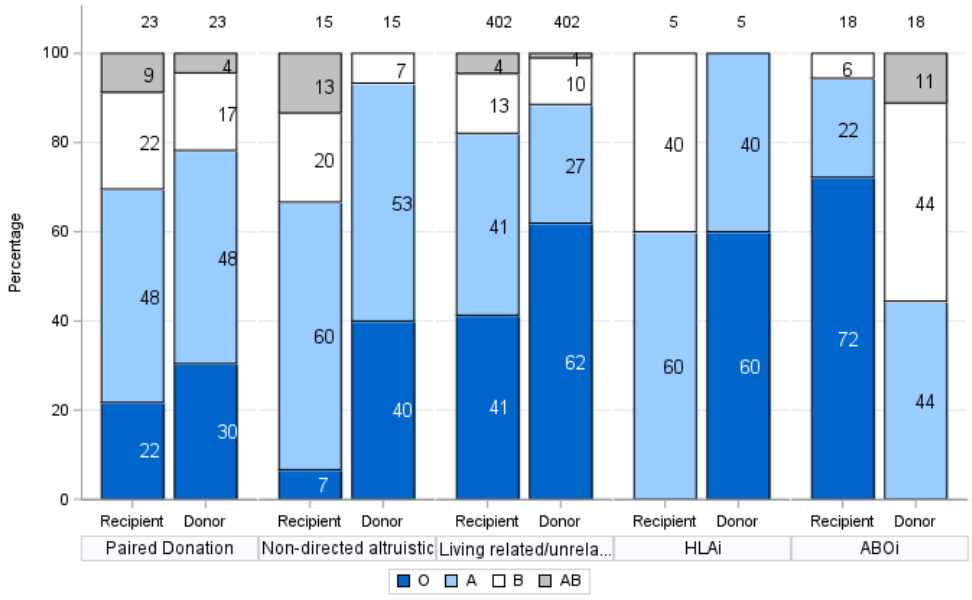


Figure 3.15 Dialysis status at transplant by paediatric transplant type, 1 April 2014 - 31 March 2020

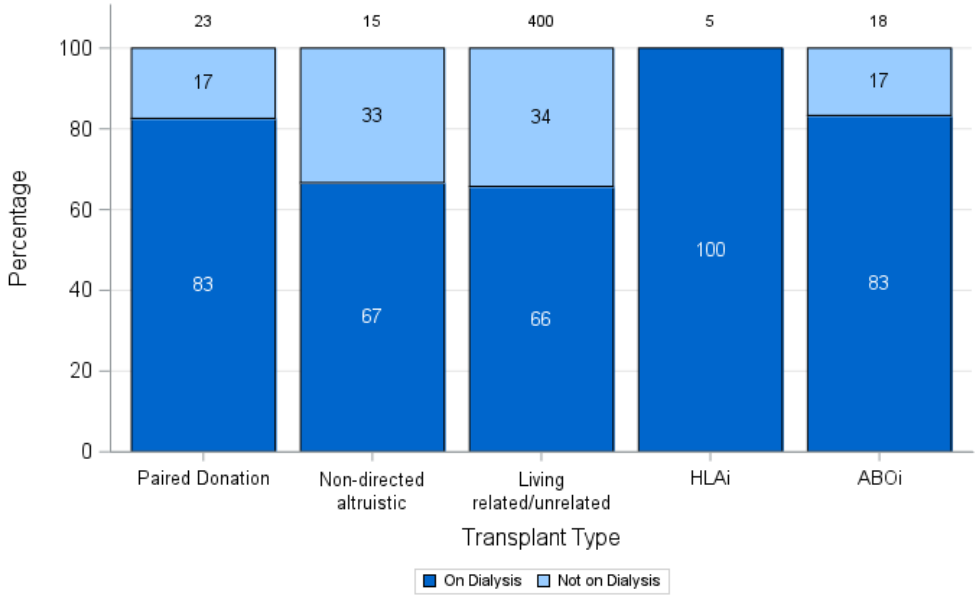
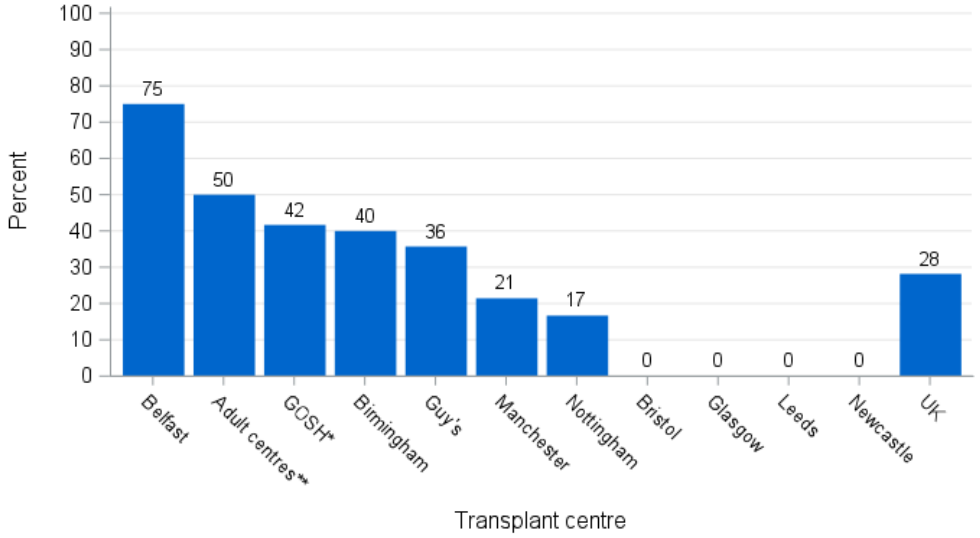


Figure 3.16 Paediatric living donor pre-emptive transplant rates by centre, 1 April 2019 - 31 March 2020



*Guy's team assess donors and perform transplants for GOSH recipients
**Adult centres includes patients under 18 years transplanted at adult units

UK Living Kidney Sharing Scheme

4.1 Paired Donation Scheme

4.1.1 Registrations: Matching Runs, 1 April 2014 – 31 March 2020

Figure 4.1 shows the number of patients included in matching runs from 1 April 2014 to 31 March 2020. The number of patients included has increased over this period with 178 in April 2014 to 277 in January 2020. Overall, there were 1,716 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 4.1 Number of patients included in matching runs, 1 April 2014 - 31 March 2020

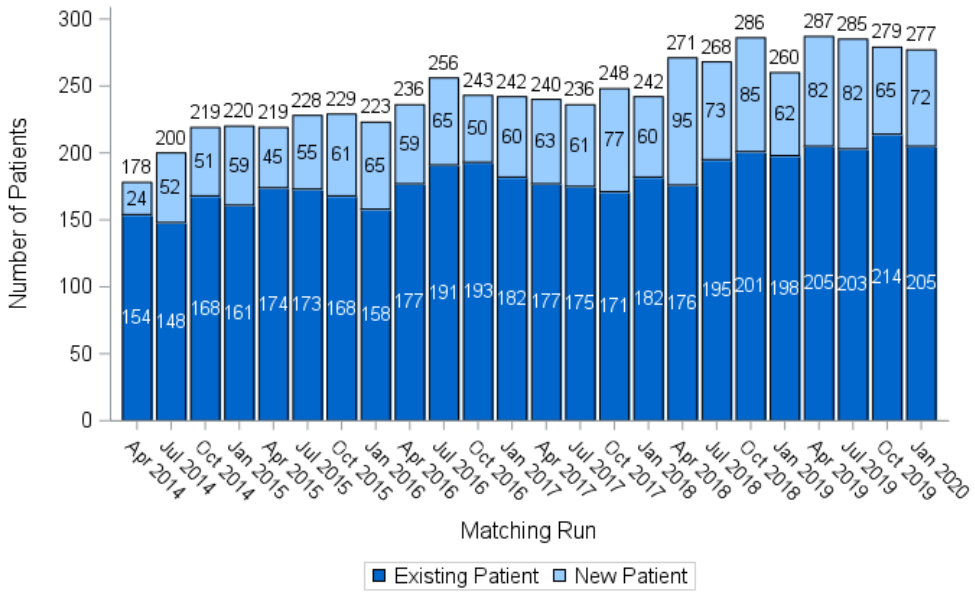


Figure 4.2 Pairs included in matching runs, 1 April 2014 - 31 March 2020

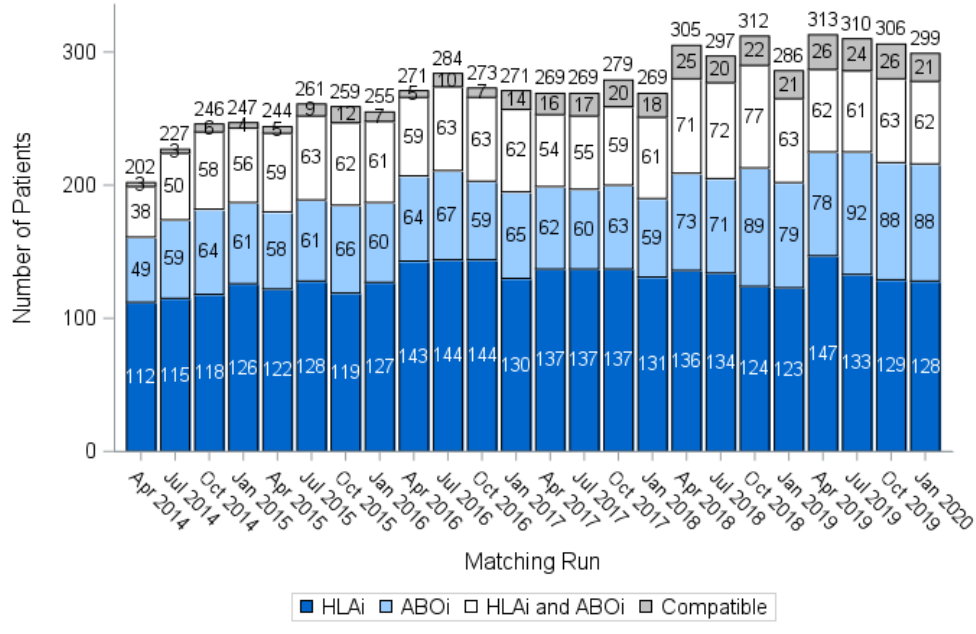
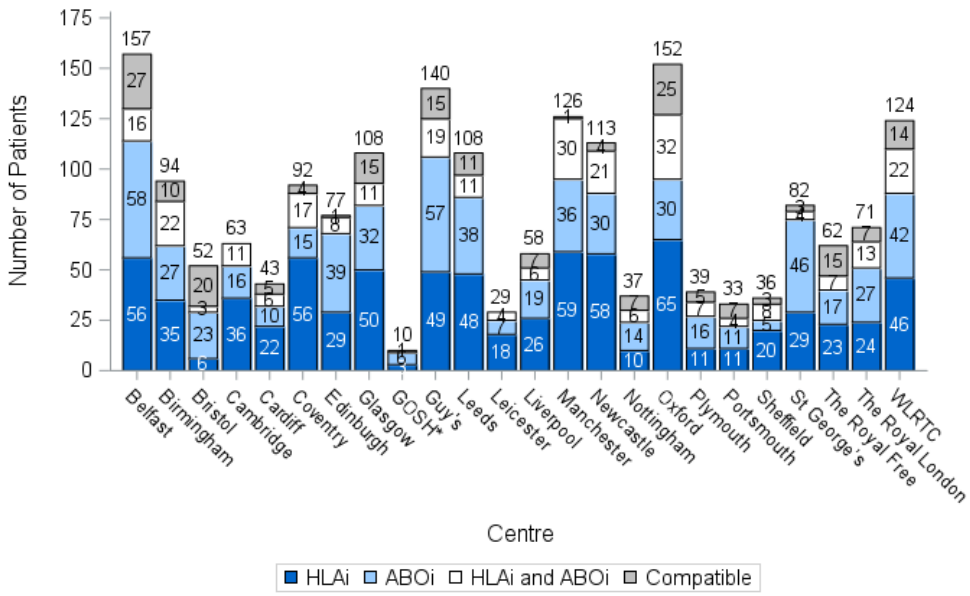


Figure 4.3 shows the number of pairs included in matching runs from 1 April 2014 to 31 March 2020 by centre. This is broken down further by the nature of the incompatibility between the pair. It can be seen that Belfast has had the highest number of pairs registered over this time period. Most pairs registered over this period were HLA incompatible (41%). This information is also shown in **Table 4.1**.

Figure 4.3 Number of pairs included in matching runs, 1 April 2014 - 31 March 2020



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

Table 4.1 **Pairs included in matching runs by compatibility and Centre, April 2014 - March 2020**

Centre	Number of pairs	HLAi	ABOi	HLAi and ABOi	Compatible
Belfast	157	56	58	16	27
Birmingham	94	35	27	22	10
Bristol	52	6	23	3	20
Cambridge	63	36	16	11	0
Cardiff	43	22	10	6	5
Coventry	92	56	15	17	4
Edinburgh	77	29	39	8	1
Glasgow	108	50	32	11	15
GOSH*	10	3	6	0	1
Guy's	140	49	57	19	15
Leeds	108	48	38	11	11
Leicester	29	18	7	4	0
Liverpool	58	26	19	6	7
Manchester	126	59	36	30	1
Newcastle	113	58	30	21	4
Nottingham	37	10	14	6	7
Oxford	152	65	30	32	25
Plymouth	39	11	16	7	5
Portsmouth	33	11	11	4	7
Sheffield	36	20	5	8	3
St George's	82	29	46	4	3
The Royal Free	62	23	17	7	15
The Royal London	71	24	27	13	7
WLRTC	124	46	42	22	14
UK	**1906**	**790**	**621**	**288**	**207**

*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 2014 - 31 March 2020**

Year	Registered with different blood groups		Registered with unacceptable antigens		Total number of patients registered
	N	%	N	%	
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	1	0.3	25	8.6	290
19/20	2	0.8	22	8.3	264

4.1.2 Outcomes: Matching Runs, 1 April 2016 – 31 March 2020

Figure 4.4 shows the outcomes of patients included in matching runs from 1 April 2016 to 31 March 2020, split by centre. Overall, 41% of patients registered have had a transplant through the paired donation scheme.

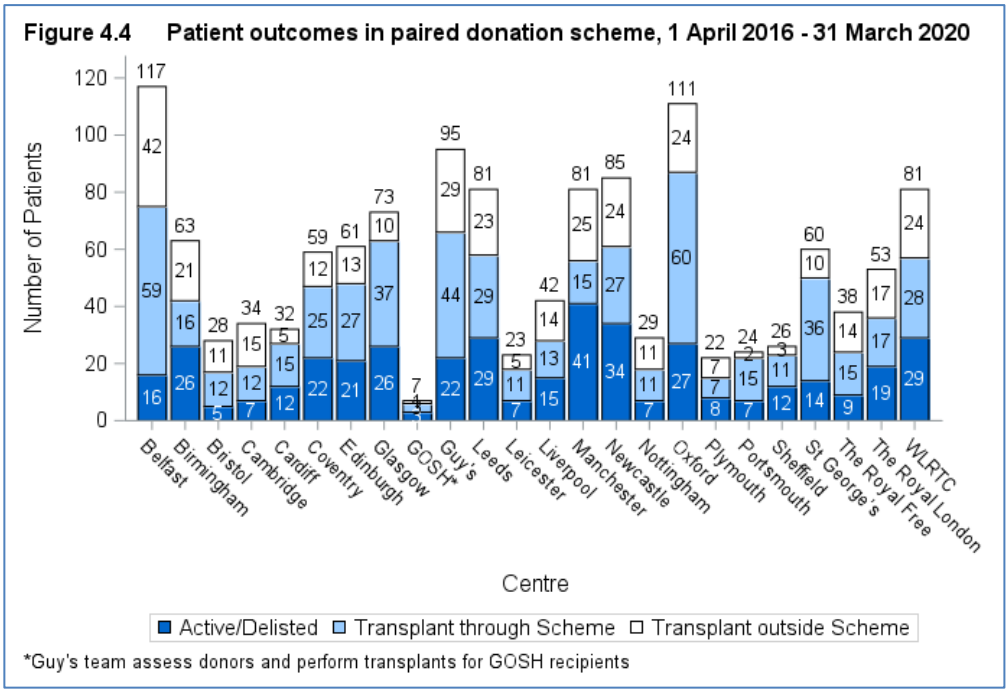
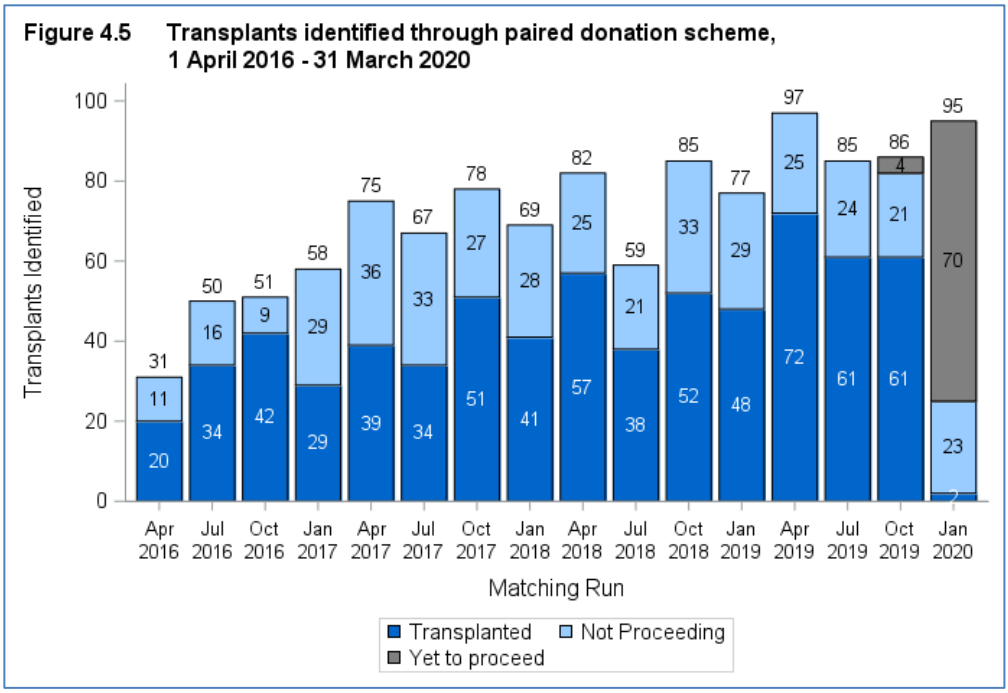


Figure 4.5 shows the transplants identified in each matching run from 1 April 2016 to 31 March 2020. The number of those that proceeded to transplant is also shown. Overall, 59% of transplants identified through the paired donation scheme have proceeded to transplant over this period.



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 2016 - 31 March 2020**

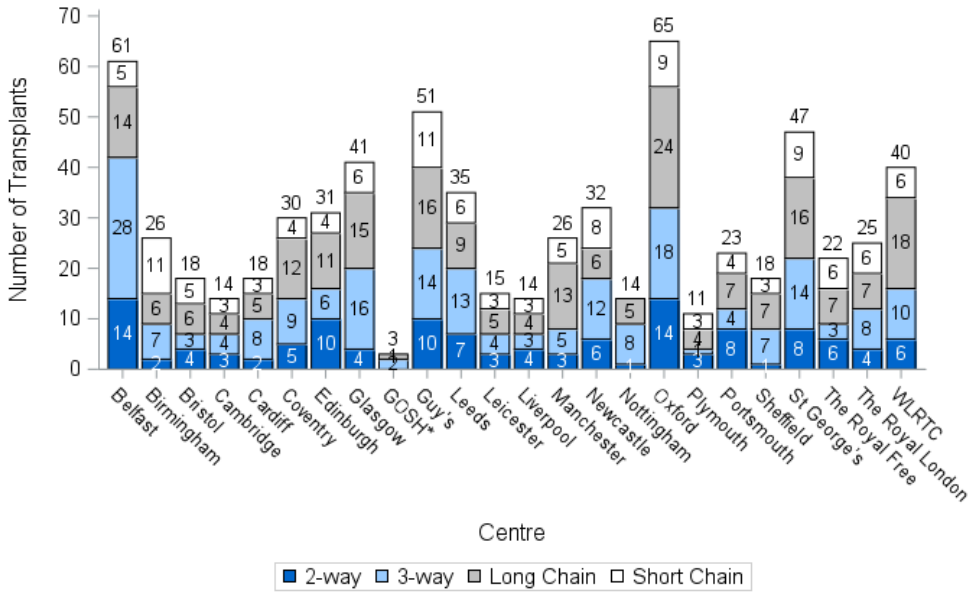
Calculated Reaction Frequency	Patients Registered	Patients Transplanted	
		N	(%)
0-9%	456	217	(48)
10-84%	362	193	(53)
85-94%	141	78	(55)
95-99%	230	53	(23)
100%	136	4	(3)

Table 4.4 **Transplants as a proportion of registered pairs by blood group, 1 April 2016 - 31 March 2020**

Donor Blood Group	Patient Blood Group (Patients Transplanted/Pairs Registered (%))											
	O			A			B			AB		
O	114/	301	(38%)	78/	143	(55%)	30/	54	(56%)	7/	13	(54%)
A	106/	425	(25%)	67/	194	(35%)	37/	57	(65%)	3/	18	(17%)
B	43/	111	(39%)	26/	54	(48%)	14/	40	(35%)	2/	4	(50%)
AB	4/	19	(21%)	7/	19	(37%)	6/	19	(32%)	1/	6	(17%)

Figure 4.6 shows the number of patients transplanted from matching runs between 1 April 2016 and 31 March 2020. This is split by centre and exchange type.

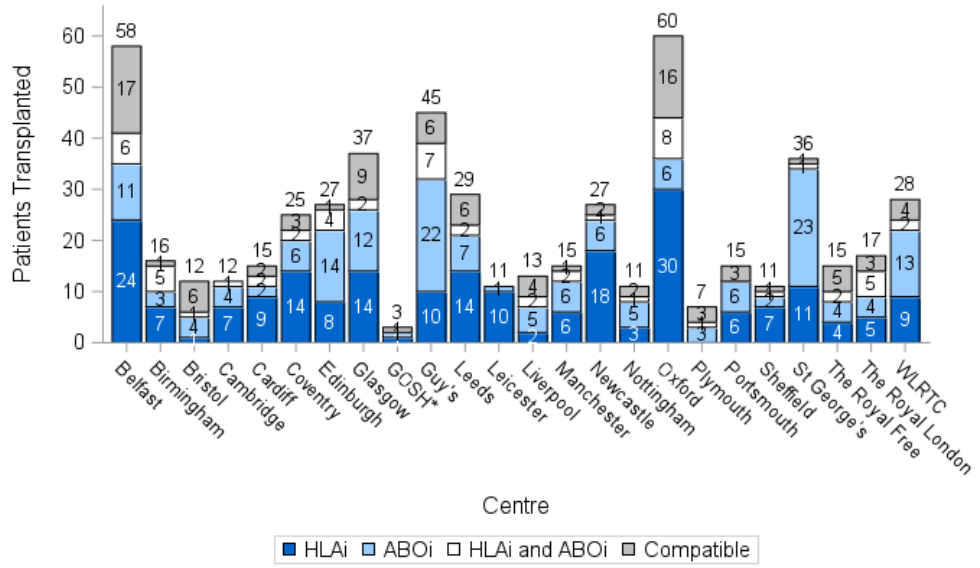
Figure 4.6 **Number of transplants by type and centre, 1 April 2016 - 31 March 2020**



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

Figure 4.7 shows the patients transplanted from matching runs between 1 April 2016 and 31 March 2020. 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.

Figure 4.7 Patients transplanted by pair incompatibility in matching runs, 1 April 2016 - 31 March 2020



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

Table 4.5 Transplants by group type and Centre, April 2016 - March 2020

Centre	Number of Transplants	2-way	3-way	Short Chain	Long Chain
Belfast	61	14	28	14	5
Birmingham	26	2	7	6	11
Bristol	18	4	3	6	5
Cambridge	14	3	4	4	3
Cardiff	18	2	8	5	3
Coventry	30	5	9	12	4
Edinburgh	31	10	6	11	4
Glasgow	41	4	16	15	6
GOSH*	3	0	2	1	0
Guy's	51	10	14	16	11
Leeds	35	7	13	9	6
Leicester	15	3	4	5	3
Liverpool	14	4	3	4	3
Manchester	26	3	5	13	5
Newcastle	32	6	12	6	8
Nottingham	14	1	8	5	0
Oxford	65	14	18	24	9
Plymouth	11	3	1	4	3
Portsmouth	23	8	4	7	4
Sheffield	18	1	7	7	3
St George's	47	8	14	16	9
The Royal Free	22	6	3	7	6
The Royal London	25	4	8	7	6
WLRTC	40	6	10	18	6
UK	**680**	**128**	**207**	**222**	**123**

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

Table 4.6 Median waiting time to paired donation kidney transplant in the UK, for patients registered 1 April 2010 - 31 March 2016

Pair Incompatibility	Number of patients registered	Waiting time (days)	
		Median	95% Confidence interval
HLAi	314	1147	556 - 1738
ABOi	246	771	615 - 927
All Pairs	665	1139	756 – 1522

4.2 Non-directed Altruistic Donation

4.2.1 Transplants, 1 April 2011 – 31 March 2020

Figure 4.8 shows the number of non-directed altruistic donor kidney transplants from 1 April 2011 to 31 March 2020. 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 34 in 2011/12 to 118 in 2013/14 before falling to 64 in 2018/19. In the latest financial year, the number of transplants increased to 95.

Figure 4.8 Non-directed altruistic donor kidney transplants in the UK by type, 1 April 2011 - 31 March 2020

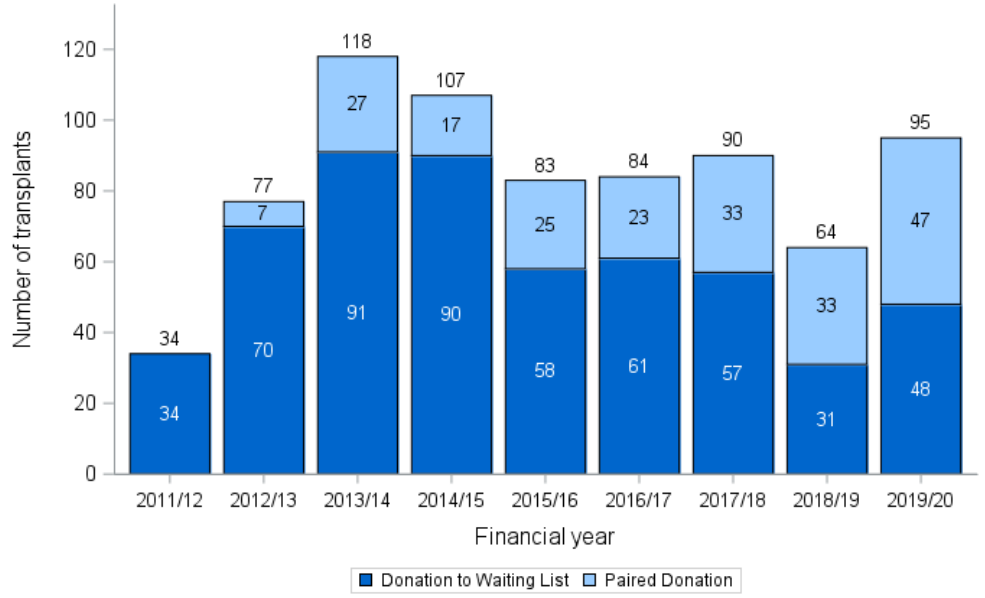


Figure 4.9 shows the number of non-directed altruistic donor kidney transplants from 1 April 2016 to 31 March 2020 by donor centre. Guy's had the highest number of non-directed altruistic donors. **Figure 4.10** shows the number of non-directed altruistic donor kidney transplants from 1 April 2016 to 31 March 2020 by recipient centre. Oxford had the highest number of recipients of non-directed altruistic donors.

Figure 4.9 Non-directed altruistic donor kidney transplants in the UK by type and donor centre, 1 April 2016 - 31 March 2020

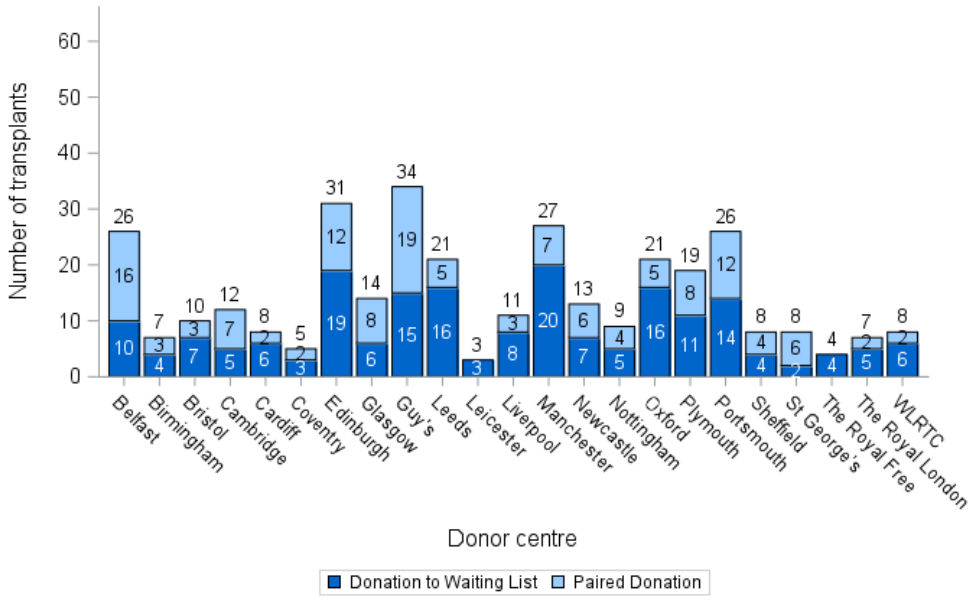
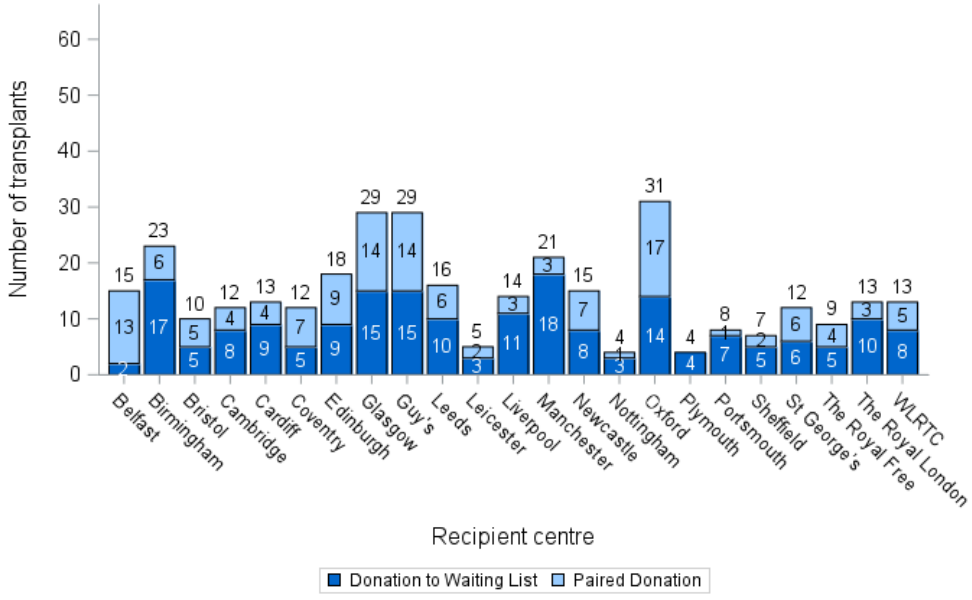


Figure 4.10 Non-directed altruistic donor kidney transplants in the UK by type and recipient centre, 1 April 2016 - 31 March 2020



4.2.2 Time to donation, 1 April 2016 – 31 March 2020

Figure 4.11 shows the median time in months from notification to donation from 1 April 2016 to 31 March 2020, 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.

Figure 4.11 Median time between notification and donation by centre, notifications April 2016 - March 2020

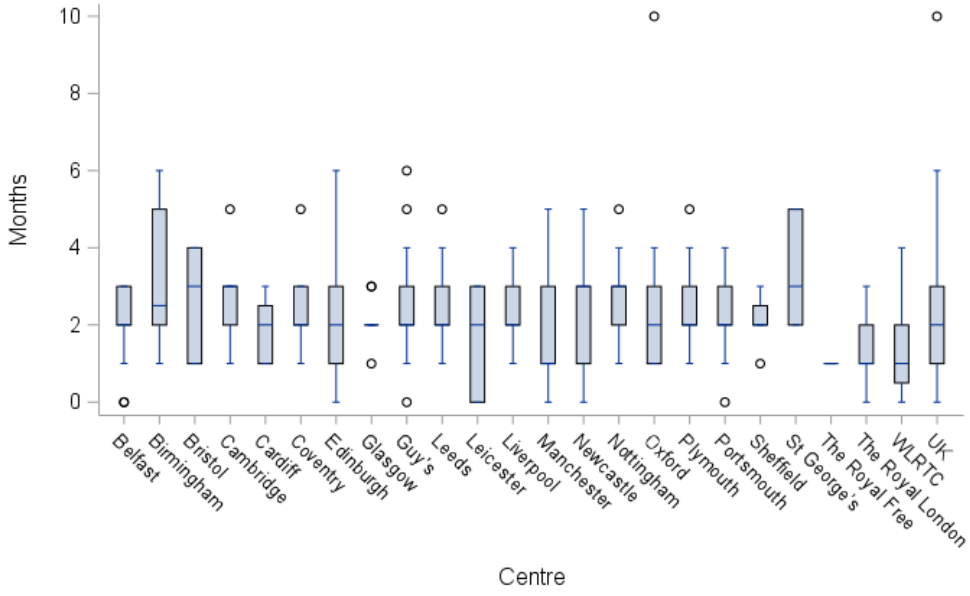


Table 4.7 **Median time between notification and donation by Centre, Donations April 2016 - March 2020**

Centre	Number of donors	Median	Interquartile range
Belfast	26	2	2 - 3
Birmingham	6	3	2 - 5
Bristol	10	3	1 - 4
Cambridge	12	3	2 - 3
Cardiff	8	2	1 - 2
Coventry	5	2	2 - 3
Edinburgh	30	2	1 - 3
Glasgow	10	2	2 - 2
Guy's	34	2	2 - 3
Leeds	21	2	2 - 3
Leicester	3	2	0 - 3
Liverpool	11	2	2 - 3
Manchester	26	1	1 - 3
Newcastle	13	3	1 - 3
Nottingham	9	3	2 - 3
Oxford	20	2	1 - 3
Plymouth	19	2	2 - 3
Portsmouth	23	2	2 - 3
Sheffield	8	2	2 - 3
St George's	7	3	2 - 5
The Royal Free	4	1	1 - 1
The Royal London	7	1	1 - 2
WLRTC	8	1	1 - 2
UK	**320**	**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 and include data on forms relating to antibody incompatible transplants from direct living donation and via the UKLKSS. The remainder of the section contains data on direct transplants only.

Figure 5.1 Antibody Incompatible Transplants return rates, 1 April 2010 - 31 March 2020

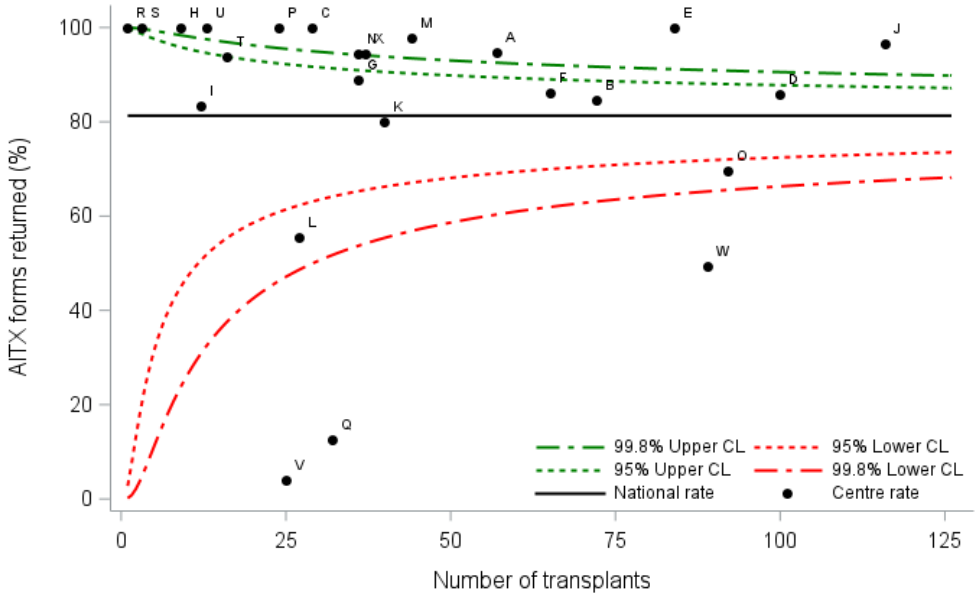


Table 5.1 **Antibody incompatible transplant form return rates, 1 April 2010 – 31 March 2020**

Transplant Centre	Code	Number of transplants	AITX forms returned N	%
Belfast	A	57	54	95
Birmingham	B	72	61	85
Bristol	C	29	29	100
Cambridge	D	100	86	86
Cardiff	E	84	84	100
Coventry	F	65	56	86
Edinburgh	G	36	32	89
Glasgow	H	9	9	100
GOSH*	I	12	10	83
Guy's	J	116	112	97
Leeds	K	40	32	80
Leicester	L	27	15	56
Liverpool	M	44	43	98
Manchester	N	36	34	94
Newcastle	O	92	64	70
Nottingham	P	24	24	100
Oxford	Q	32	4	13
Plymouth	R	1	1	100
Portsmouth	S	3	3	100
Sheffield	T	16	15	94
St George's	U	13	13	100
The Royal Free	V	25	1	4
The Royal London	W	89	44	49
WLRTC	X	37	35	95
UK		**1059**	**861**	**81**

*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 37 in the latest financial year.

Figure 5.2 Adult living donor antibody incompatible kidney transplants in the UK, 1 April 2010 - 31 March 2020

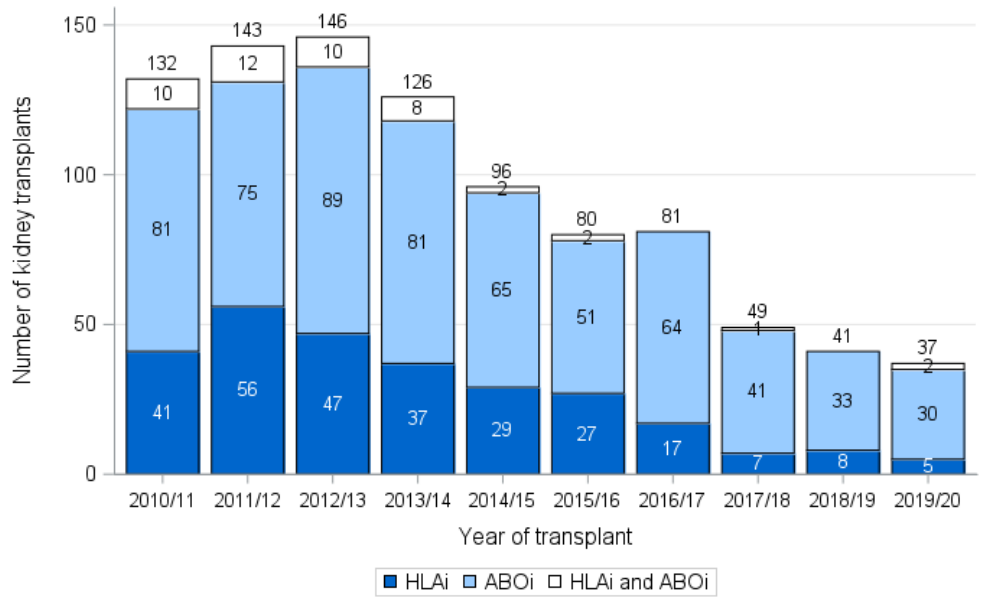


Figure 5.3 Adult living donor antibody incompatible kidney transplants in the UK, 1 April 2010 - 31 March 2020

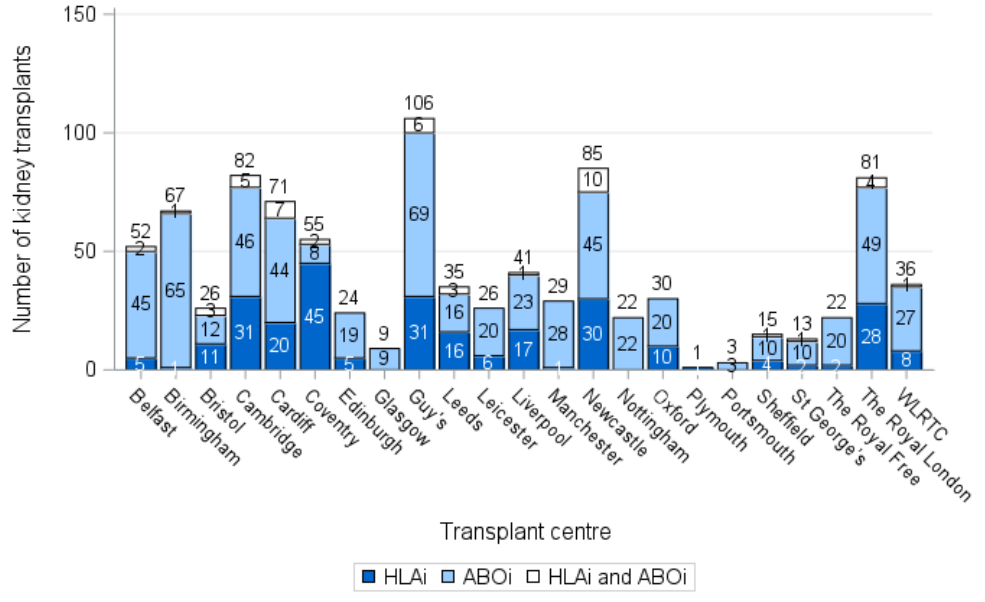


Table 5.2 shows the donor and recipient blood group for all ABOi transplants.

Table 5.2 Donor and recipient blood group for all adult ABOi transplants, 1 April 2010 - 31 March 2020

Recipient blood group	Donor blood group					
	A		B		AB	
	N	(%)	N	(%)	N	(%)
A	1	(<1)	64	(10)	39	(6)
B	84	(13)	-		26	(4)
O	310	(47)	118	(18)	11	(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 2010 - 31 March 2020

Donor-Recipient ABO	Recipient CRF at transplant							
	0-9		10-84		85-94		95-100	
	N	(%)	N	(%)	N	(%)	N	(%)
A-A	16	(2)	17	(2)	12	(1)	23	(3)
A-AB	2	(<1)	2	(<1)	1	(<1)	1	(<1)
A-B	59	(6)	13	(1)	3	(<1)	9	(1)
A-O	208	(22)	78	(8)	10	(1)	16	(2)
AB-A	26	(3)	8	(1)	3	(<1)	2	(<1)
AB-AB	-		-		1	(<1)	3	(<1)
AB-B	22	(2)	3	(<1)	-		1	(<1)
AB-O	7	(1)	1	(<1)	2	(<1)	1	(<1)
B-A	46	(5)	10	(1)	3	(<1)	5	(1)
B-AB	-		-		-		1	(<1)
B-B	4	(<1)	4	(<1)	3	(<1)	8	(1)
B-O	77	(8)	32	(3)	7	(1)	2	(<1)
O-A	17	(2)	7	(1)	5	(1)	10	(1)
O-AB	1	(<1)	2	(<1)	-		-	
O-B	1	(<1)	6	(1)	2	(<1)	6	(1)
O-O	28	(3)	30	(3)	18	(2)	46	(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 2010 - 31 March 2020**

	At Transplant antibody level group											
Pre treatment antibody level group	CDC pos, Flow pos, DSA SPA pos		CDC neg, Flow pos, DSA SPA pos		CDC neg, Flow neg, DSA SPA pos		CDC neg, Flow neg, DSA SPA neg		CDC NT, Flow pos, DSA SPA pos		Unknown	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
CDC NT, Flow pos, DSA SPA pos	-		-		16	(5)	-		11	(3)	1	(<1)
CDC neg, Flow neg, DSA SPA pos	-		1	(<1)	80	(24)	18	(6)	-		1	(<1)
CDC neg, Flow pos, DSA SPA pos	-		64	(20)	38	(12)	32	(10)	-		19	(6)
CDC pos, Flow pos, DSA SPA pos	4	(1)	11	(3)	9	(3)	5	(2)	1	(<1)	2	(1)
Unknown	-		1	(<1)	-		3	(1)	-		11	(3)

Table 5.5 **At transplant calculated reaction frequency by incompatibility type, 1 April 2010 - 31 March 2020**

Calculated Reaction Frequency	ABOi		HLAi		HLAi and ABOi	
	N	%	N	%	N	%
0-9	440	(72)	66	(24)	8	(17)
10-84	133	(22)	68	(25)	12	(26)
85-94	23	(4)	42	(15)	5	(11)
95-100	14	(2)	98	(36)	22	(47)

PAEDIATRIC

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

Figure 5.4 Paediatric living donor antibody incompatible kidney transplants in the UK, 1 April 2010 - 31 March 2020

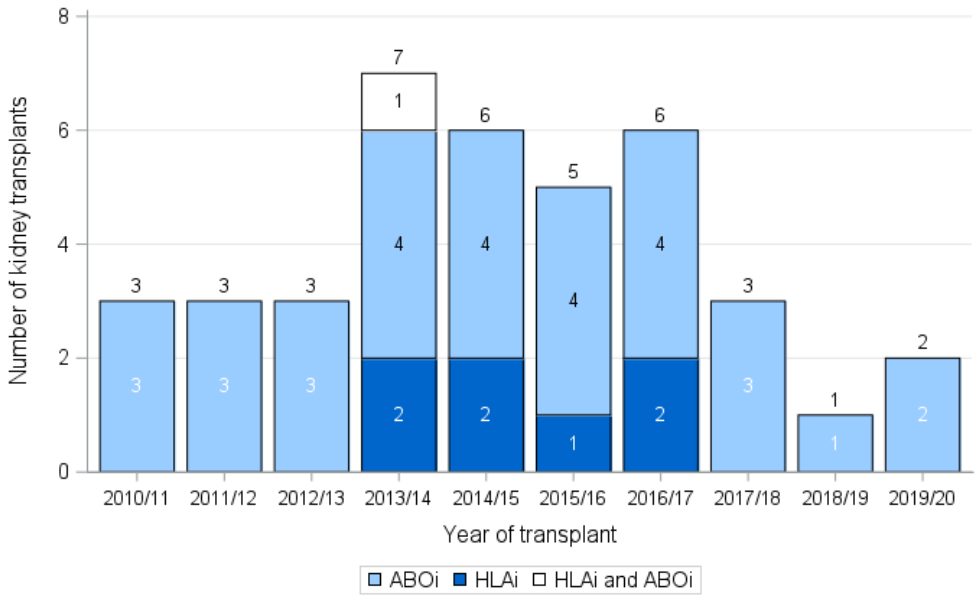
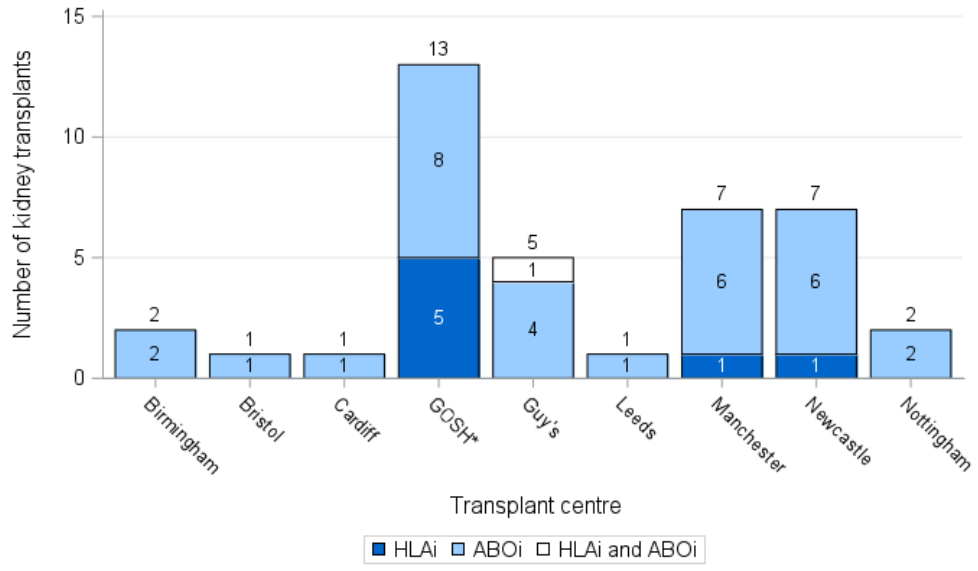


Figure 5.5 Paediatric living donor antibody incompatible kidney transplants in the UK, 1 April 2010 - 31 March 2020



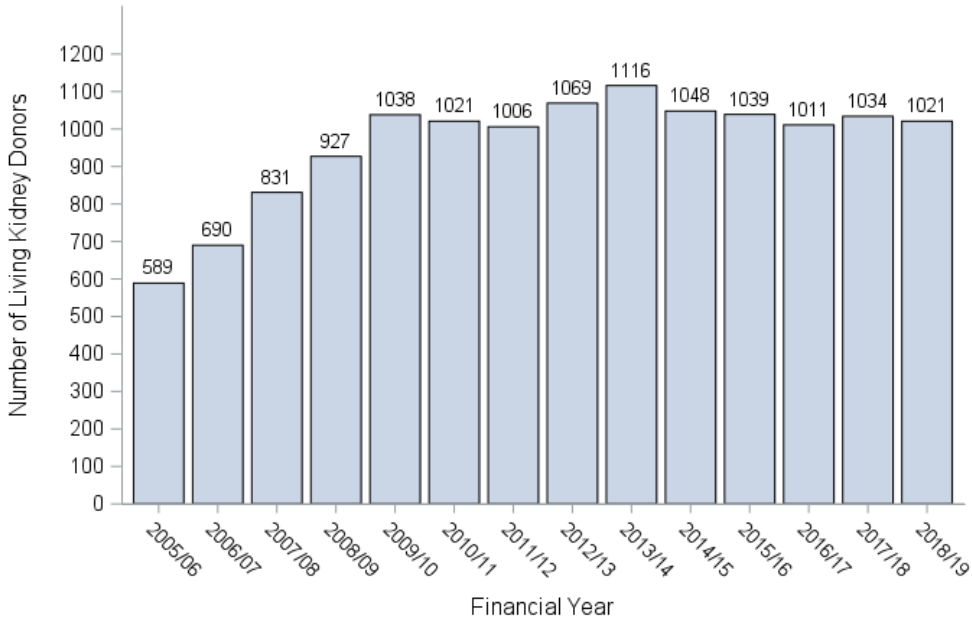
*Guy's team assess donors and perform transplants for GOSH recipients

Living Donor Follow-Up

This section contains information on all living donors who have donated to both adult and paediatric recipients from 2005/06 to 2018/19. 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 2005/06 to 2018/19. The number of living donors has increased from 589 in 2005/06 to 1021 in 2018/19.

Figure 6.1 Number of Living Kidney Donors, 1 April 2005- 31 March 2019



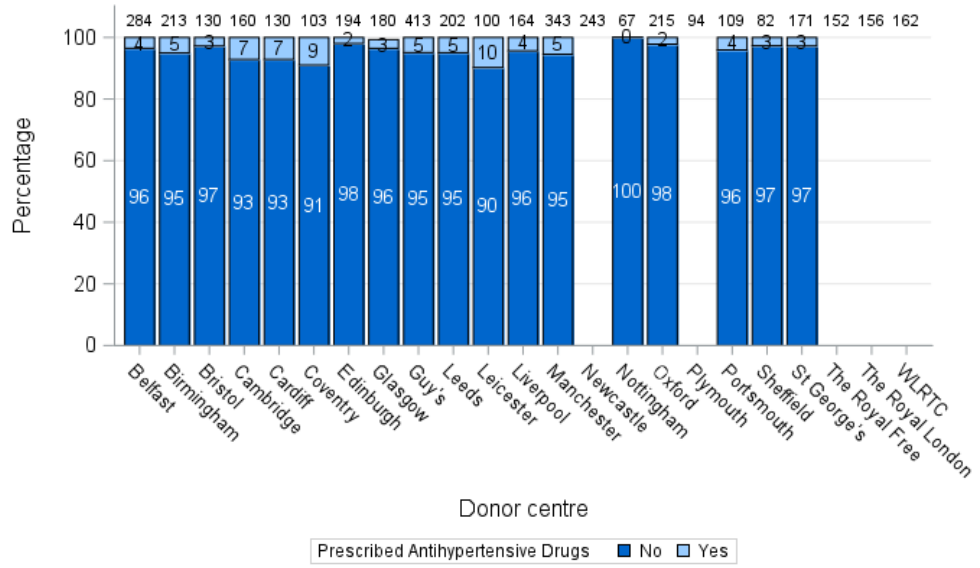
Of the living donors over this period, 88 deaths have been recorded. The causes of death are shown in **Table 6.1**. No donors have joined the kidney waiting list, although one has received a kidney transplant from a living donor.

Table 6.1	**Cause of death for living donors 1 April 2005 – 31 March 2019**	
Cause of Death	N	%
Cancer	38	43
Bowel	3	3
Breast	4	5
Colonic	2	2
Gastric	1	1
Liver	1	1
Lung	2	2
Oesophagus	3	3
Pancreatic	6	7
Prostate	1	1
Testicular	1	1
Other	14	16
Brain Tumor	2	2
Intracranial hemorrhage	3	3
Seizure	2	2
Parkinson's disease	2	2
RTA	2	2
Suicide	2	2
Bronchopneumonia	2	2
Other	9	10
Unknown	26	30
TOTAL	**88**	**100**

6.1 Prescription of Antihypertensive drugs, 1 April 2005 – 31 March 2019

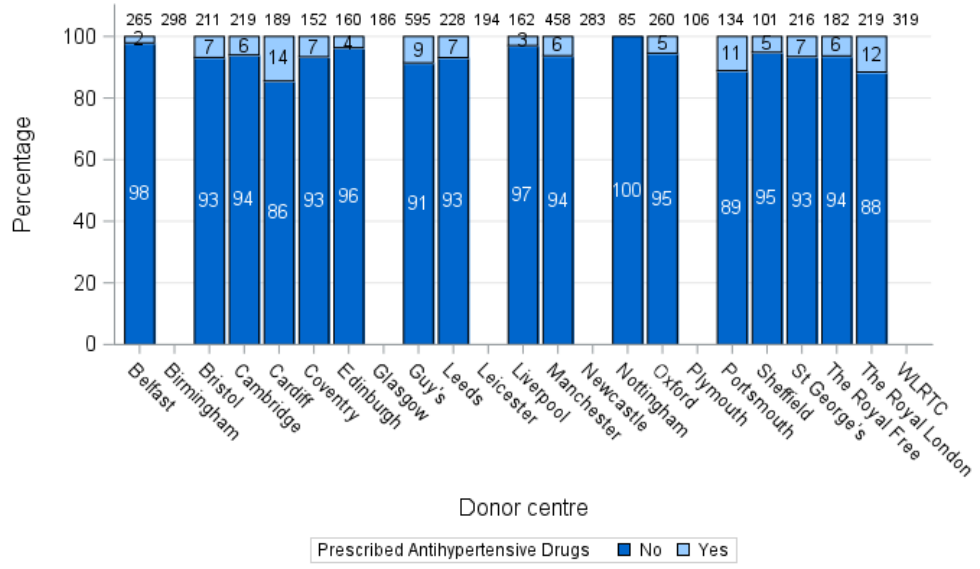
Figure 6.2, 6.3 and 6.4 show the proportion of living donor kidney donors where the donor has been prescribed antihypertensive drugs at 1, 5 and 10 year follow-up by centre, respectively. The same information is summarised in **Table 6.2**. The proportion of living donors across the UK being prescribed anti-hypertensive drugs is 4% at one year, 7% at five years and 11% at ten years post donation.

Figure 6.2 Percentage of Donors Prescribed Antihypertensive Drugs at 1 Year Follow-up, Donations 1 April 2015- 31 March 2019



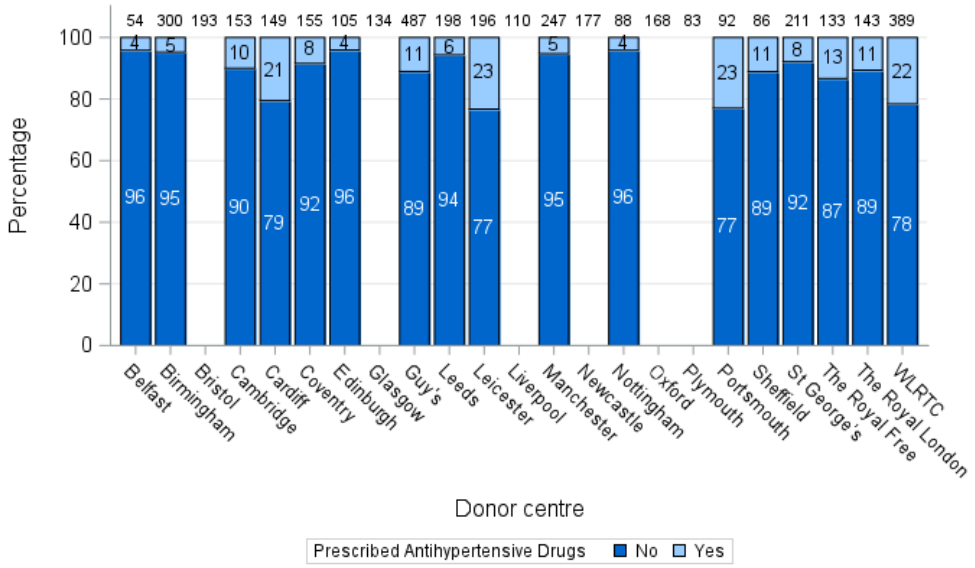
Percentages are omitted where less than 75% of data reported

Figure 6.3 Percentage of Donors Prescribed Antihypertensive Drugs at 5 Year Follow-up, Donations 1 April 2010- 31 March 2015



Percentages are omitted where less than 50% of data reported

Figure 6.4 Percentage of Donors Prescribed Antihypertensive Drugs at 10 Year Follow-up, Donations 1 April 2005- 31 March 2010



Percentages are omitted where less than 35% of data reported

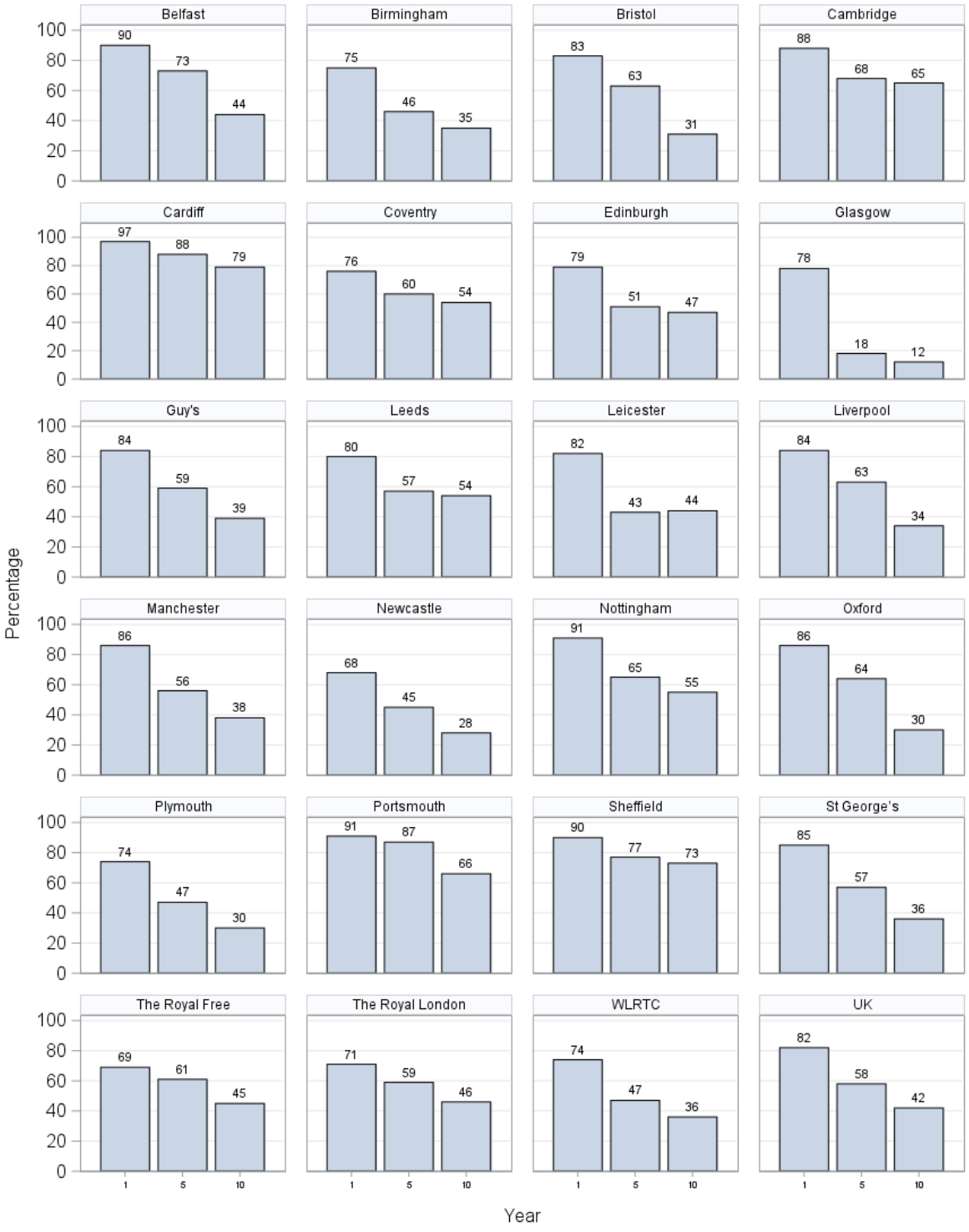
Table 6.2 **Percentage of donors, with lifetime follow-up, prescribed antihypertensive drugs by centre, donations April 2005 - March 2019**

Centre	1 Year			5 Year			10 Year		
	N	%[1]	%[2]	N	%[1]	%[2]	N	%[1]	%[2]
Belfast	284	90	4	265	73	2	54	44	4
Birmingham	213	75	5	298	46	-	300	35	5
Bristol	130	83	3	211	63	7	193	31	-
Cambridge	160	88	7	219	68	6	153	65	10
Cardiff	130	97	7	189	88	14	149	79	21
Coventry	103	76	9	152	60	7	155	54	8
Edinburgh	194	79	2	160	51	4	105	47	4
Glasgow	180	78	3	186	18	-	134	12	-
Guy's	413	84	5	595	59	9	487	39	11
Leeds	202	80	5	228	57	7	198	54	6
Leicester	100	82	10	194	43	-	196	44	23
Liverpool	164	84	4	162	63	3	110	34	-
Manchester	343	86	5	458	56	6	247	38	5
Newcastle	243	68	-	283	45	-	177	28	-
Nottingham	67	91	0	85	65	0	88	55	4
Oxford	215	86	2	260	64	5	168	30	-
Plymouth	94	74	-	106	47	-	83	30	-
Portsmouth	109	91	4	134	87	11	92	66	23
Sheffield	82	90	3	101	77	5	86	73	11
St George's	171	85	3	216	57	7	211	36	8
The Royal Free	152	69	-	182	61	6	133	45	13
The Royal London	156	71	-	219	59	12	143	46	11
WLRTC	162	74	-	319	47	-	389	36	22
UK	**4067**	**82**	**4**	**5222**	**58**	**7**	**4051**	**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 2005 - March 2019.

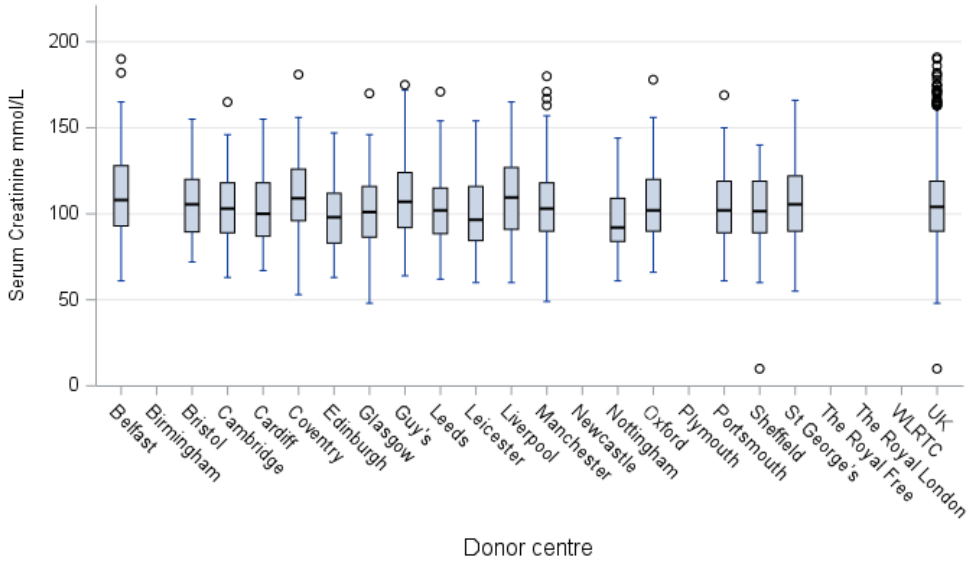
Figure 6.5 Percentage of donors with lifetime follow-up reported, by centre



6.2 Serum creatinine, 1 April 2005 – 31 March 2019

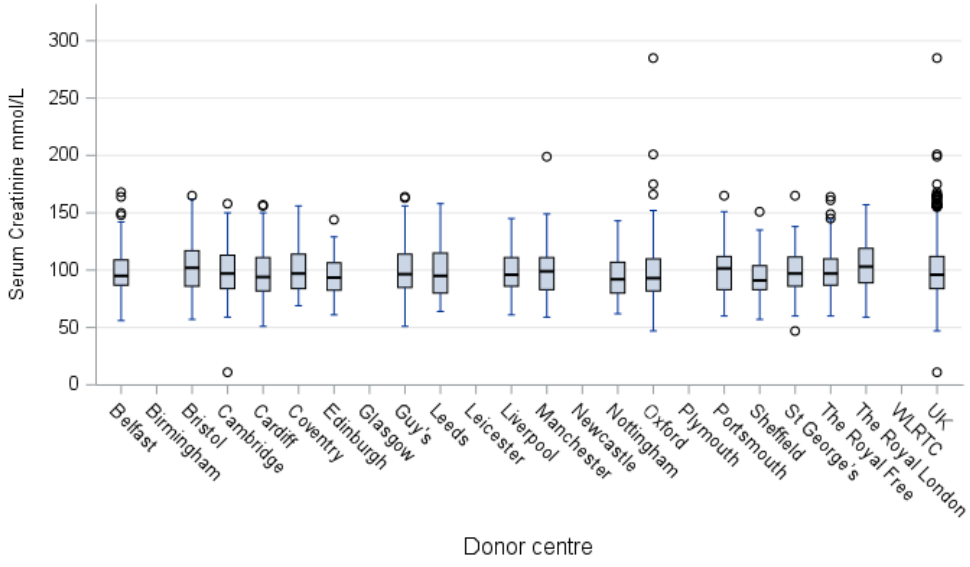
Figure 6.6, 6.7 and 6.8 show the median serum creatinine at 1, 5 and 10 year follow-up by centre, respectively. The same information is summarised in **Table 6.3**. Serum creatinine for living donors in the UK is 104 (IQ-range 90-119) at one year, 96 (84-112) at five years and 92 (81-106) at ten years post donation.

Figure 6.6 Median Serum Creatinine at 1 year follow-up by Centre, Donations 1 April 2015 - 31 March 2019



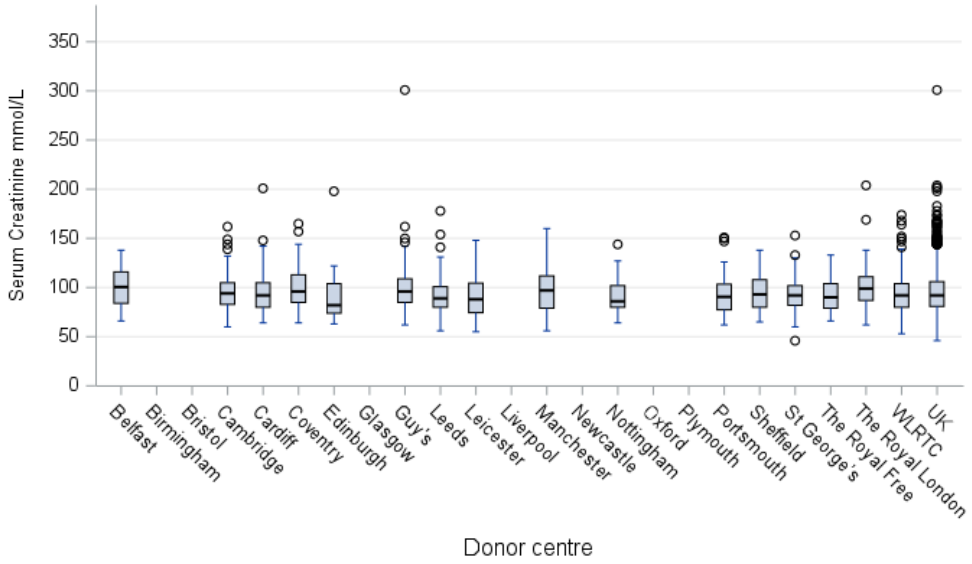
Median omitted where less than 75% of data reported

Figure 6.7 Median Serum Creatinine at 5 year follow-up by Centre, Donations 1 April 2010 - 31 March 2015



Median omitted where less than 50% of data reported

Figure 6.8 Median Serum Creatinine at 10 year follow-up by Centre, Donations 1 April 2005 - 31 March 2010



Median omitted where less than 35% of data reported

Table 6.3 **Median serum creatinine at 1, 5 and 10 year follow up by centre, donations 1 April 2005 - 31 March 2019**

Centre	1 Year			5 Year			10 Year		
	N	%[1]	Median (IQ range)	N	%[1]	Median (IQ range)	N	%[1]	Median (IQ range)
Belfast	284	89	108 (93-128)	265	73	95 (87-109)	54	44	101 (84-116)
Birmingham	213	74	- (-)	298	46	(-)	300	34	(-)
Bristol	130	83	106 (90-120)	211	62	102 (86-117)	193	31	(-)
Cambridge	160	87	103 (89-118)	219	68	97 (84-113)	153	64	94 (83-105)
Cardiff	130	96	100 (87-118)	189	88	94 (82-111)	149	79	92 (80-105)
Coventry	103	76	109 (96-126)	152	61	97 (84-114)	155	53	96 (85-113)
Edinburgh	194	77	98 (83-112)	160	50	94 (83-107)	105	47	82 (74-104)
Glasgow	180	78	101 (87-116)	186	18	(-)	134	12	(-)
Guy's	413	83	107 (92-124)	595	58	97 (85-114)	487	39	96 (85-109)
Leeds	202	79	102 (89-115)	228	57	95 (80-115)	198	53	89 (80-101)
Leicester	100	80	97 (85-116)	194	42	(-)	196	43	88 (75-105)
Liverpool	164	79	110 (91-127)	162	62	96 (86-111)	110	34	(-)
Manchester	343	85	103 (90-118)	458	55	99 (83-111)	247	38	97 (79-112)
Newcastle	243	68	- (-)	283	45	(-)	177	28	(-)
Nottingham	67	91	92 (84-109)	85	65	92 (80-107)	88	55	86 (80-102)
Oxford	215	85	102 (90-120)	260	63	93 (82-110)	168	30	(-)
Plymouth	94	74	- (-)	106	47	(-)	83	30	(-)
Portsmouth	109	89	102 (89-119)	134	85	102 (83-112)	92	65	91 (78-104)
Sheffield	82	90	102 (89-119)	101	76	91 (83-104)	86	73	93 (80-108)
St George's	171	83	106 (90-122)	216	56	97 (86-112)	211	36	92 (82-102)
The Royal Free	152	69	- (-)	182	61	97 (87-110)	133	45	90 (79-104)
The Royal London	156	71	- (-)	219	59	103 (89-119)	143	46	99 (87-111)
WLRTC	162	74	- (-)	319	47	(-)	389	35	92 (80-104)
UK	**4067**	**81**	**104 (90-119)**	**5222**	**57**	**96 (84-112)**	**4051**	**42**	**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 2005 – 31 March 2019

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.

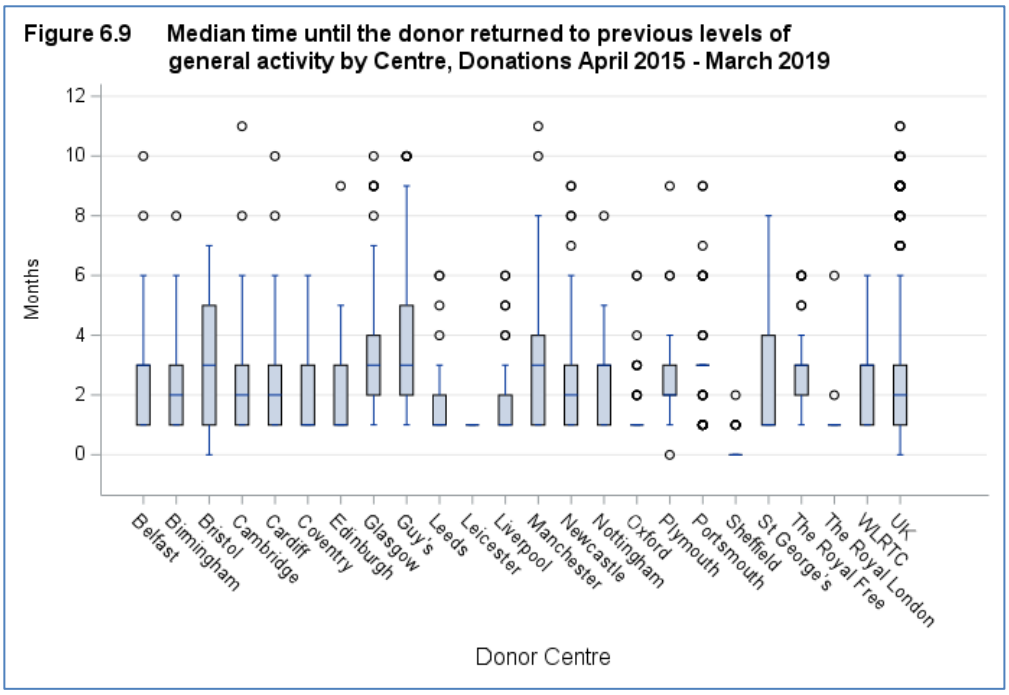
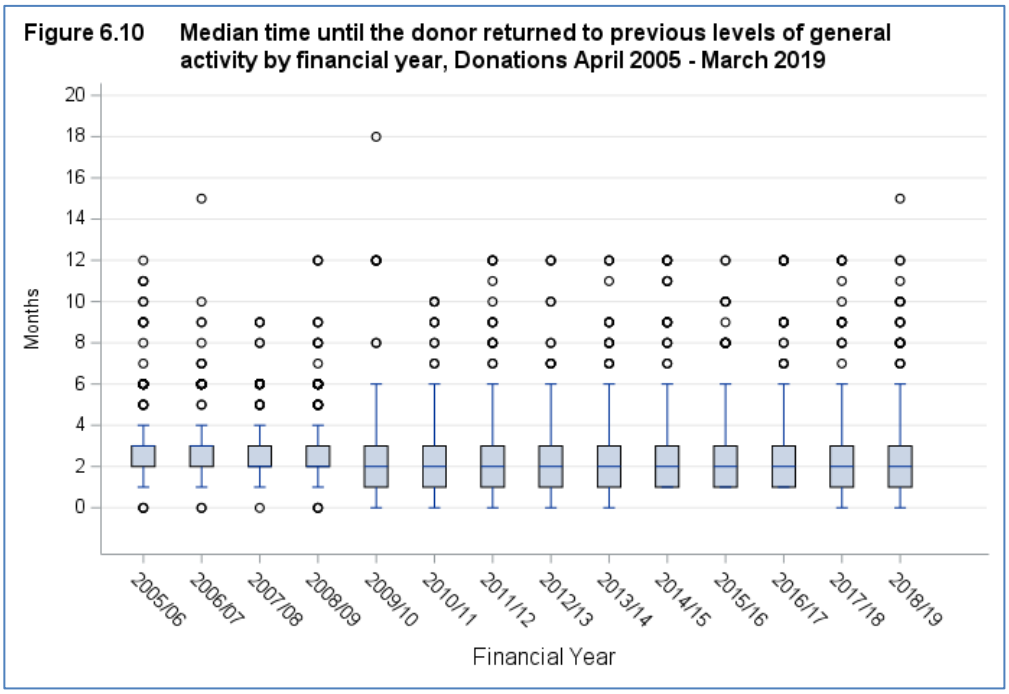


Figure 6.10 shows the median time (in months) to return to normal activity after donation in the UK, by financial year.



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.

Figure 7.1 1 year graft survival following adult living kidney transplant between 1 April 2015 and 31 March 2019

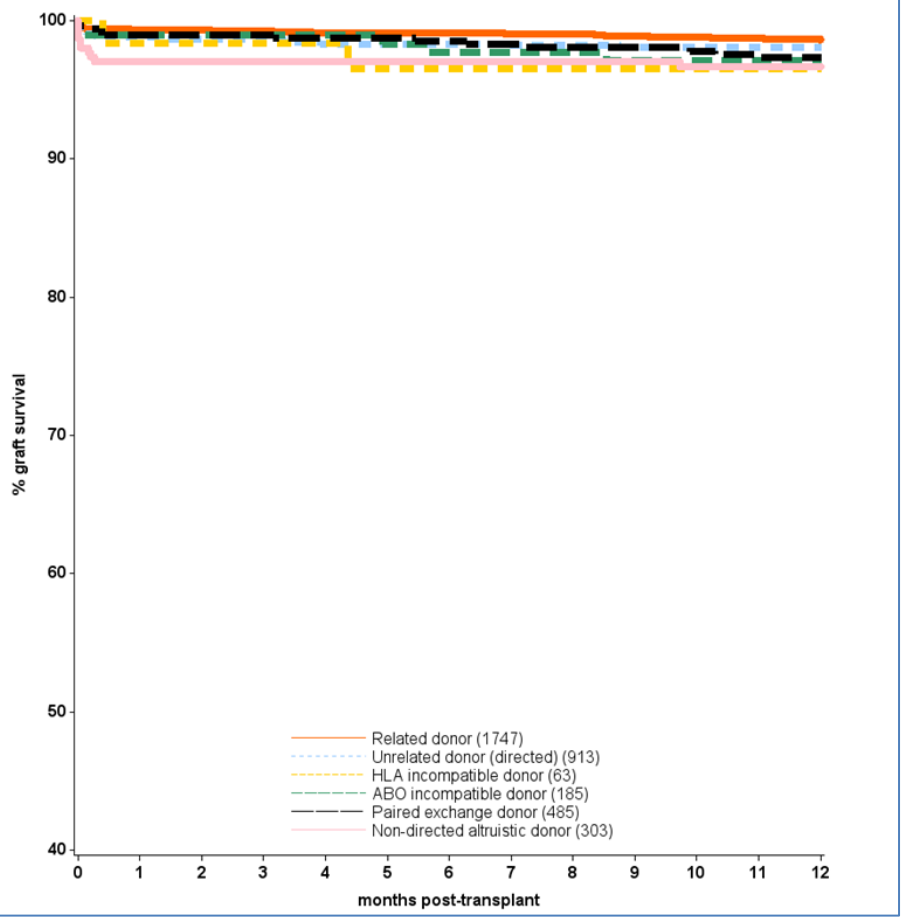


Table 7.1 1 year graft survival following living kidney transplant between 1 April 2015 and 31 March 2019 (p=0.1239)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1747	98.6	(98-99)
Unrelated donor (directed)	913	98.1	(97-99)
Paired exchange donor	485	97.3	(95-98)
ABO incompatible donor	185	97.1	(93-99)
Non-directed altruistic donor	303	96.7	(94-98)
HLA incompatible donor	63	96.5	(87-99)

Figure 7.2 5 year graft survival following adult living kidney transplant between 1 April 2011 and 31 March 2015

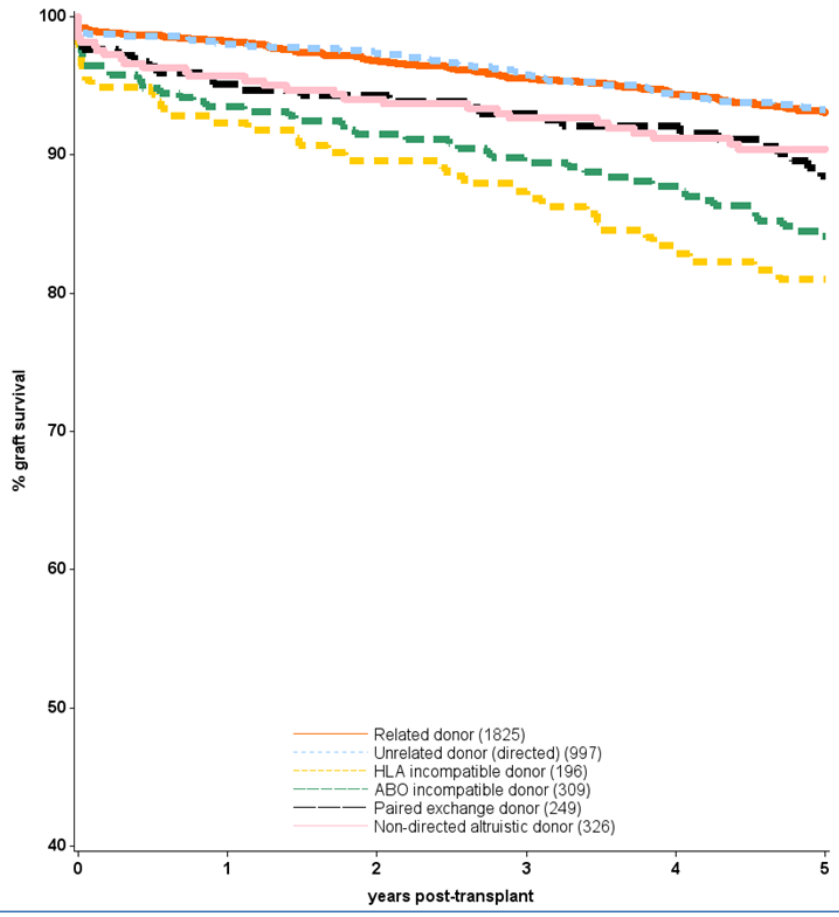


Table 7.2 5 year graft survival following living kidney transplant between 1 April 2011 and 31 March 2015 (p<0.0001)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Unrelated donor (directed)	997	93.3	(91-95)
Related donor	1825	93.1	(92-94)
Non-directed altruistic donor	326	90.4	(86-93)
Paired exchange donor	249	88.5	(84-92)
ABO incompatible donor	309	84.1	(79-88)
HLA incompatible donor	196	81.0	(75-86)

Figure 7.3 1 year patient survival following adult living kidney transplant between 1 April 2015 and 31 March 2019

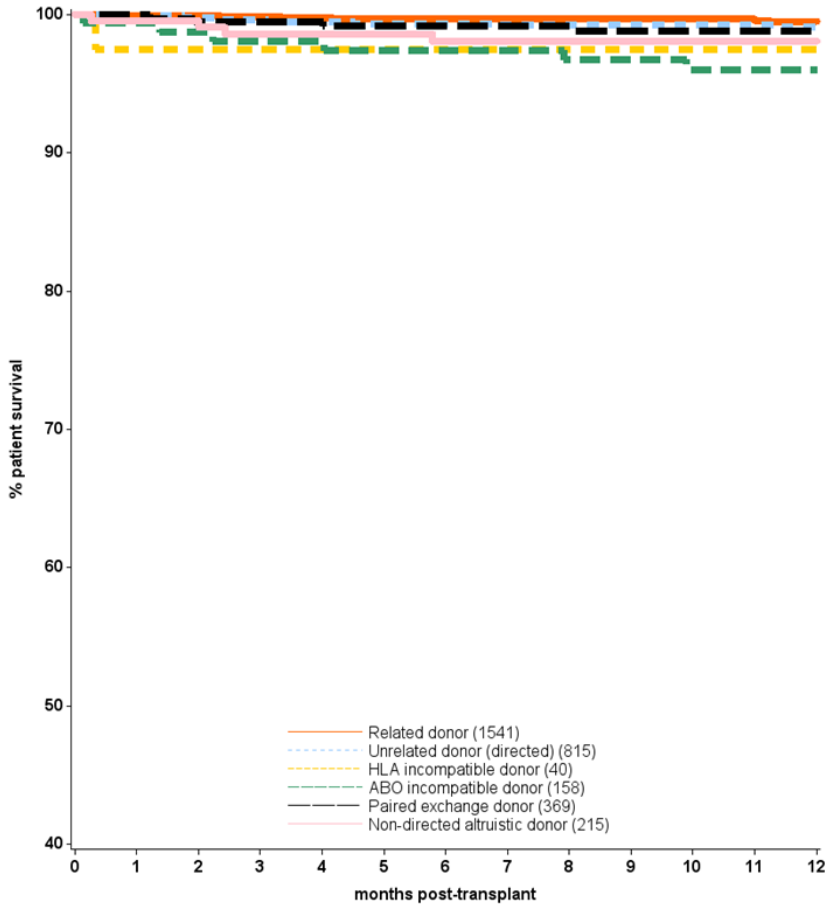


Table 7.3 1 year patient survival following living kidney transplant between 1 April 2015 and 31 March 2019 (p=0.0008)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1541	99.5	(99-100)
Unrelated donor (directed)	815	99.1	(98-100)
Paired exchange donor	369	98.8	(97-100)
Non-directed altruistic donor	215	98.1	(95-99)
HLA incompatible donor	40	97.5	(84-100)
ABO incompatible donor	158	96.0	(91-98)

Figure 7.4 5 year patient survival following adult living kidney transplant between 1 April 2011 and 31 March 2015

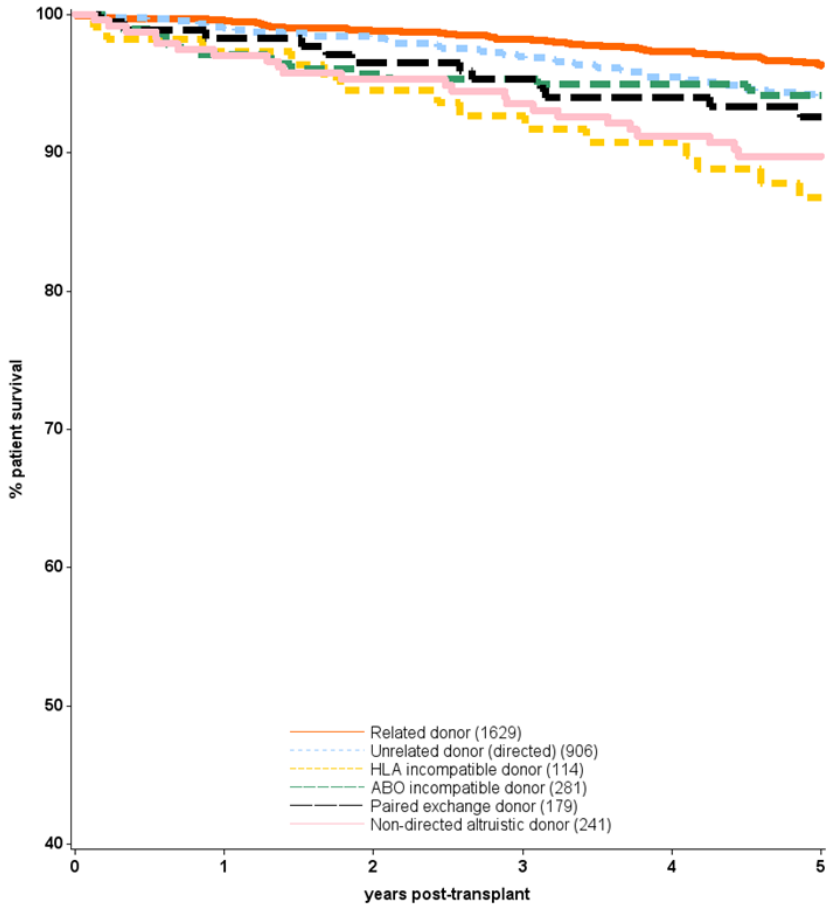


Table 7.4 5 year patient survival following living kidney transplant between 1 April 2011 and 31 March 2015 (p<0.0001)

Living Donors	No. at risk on day 0	% Graft survival	(95% confidence interval)
Related donor	1629	96.3	(95-97)
ABO incompatible donor	281	94.2	(91-96)
Unrelated donor (directed)	906	94.1	(92-95)
Paired exchange donor	179	92.6	(87-96)
Non-directed altruistic donor	241	89.7	(85-93)
HLA incompatible donor	114	86.8	(79-92)

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, 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 7.5 **1 year graft survival following adult living related kidney transplant between 1 April 2015 and 31 March 2019**

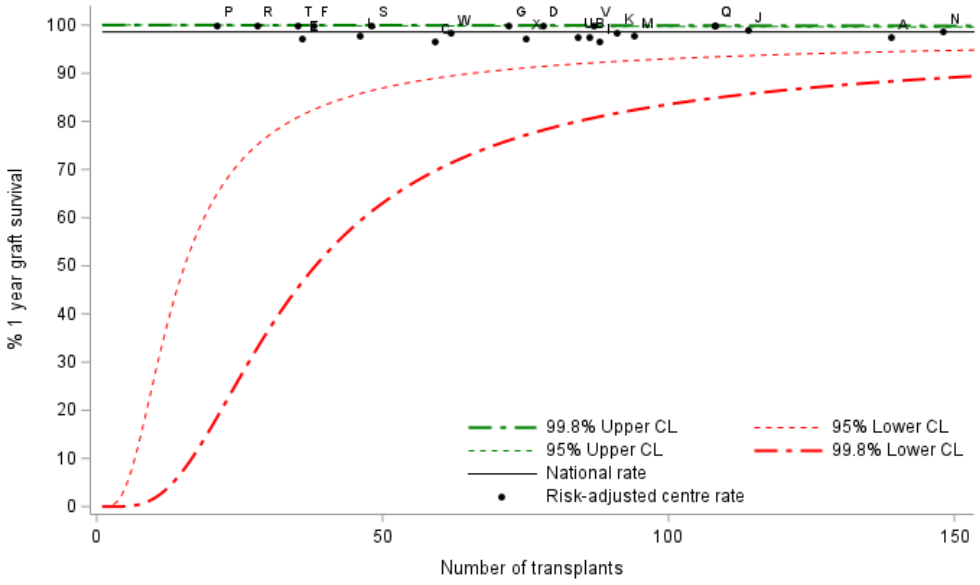


Figure 7.6 **1 year graft survival following adult living unrelated donor (directed) kidney transplant between 1 April 2015 and 31 March 2019**

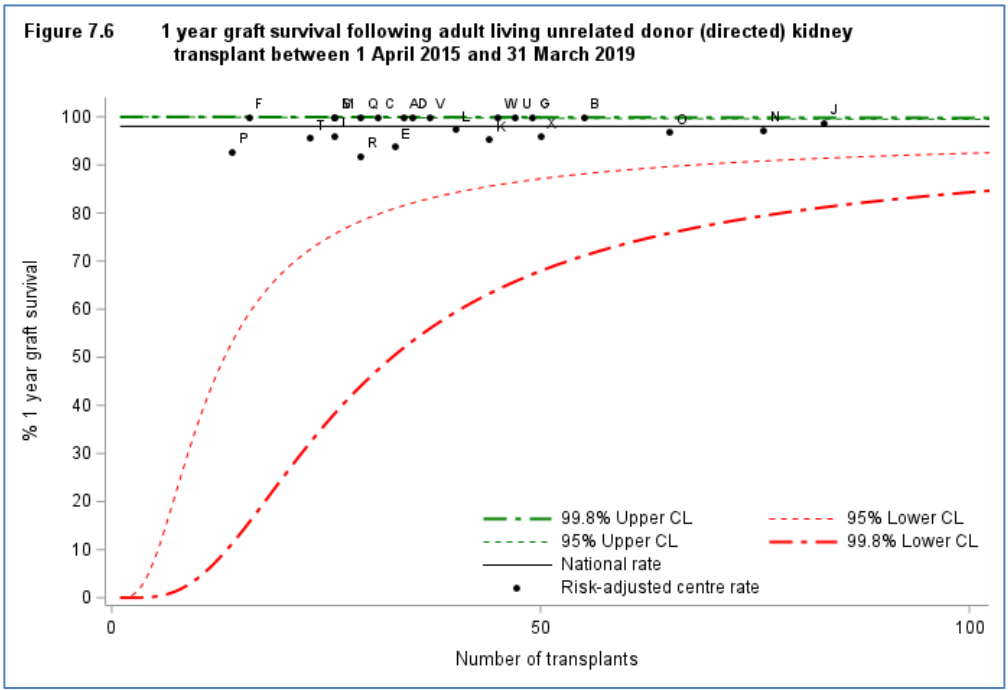


Figure 7.7 **1 year graft survival following adult living HLAi donor kidney transplant between 1 April 2015 and 31 March 2019**

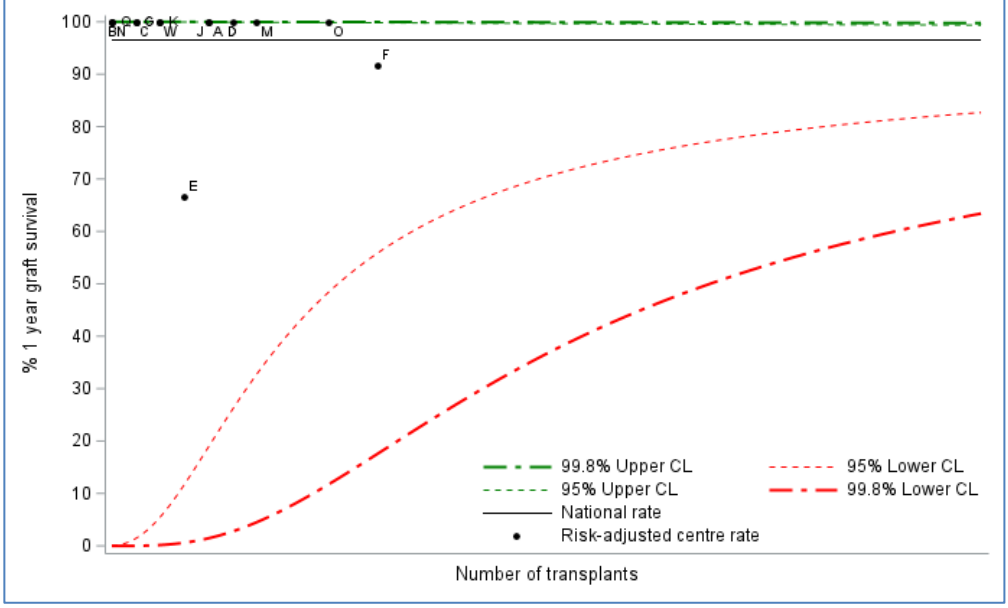


Figure 7.8 **1 year graft survival following adult living ABOi donor kidney transplant between 1 April 2015 and 31 March 2019**

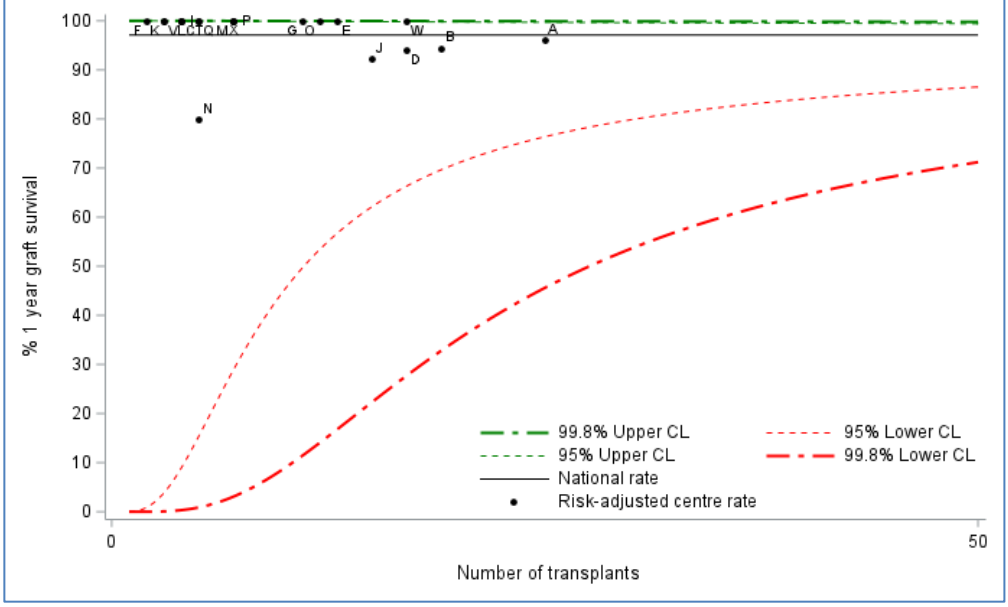


Figure 7.9 **1 year graft survival following adult living paired exchange donor kidney transplant between 1 April 2015 and 31 March 2019**

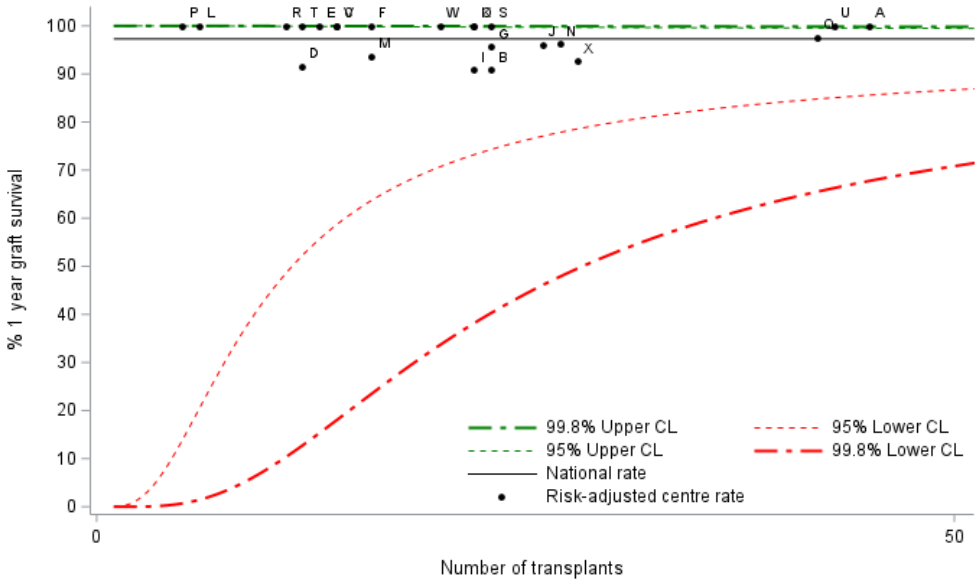


Figure 7.10 **1 year graft survival following adult living non-directed altruistic donor kidney transplant between 1 April 2015 and 31 March 2019**

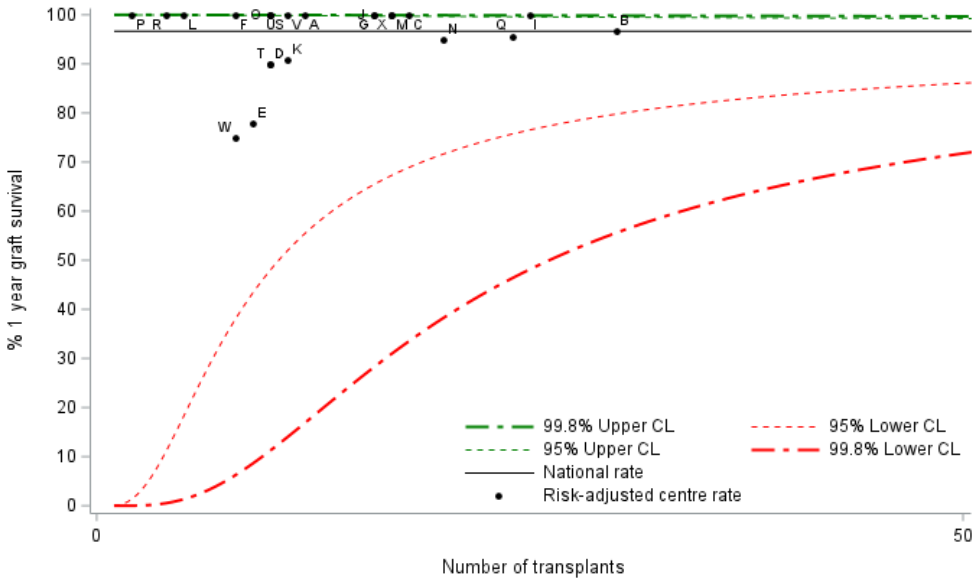


Table 7.5 **1 year graft survival following adult living donor kidney transplant between 1 April 2015 and 31 March 2019, by donor type and centre**

		Related		Unrelated		HLAi		ABOi		Paired		Non-directed altruistic	
Centre	Code	N	%[1]	N	%[1]	N	%[1]	N	%[1]	N	%[1]	N	%[1]
Belfast	A	139	98	34	100	5	100	25	96	45	100	12	100
Birmingham	B	86	98	55	100	1	100	19	94	23	91	30	97
Bristol	C	59	97	31	100	2	100	4	100	14	100	18	100
Cambridge	D	78	100	35	100	6	100	17	94	12	92	10	90
Cardiff	E	36	97	33	94	4	67	13	100	13	100	9	78
Coventry	F	38	100	16	100	12	92	2	100	16	100	8	100
Edinburgh	G	72	100	49	100	2	100	11	100	23	96	16	100
Glasgow	I	88	97	26	96	-		4	100	22	91	25	100
Guy's	J	114	99	83	99	5	100	15	92	26	96	16	100
Leeds	K	91	99	44	95	3	100	3	100	22	100	11	91
Leicester	L	46	98	40	98	-		4	100	6	100	5	100
Liverpool	M	94	98	26	100	7	100	7	100	16	94	17	100
Manchester	N	148	99	76	97	1	100	5	80	27	96	20	95
Newcastle	O	108	100	65	97	10	100	12	100	22	100	10	100
Nottingham	P	21	100	14	93	-		7	100	5	100	2	100
Oxford	Q	108	100	29	100	1	100	5	100	42	98	24	96
Plymouth	R	28	100	29	92	-		-		11	100	4	100
Portsmouth	S	48	100	26	100	-		-		23	100	10	100
Sheffield	T	35	100	23	96	-		5	100	12	100	10	90
St George's	U	84	98	47	100	-		-		43	100	10	100
The Royal Free	V	87	100	37	100	-		3	100	14	100	11	100
The Royal London	W	62	98	45	100	3	100	17	100	20	100	8	75
WLRTC	X	75	97	50	96	-		7	100	28	93	17	100
UK		**1745**	**99**	**913**	**98**	**62**	**97**	**185**	**97**	**485**	**97**	**303**	**97**

[1] % 1 year graft survival

PAEDIATRIC

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

Appendix

A1 Glossary of terms

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

Living 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 Matthew Robb
Miss Chloe Brown