



Blood and Transplant

ANNUAL REPORT ON KIDNEY TRANSPLANTATION

**REPORT FOR 2019/2020
(1 APRIL 2010 – 31 MARCH 2020)**

PUBLISHED OCTOBER 2020

PRODUCED IN COLLABORATION WITH NHS ENGLAND



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Executive Summary

This report presents key figures about kidney transplantation in the UK. The period reported covers 10 years of transplant data, from 1 April 2010. The report presents information on the number of transplants and survival analysis after first kidney only transplantation on a national and centre-specific basis.

Key findings

- On 29 February 2020, there were 4,618 adult patients on the UK active kidney transplant list which represents a 1% decrease in the number of patients a year earlier. The equivalent number of paediatric patients was 108, representing a 17% increase from the previous year
- There were 3,190 adult kidney only transplants performed in the UK in 2019/20 an decrease of 3% compared to 2018/19. Of these, 1,326 were from DBD donors, 915 were from DCD donors and 949 were from living donors. The equivalent number of paediatric transplants was 113 representing a 19% decrease from the previous year.
- The national rate of graft survival five years after first adult deceased donor kidney only transplant is 86%. These rates vary between centres, ranging from 76% to 93% (risk-adjusted). The equivalent rate after first paediatric deceased donor kidney only transplant is 86%, ranging from 79% to 100%.
- The national rate of graft survival five years after first adult living donor kidney only transplant is 93%. These rates vary between centres, ranging from 88% to 97% (risk-adjusted). The equivalent rate after first paediatric living donor kidney only transplant is 91%, ranging from 85% to 100%.
- The national rate of ten year patient survival from listing for deceased donor kidney only transplants in adult patients is 75%. These rates vary between centres, ranging from 69% to 88% (risk-adjusted).

Use of the contents of this report should be acknowledged as follows:

Annual Report on Kidney Transplantation 2019/20, NHS Blood and Transplant

Introduction

This report presents information on transplant activity between 1 April 2010 and 31 March 2020, for all 24 centres performing 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 (deceased and living).

[Patient survival](#) from listing is reported at one, five and ten year post registration for a deceased donor adult kidney only transplant between 1 January 2008 and 31 December 2019.

The centre specific results for survival estimates are adjusted for differences in [risk factors](#) between the centres. The risk models used are described in the Appendix.

Patients requiring [multi-organ transplants](#) are excluded from all analyses and all results are described separately for adult (aged \geq 18years) and paediatric patients (aged $<$ 18 years) other than those presented in this Introduction section.

Throughout this report West London Renal and Transplant Centre is labeled as WLRTC.

On 11 September 2019, a new National Kidney Offering Scheme was introduced to offer kidneys from both donors after brain death and donors after circulatory death. This is a change from the previous system where kidneys from donors after circulatory death were offered under a different scheme than kidneys from donors after brain death. The scheme has two tiers with priority going to patients who are the most difficult to match or who have waited over 7 years for a transplant.

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.

Waiting list figures at the 31 March 2020 do not accurately reflect the need for kidney transplantation due to the COVID-19 pandemic. Different practices were established across the UK with regards to waiting list management. Due to this, a snapshot of the waiting list at 29 February 2020 has been used to better reflect activity near the end of the 2019-2020 financial year.

Figure 2.1 shows the number of patients on the kidney [transplant list](#) at 31 March each year between 2011 and 2019 and at 29 February 2020. The number of patients actively waiting for a kidney transplant decreased from 6,871 in 2011 to 4,938 in 2020.

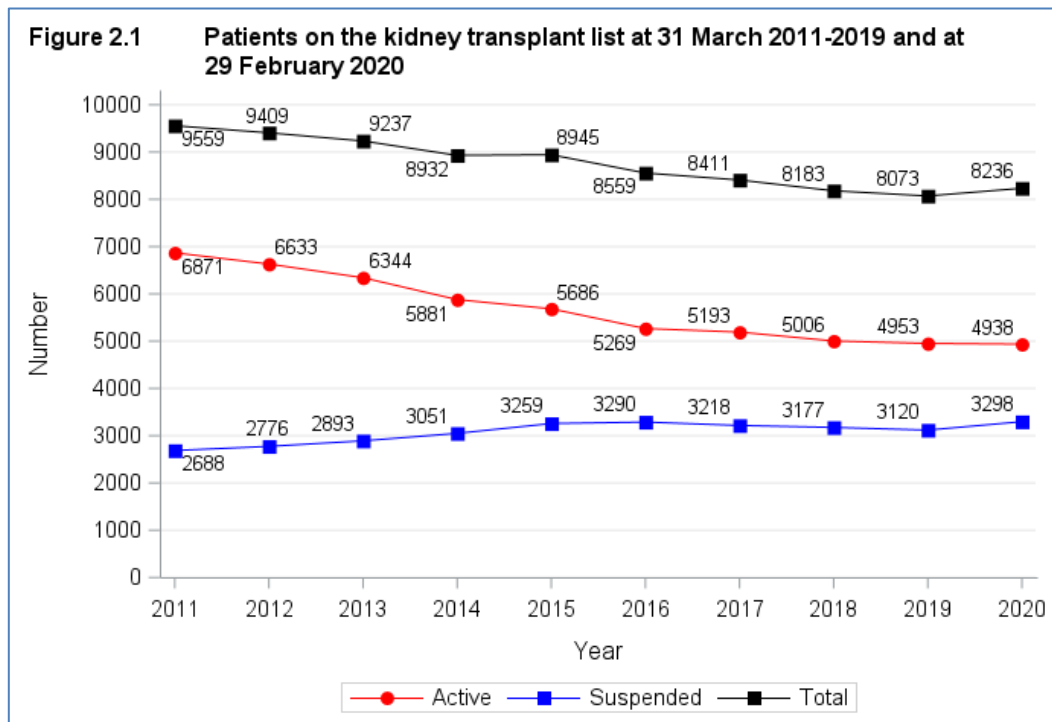


Figure 2.2 shows the number of patients on the kidney [transplant list](#) at 29 February 2020 for each transplant centre. Manchester has the largest active [transplant list](#) with 413 patients registered for a kidney transplant.

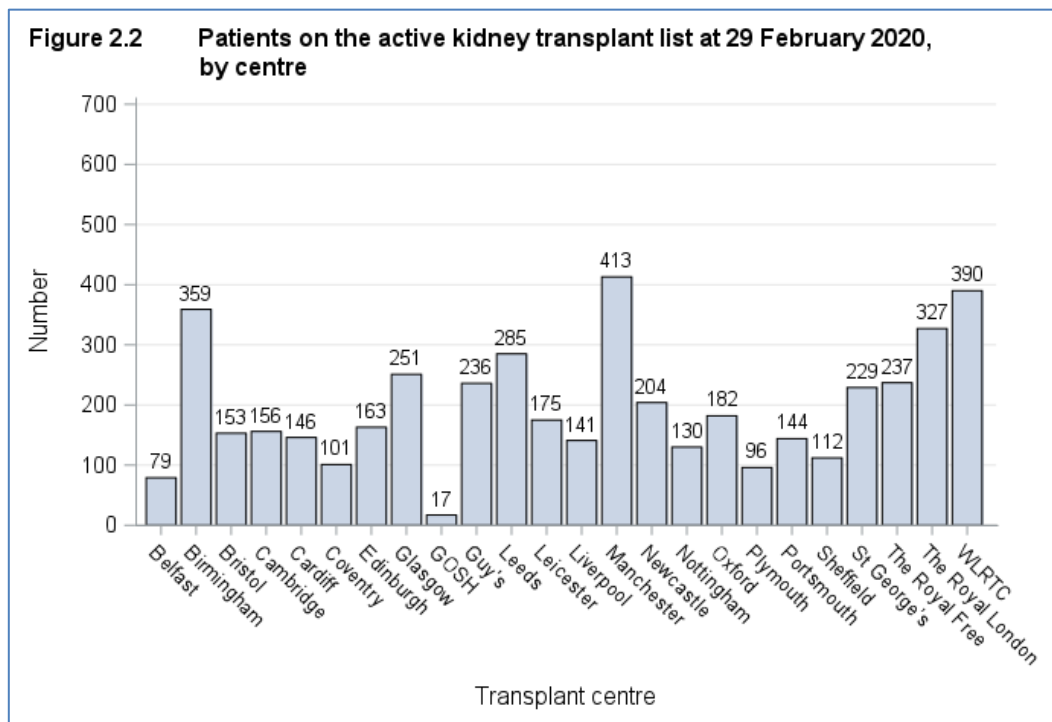


Figure 2.3 shows the total number of kidney transplants performed in the last ten years. The number of transplants steadily increased from 2,686 in 2010/11 to 3,486 in 2019/20.

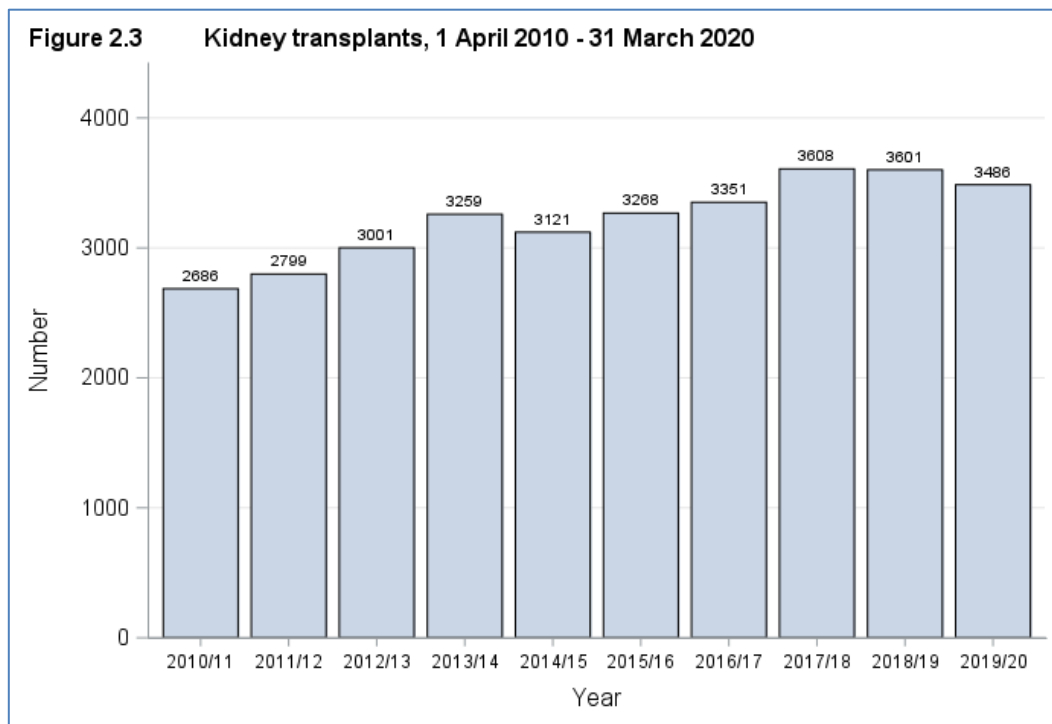


Figure 2.4 shows the total number of kidney transplants performed in 2019/20 at each transplant centre. Guy's performed the most kidney transplants last year with 302 patients receiving a transplant.

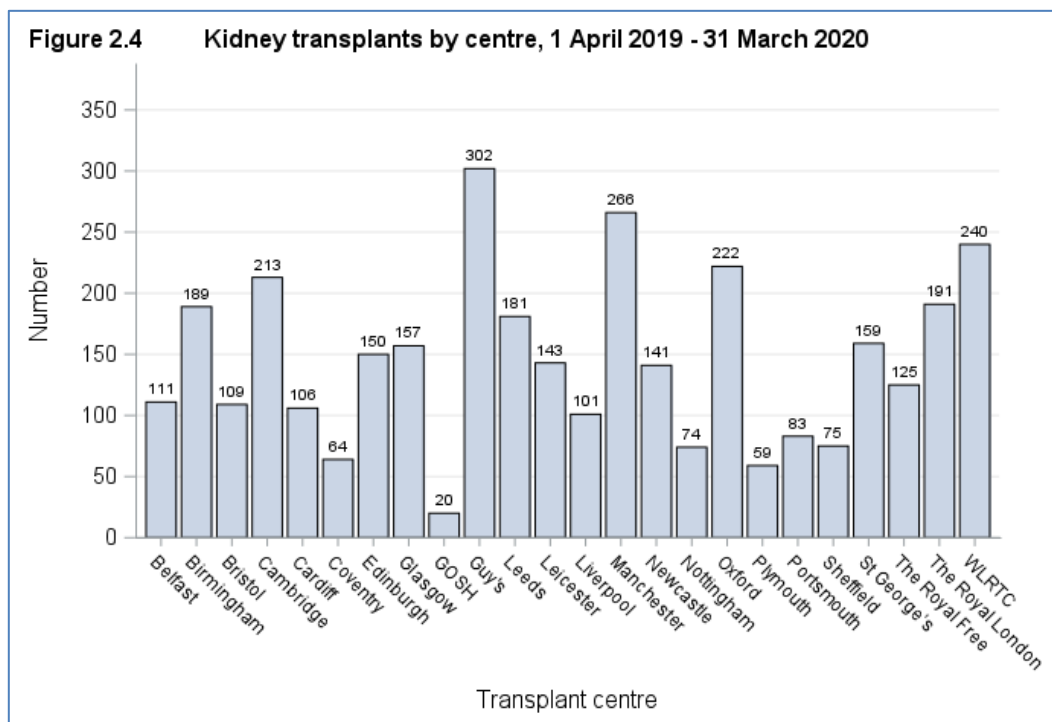


Figure 2.5 shows the total number of kidney transplants performed per million population in 2019/20 at each transplant centre. WLRTC had the highest number of adult deceased donors kidney transplants per million population.

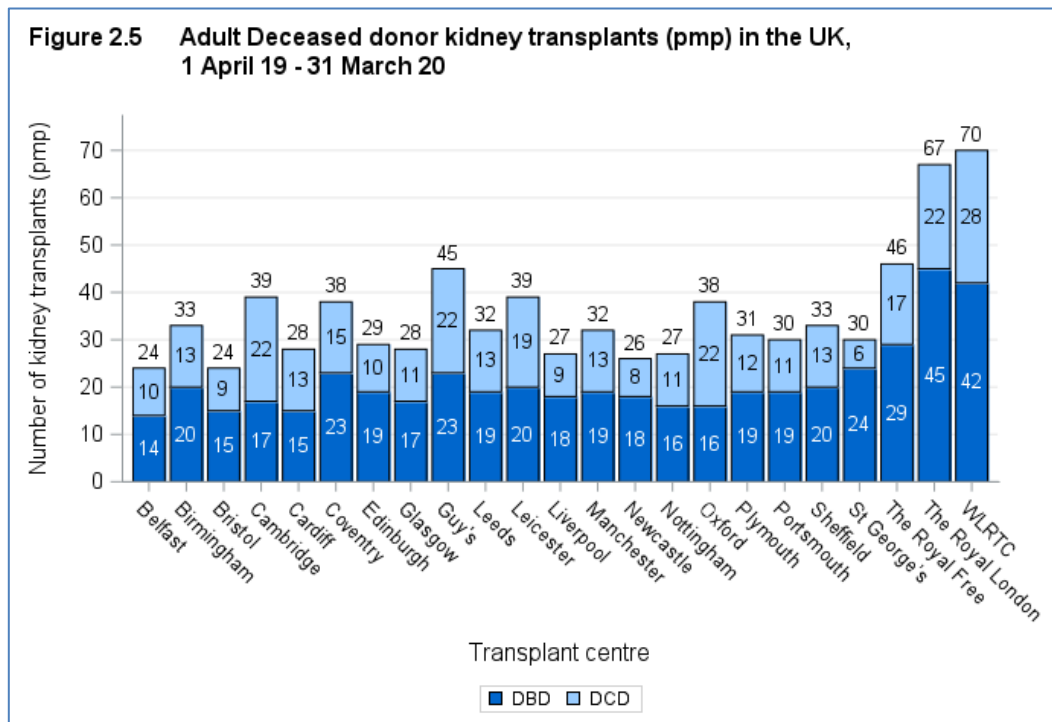
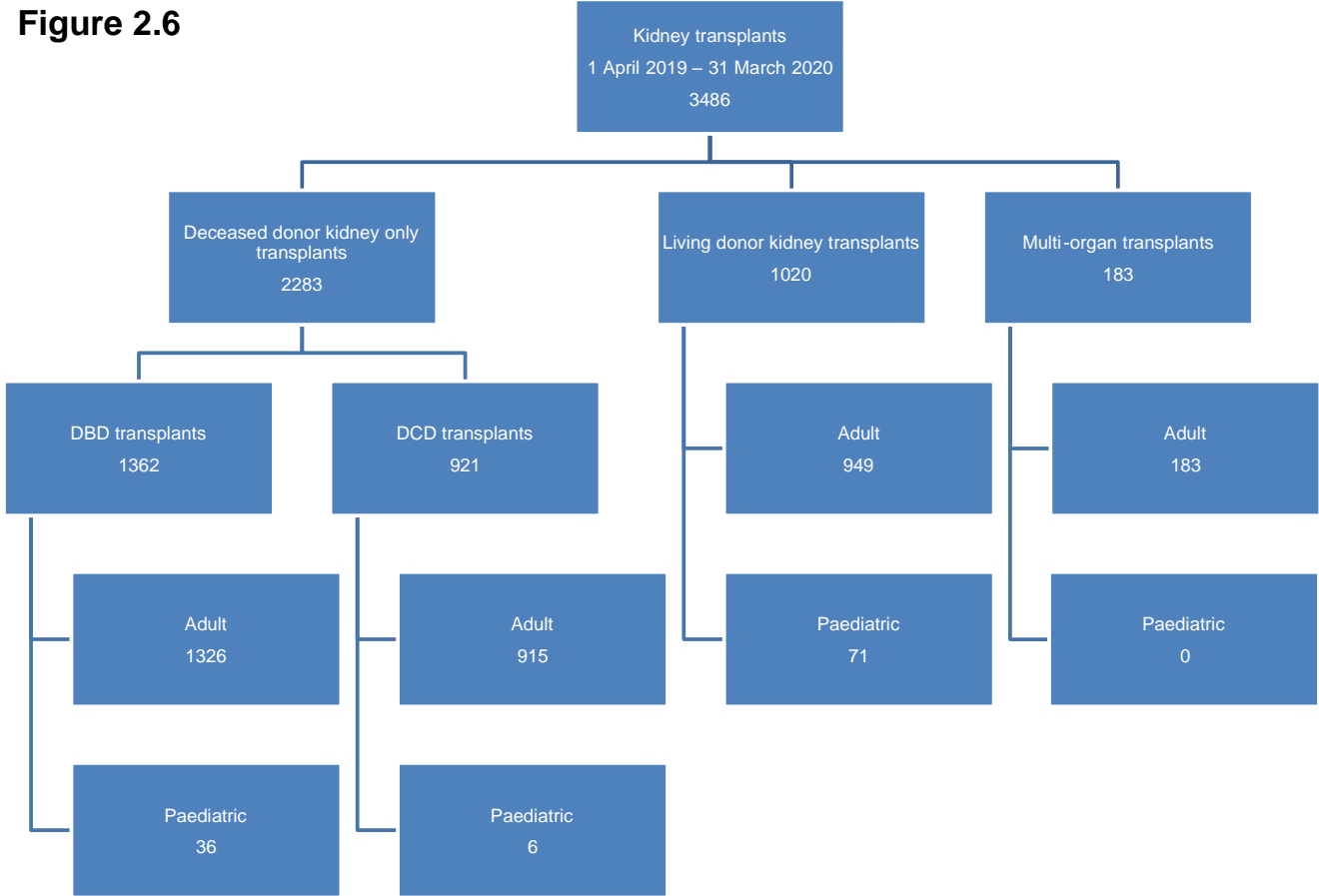


Figure 2.6 details the 3,486 kidney transplants performed in the UK between 1 April 2019 and 31 March 2020. Of these, 2,283 (65%) were deceased donor kidney only transplants and 1020 (29%) were living donor kidney transplants. Of the 183 multi-organ transplants, 162 were simultaneous kidney and pancreas transplants, 15 were kidney and liver transplants, 5 were simultaneous kidney and islet transplants and 1 was a heart and kidney transplant.

Figure 2.6



Geographical variation in registration and transplant rates

All NHS group 1 patients who were registered onto the kidney transplant list with an active status between 1 April 2019 and 31 March 2020 were extracted from the UK Transplant Registry on 3 July 2020 (numerator). Only patients registered for kidney only were considered. Patients were assigned to NHS regions in England using their postcode of residence, as reported at registration. The number of registrations per million population (pmp) by NHS region was obtained using mid-2018 population estimates based on the Office for National Statistics (ONS) 2011 Census figures (denominator). No NHS region age- or sex-specific standardisation of rates was performed.

The registration rates pmp were categorised into four groups – low, low-medium, medium-high and high – based on the quartiles of their distribution and visualised in a map using contrasting colours.

Transplant rates pmp were obtained as the number of kidney only transplants on NHS group 1 recipients between 1 April 2019 and 31 March 2020 (numerator), divided by the mid-2018 population estimates from the ONS (denominator). Transplant rates pmp were categorised and visualised in a map as done for the registration rates.

Systematic component of variation

For systematic component of variation, only registrations or transplants in England between 1 April 2019 and 31 March 2020 were included. If a patient was re-registered during the time period, only the first registration was considered. If a patient underwent more than one deceased donor kidney transplant in the time period, only the first transplant was considered, similarly for living donor kidney transplants.

Figure 2.7 shows rates of registration to the kidney only transplant list per million population (pmp) between 1 April 2019 and 31 March 2020 compared with deceased donor kidney only transplant rates pmp for the same time period, by recipient country/NHS region of residence. **Figure 2.8** shows the transplant rates pmp for living donor kidney only transplants in the same period. **Table 2.1** shows the breakdown of these numbers by recipient country/NHS region of residence. No adjustments have been made for potential demographic differences in populations. If a patient has had more than one registration/transplant in the period, each registration/transplant is considered. Note that this analysis only considered NHS Group 1 patients.

Since there will inevitably be some random variation in rates between areas, the systematic component of variation (SCV) was used to identify if the variation is more (or less) than a random effect for the different NHS regions in England only. Only first registrations and transplants in this period were considered. The larger the SCV the greater the evidence of a high level of systematic variation between areas. Registration, deceased donor transplant, and living donor transplant rates yielded an SCV of 0.0552 (p-value <0.001), 0.068 (p-value <0.001), and 0.0065 (p-value = 0.067) respectively. The p-value shows the probability that an SCV of this size (or higher) would be observed by chance if only random variation existed and therefore, strong evidence of geographical variation beyond what would be expected at random for registrations and deceased donor transplants, and weak evidence for living donor transplants. No adjustment has been made for area-specific demographic characteristics that may impact the rates of registration to the transplant list and transplantation such as age and sex. Therefore, these results should be interpreted with caution.

Figure 2.7 Comparison of kidney registration rates (pmp) with deceased donor transplant rates (pmp) by recipient country/NHS region of residence

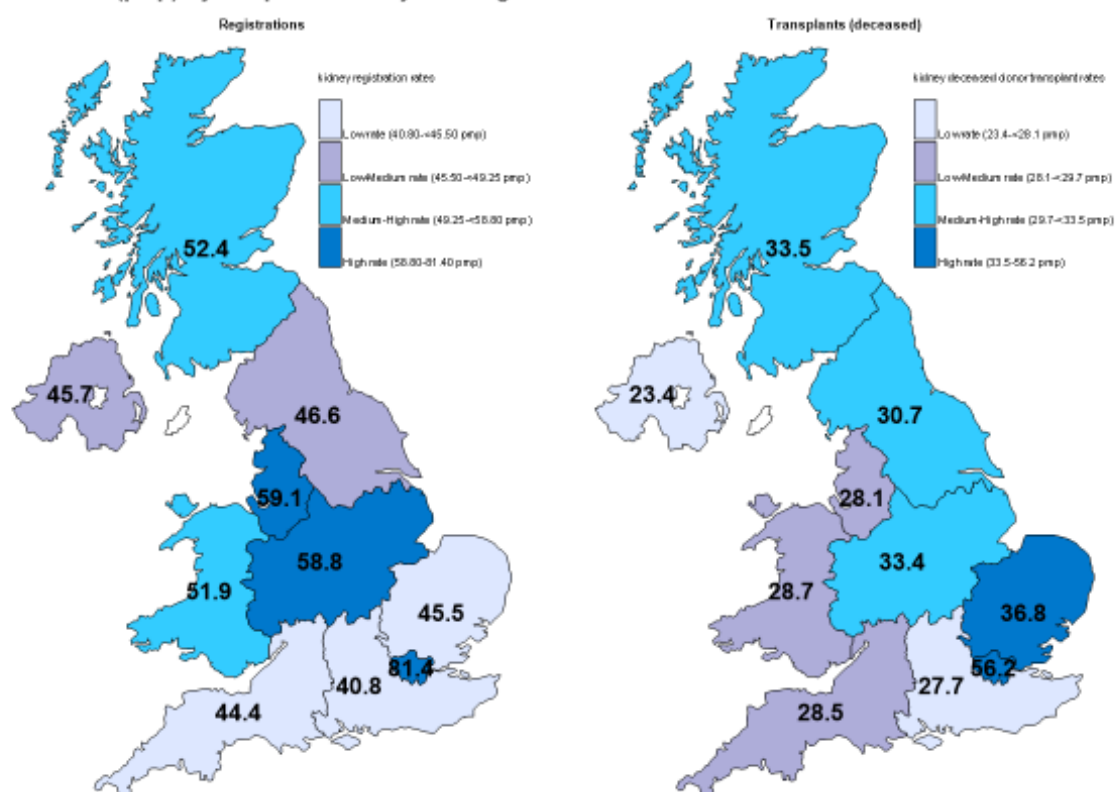


Figure 2.8 Living donor kidney transplant rates (pmp) by recipient country/NHS region of residence

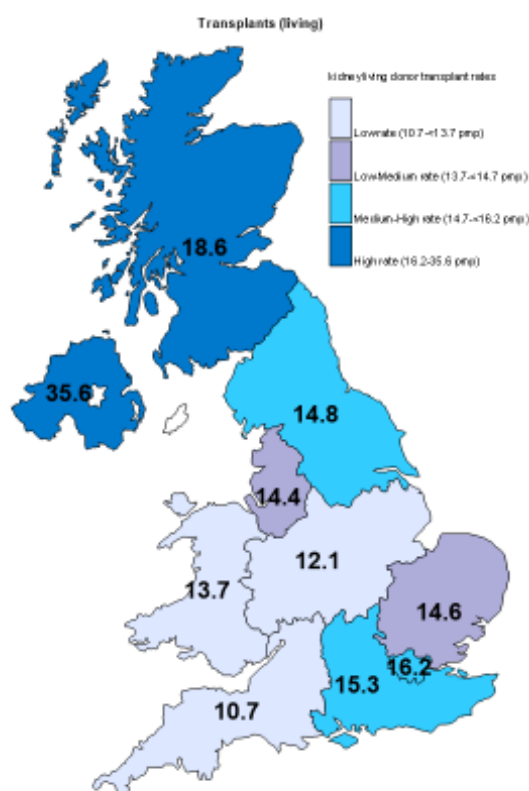


Table 2.2 Kidney registration and transplant rates per million population (pmp) in the UK, 1 April 2019 - 31 March 2020, by Country/NHS region

Country/ NHS region	Registrations (pmp)		Deceased Donor Transplants (pmp)		Living Donor Transplants (pmp)	
North East and Yorkshire	399	(46.6)	263	(30.7)	127	(14.8)
North West	414	(59.1)	197	(28.1)	101	(14.4)
Midlands	620	(58.8)	352	(33.4)	128	(12.1)
East of England	295	(45.5)	239	(36.8)	95	(14.6)
London	725	(81.4)	501	(56.2)	144	(16.2)
South East	361	(40.8)	245	(27.7)	135	(15.3)
South West	249	(44.4)	160	(28.5)	60	(10.7)
England	3063	(54.7)	1957	(35.0)	790	(14.1)
Isle of Man	3	(37.5)	1	(12.5)	2	(25.0)
Channel Islands	7	(43.8)	5	(31.3)	1	(6.3)
Wales	163	(51.9)	90	(28.7)	43	(13.7)
Scotland	285	(52.4)	182	(33.5)	101	(18.6)
Northern Ireland	86	(45.7)	44	(23.4)	67	(35.6)
TOTAL	3612¹	(54.4)	2280²	(34.3)	1004³	(15.1)

¹ Registrations include 5 recipients whose postcode was unknown and excludes 2 recipients who reside overseas

² Deceased donor transplants include 1 recipient whose postcode was unknown and excludes 3 recipients who reside overseas

³ Living donor transplants excludes 2 recipients who reside in the Republic of Ireland and 2 recipients who reside overseas

Adult kidney transplant list

3.1 Patients on the kidney transplant list as at 31 March, 2011 – 2019 and 29 February 2020

Figure 3.1 shows the number of adult patients on the kidney only [transplant list](#) at 31 March each year between 2011 and 2019 and at 29 February 2020. The number of patients actively waiting for a kidney transplant decreased from 6,504 in 2011 to 4,618 in 2020.

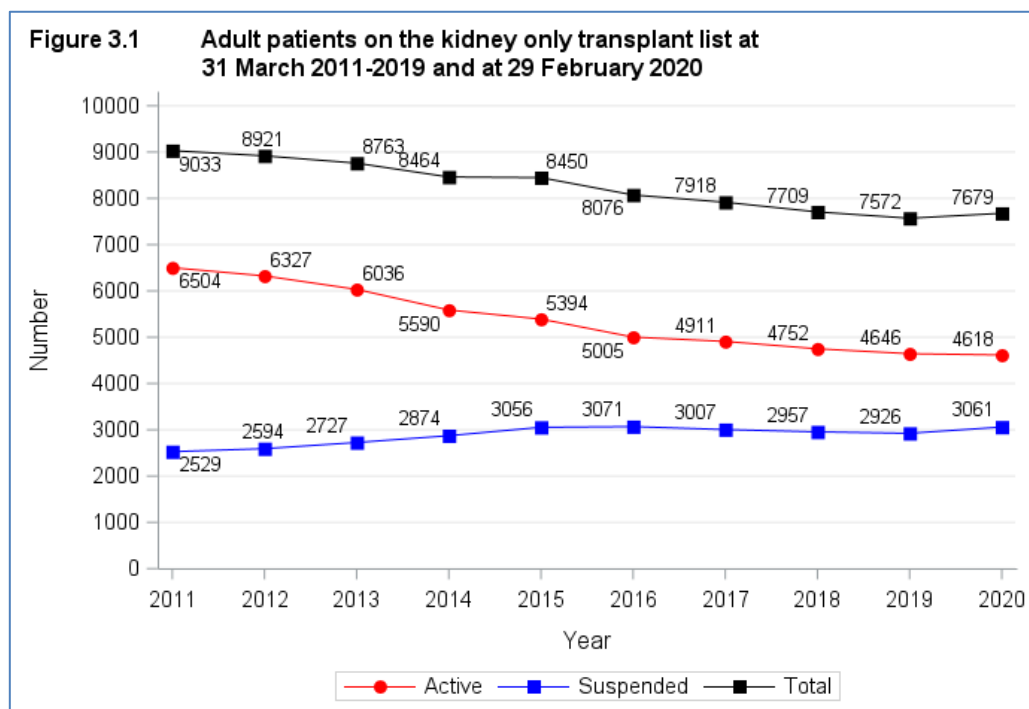


Figure 3.2 shows the number of adult patients on the active kidney only [transplant list](#) at 29 February 2020 by centre. In total, there were 4,618 adults patients. Manchester had the largest proportion of the [transplant list](#) (9%) and Belfast had the smallest (2%).

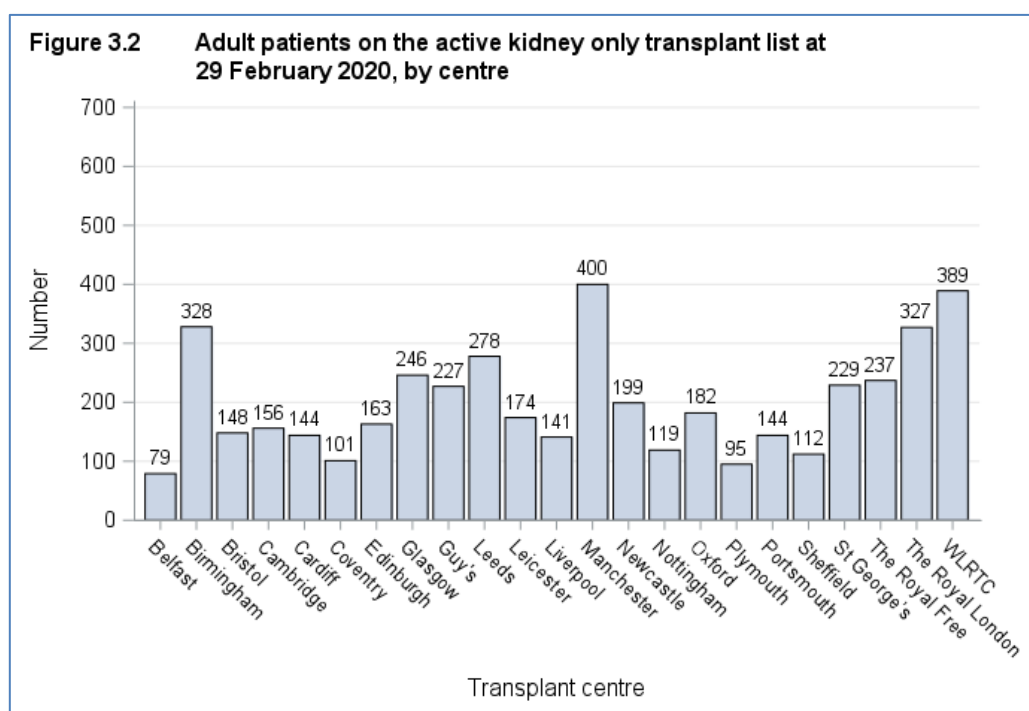


Figure 3.3 shows the number of adult patients on the suspended kidney only [transplant list](#) at 29 February 2020 by centre. In total, there were 3,061 adults patients. Manchester had the largest proportion of patients on the suspended [transplant list](#) (14%) and Plymouth had the smallest (1%).

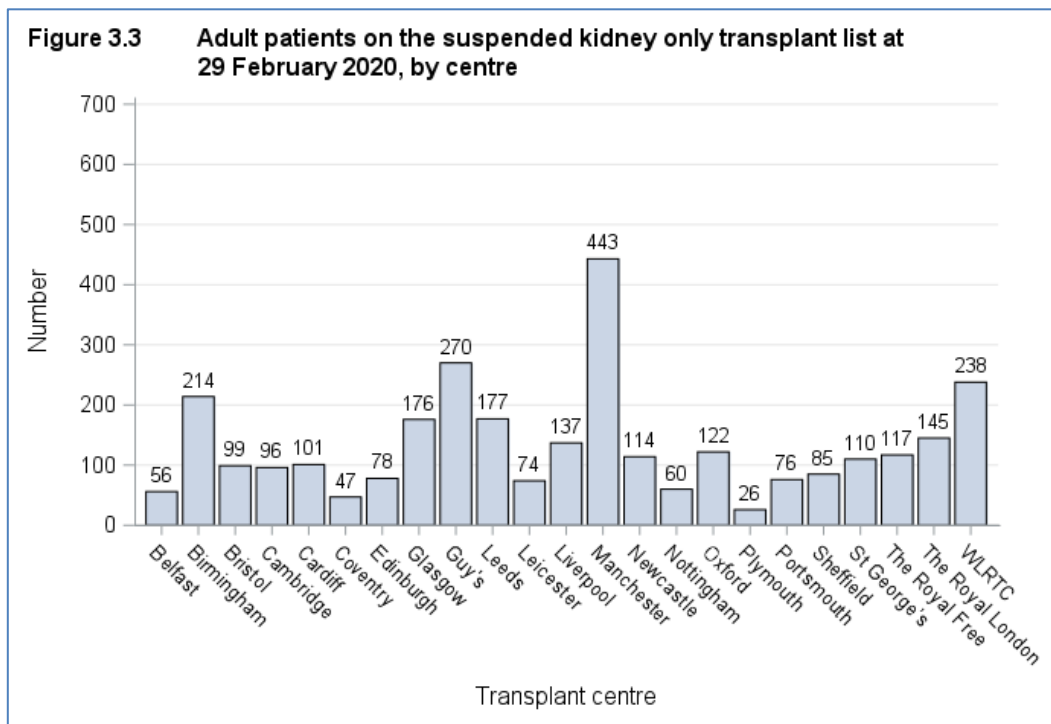
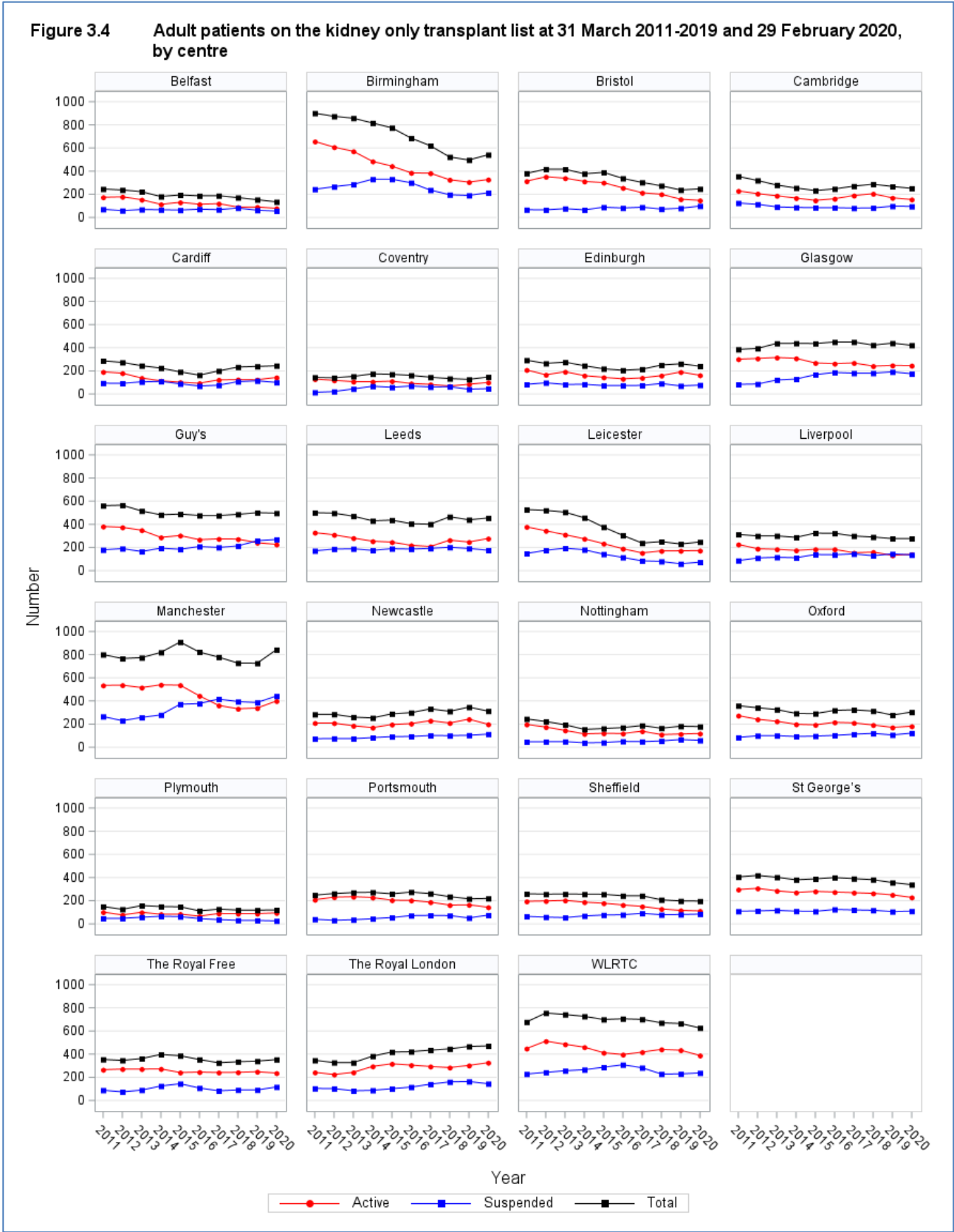


Figure 3.4 shows the number of adult patients on the [transplant list](#) at 31 March each year between 2011 and 2019 and 29 February 2020 for each transplant centre.



3.2 Post-registration outcomes, 1 April 2016 – 31 March 2017

An indication of outcomes for patients listed for a kidney transplant is summarised in **Figure 3.5**. This shows the proportion of patients transplanted or still waiting one and three years after joining the list. It also shows the proportion removed from the [transplant list](#) (typically because they become too unwell for transplant) and those dying while on the [transplant list](#). Only 34% of patients are transplanted within one year, while three years after listing 68% of patients have received a transplant.

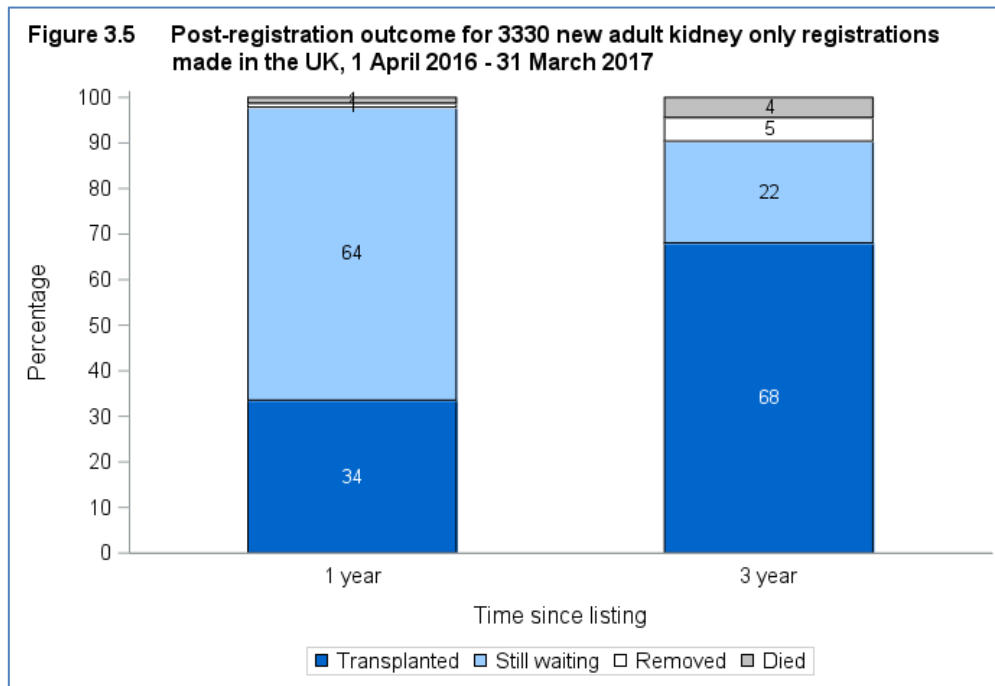
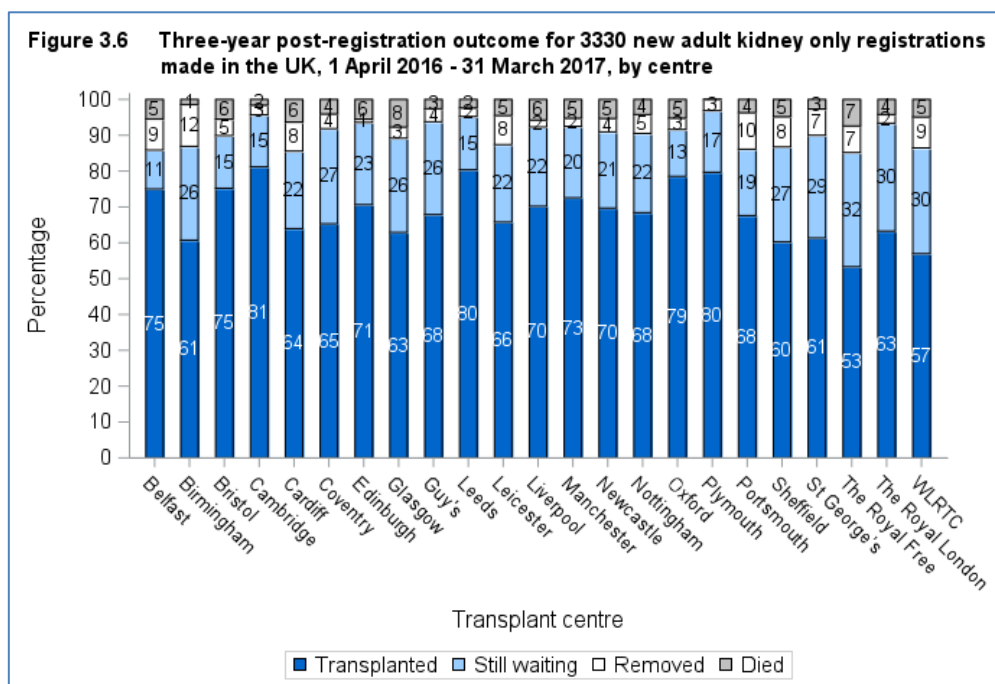


Figure 3.6 shows the proportion of patients transplanted or still waiting three years after joining the list by centre. The proportion of patients transplanted three years after listing at each centre ranges from 53% at The Royal Free to 81% at Cambridge. Higher proportions of transplanted patients can in part be attributed to strong [DCD](#) programmes within centres.



3.3 Demographic characteristics, 1 April 2019 – 31 March 2020

The sex, ethnicity, age group and primary renal disease of patients on the transplant list are shown by centre in **Figure 3.7, 3.8, 3.9** and **3.10**, respectively. Note that all percentages quoted are based only on data where relevant information was available. Data are not presented where the proportion of missing data was over 50%. Changes made to the Kidney Allocation Scheme in 2006, and the 2019 National Kidney Offering Scheme mean that tissue matching criteria between donor and recipient are less strict than previously and waiting time to transplant is now more important than it was in deciding kidney allocation. These changes have an indirect benefit for patients from ethnic minority groups, who are less often a good tissue match with the predominantly white donor pool. As a result, access to transplantation is becoming more equitable.

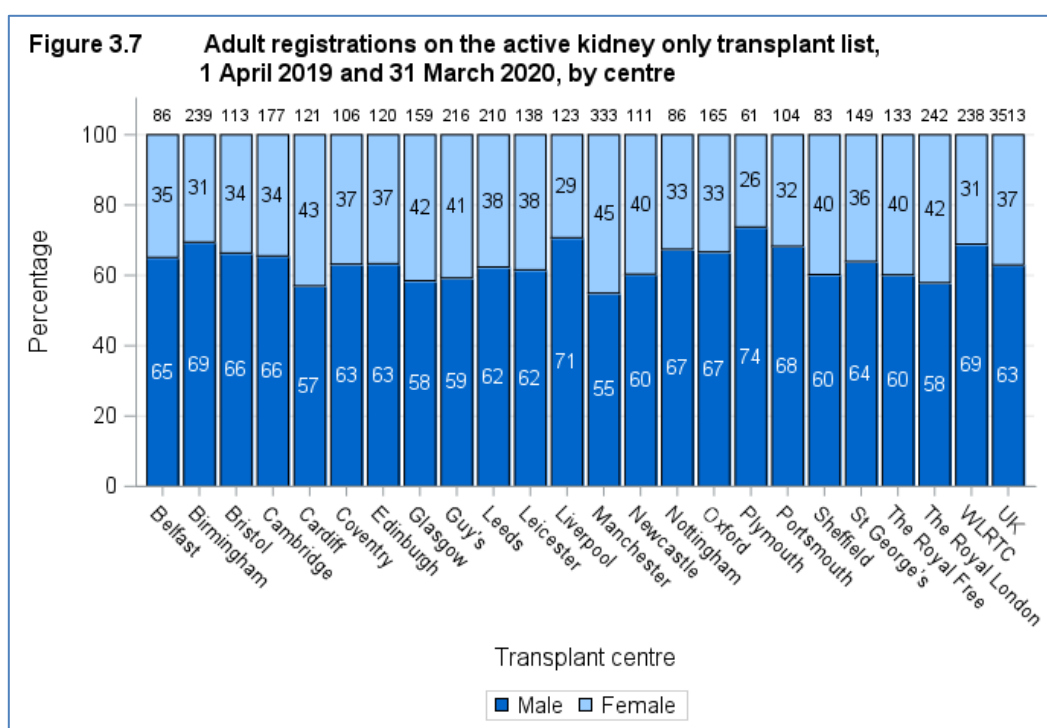


Figure 3.8 Adult registrations on the active kidney only transplant list, 1 April 2019 and 31 March 2020, by centre

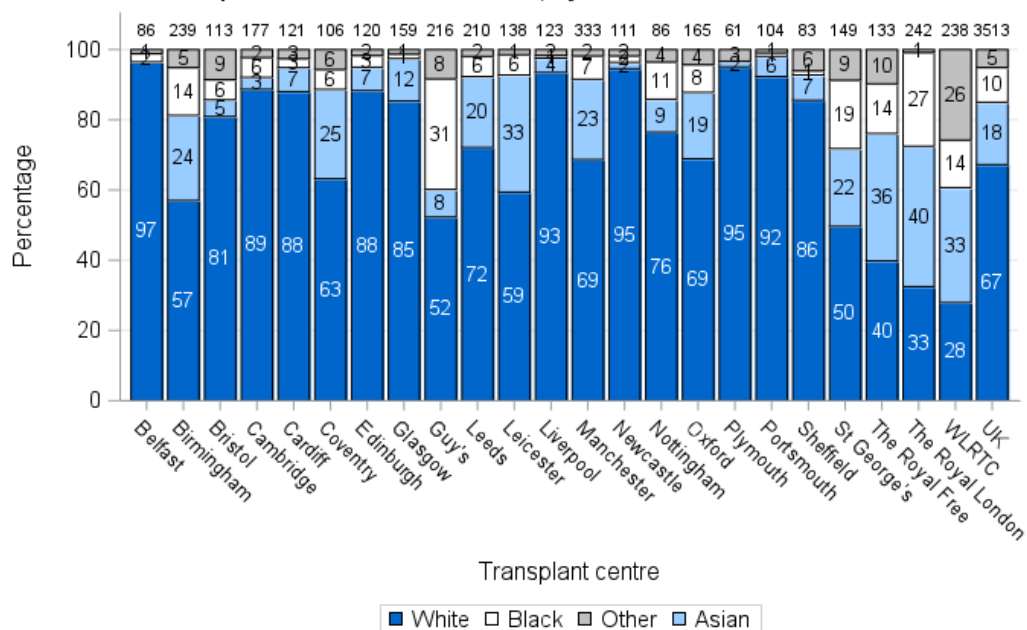
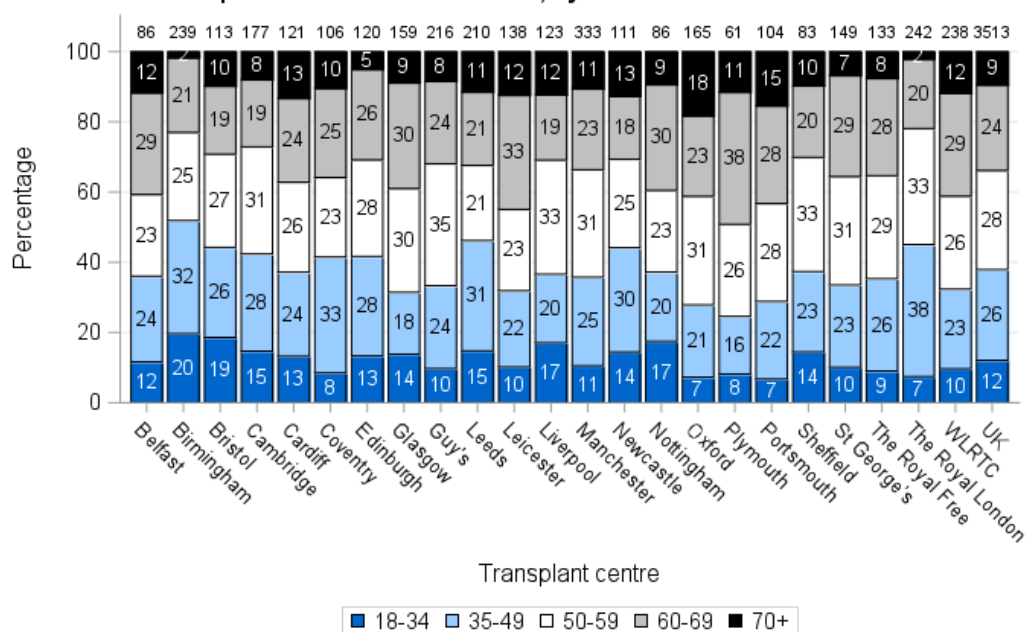
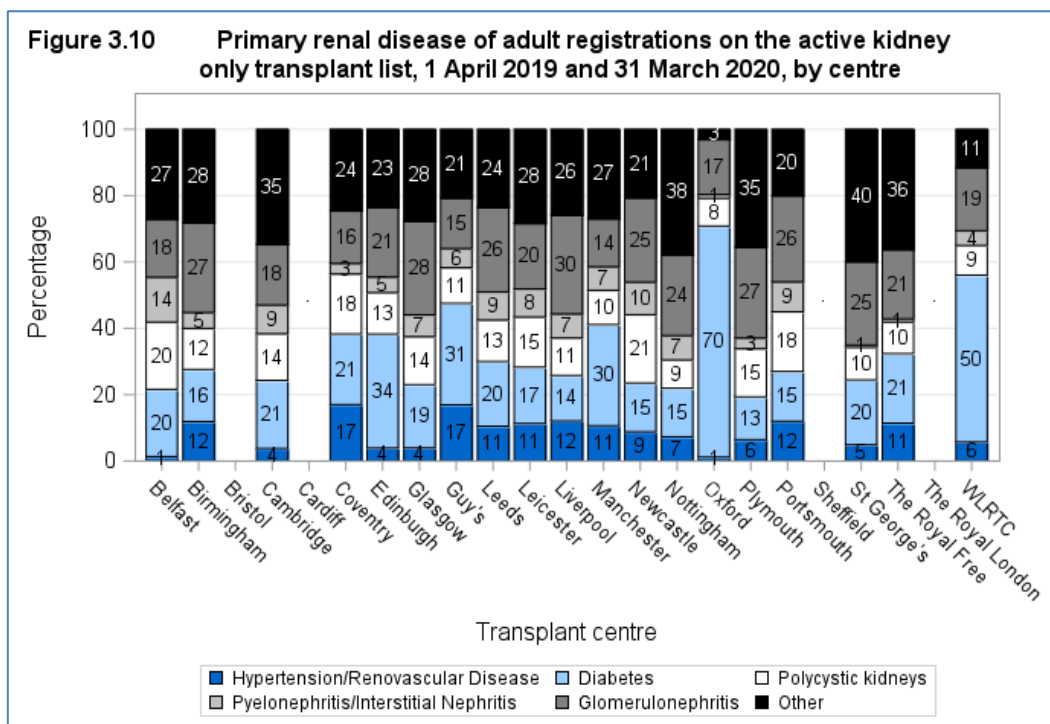


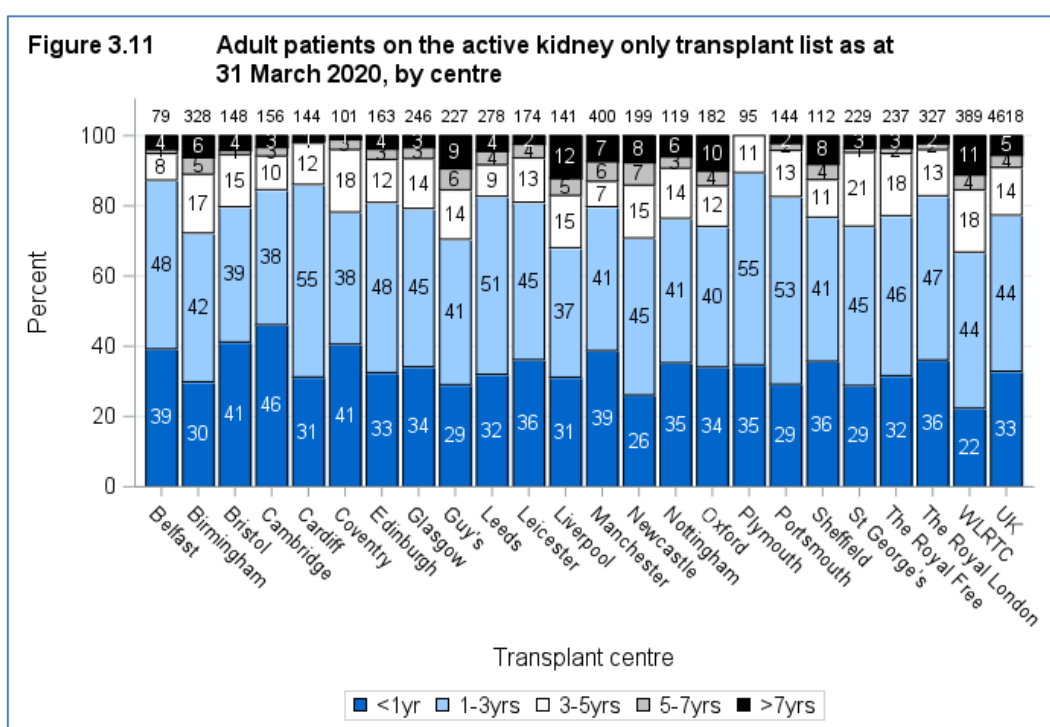
Figure 3.9 Adult registrations on the active kidney only transplant list, 1 April 2019 and 31 March 2020, by centre





3.4 Patient waiting times for those currently on the list, 31 March 2020

Figure 3.11 shows the length of time patients have been waiting on the kidney only [transplant list](#) at 31 March 2020 by centre. A small proportion of patients have been waiting for a transplant for more than seven years, 99% of these are highly sensitised with a calculated reaction frequency (cRF) of 85% or higher. Of those waiting for more than seven years, 91% have a cRF of 100% which makes these patients very difficult to match.



3.5 Median waiting time to transplant, 1 April 2014 – 31 March 2017

The length of time a patient waits for a kidney transplant varies across the UK. The [median](#) waiting time for adult deceased donor kidney only transplantation is shown in **Figure 3.12** and **Table 3.1** for patients registered at each individual unit. Risk-adjusted median waiting time to adult deceased donor kidney only transplantation is shown in **Figure 3.13** and **Table 3.1**. The data shown are for all adult patients, joining the list within the time period shown, including those still awaiting a transplant on the day of analysis. Active waiting time only is taken into account. Patients who received a [live donor](#) or [multi-organ transplant](#) are not included. The national allocation scheme introduced in April 2006 helped to reduce the variability in deceased donor kidney waiting times across the country but currently some variability remains. Waiting times across centres continue to differ in a way that it is difficult for centres to control, given that the 2006 [National Kidney Allocation Scheme](#) determined allocation of all kidneys available for transplant from donors after brain death (DBD). This has continued following the introductions of the 2019 National Kidney Offering Scheme which determines allocation of all DBD kidneys and kidneys from donations after circulatory death (DCD).

2006 National Kidney Allocation Scheme

Only kidneys from donors after brain death were allocated via a national allocation scheme during the majority of the time period analysed. DCD kidneys were allocated to patients through local allocation arrangements and these vary across the country because some centres have a larger DCD programme than others. From 3 September 2014 one kidney from DCD donors aged between 5 and 49 years were allocated within four pre-defined regions using the 2006 DBD allocation principles and as such should reduce variability in waiting times across the country.

Kidneys from DBD are allocated to patients listed nationally through the 2006 Kidney Allocation Scheme. The 2006 Kidney Allocation Scheme introduced in April 2006 prioritised patients with ideal tissue matches (000 HLA mismatches) and then assigned points to patients based on the level of tissue match between donor and recipient, the length of time spent waiting for a transplant, age of the recipient (with a progressive reduction in points given after the age of thirty) and location points such that patients geographically close to the retrieval centre received more points. The patients with the highest number of points for a donated kidney were preferentially offered the kidney, no matter where in the UK they received their treatment.

2019 National Kidney Offering Scheme

The 2019 Kidney Offering Scheme was introduced on 11 September 2019 and this is a single scheme for offering all kidneys from deceased donors in the UK. This scheme prioritises patients who are difficult to match or have waited a long time for a transplant

We present a visual comparison of median waiting time to transplant 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 waiting times of the different transplant units are with the national rate accounting for different patient mix within centres. [Funnel plots](#) show the [risk-adjusted median waiting time to transplant](#) plotted against the number of patients registered at each centre, with the overall national [unadjusted waiting time to transplant](#) (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.

Interpreting the [funnel plots](#)

If a centre lies within all the limits, then that centre has a median waiting time to transplant 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 median waiting time to transplant 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 median waiting time to transplant that is higher than the national rate, while a centre that lies below the lower limits has a median waiting time to transplant 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 median waiting time to transplant 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.

The [median](#) waiting time to transplant for adult patients registered on the kidney only [transplant list](#) between 1 April 2014 and 31 March 2017 is 603 days. This ranged from 356 days at Leeds to 863 days at Sheffield.

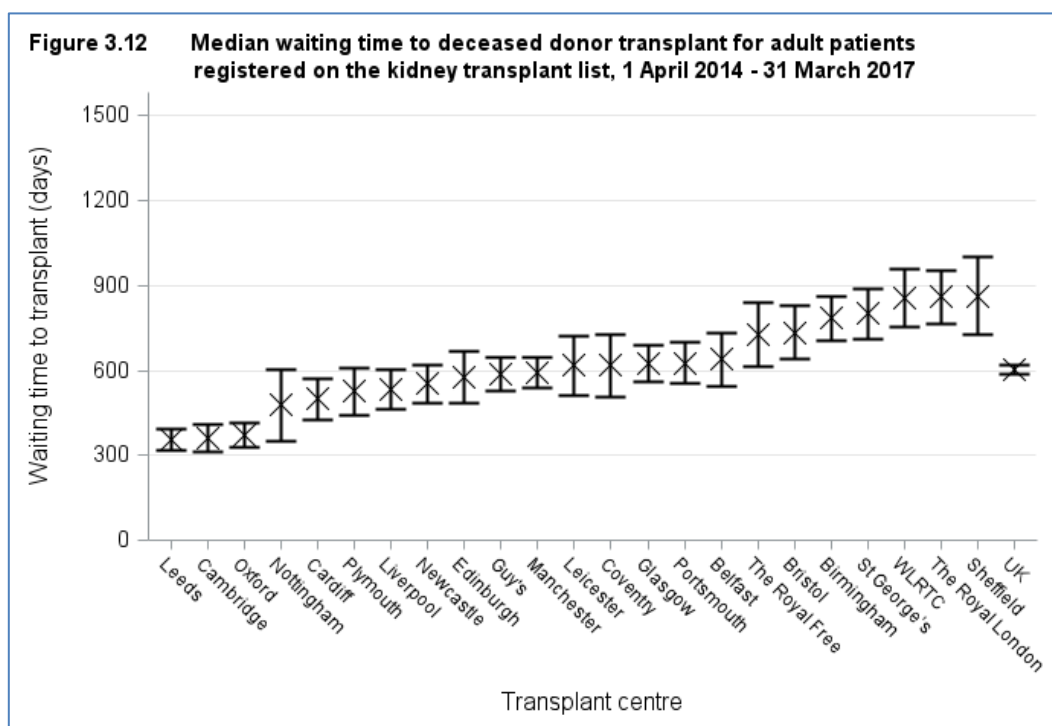
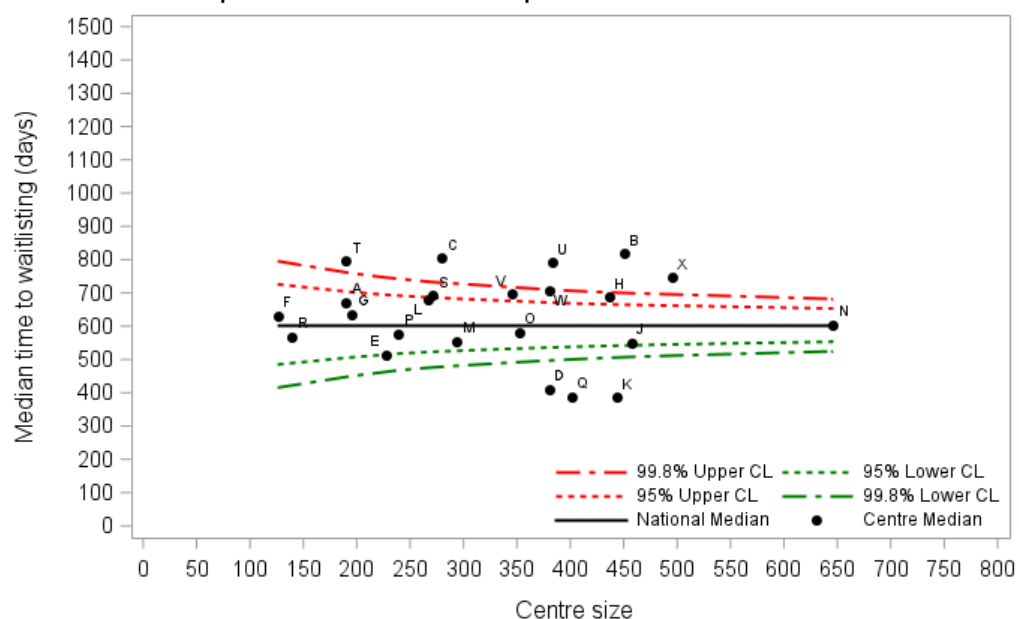


Figure 3.13 Adult risk-adjusted median waiting times
for patients listed between 1 April 2014 and March 31st 2017

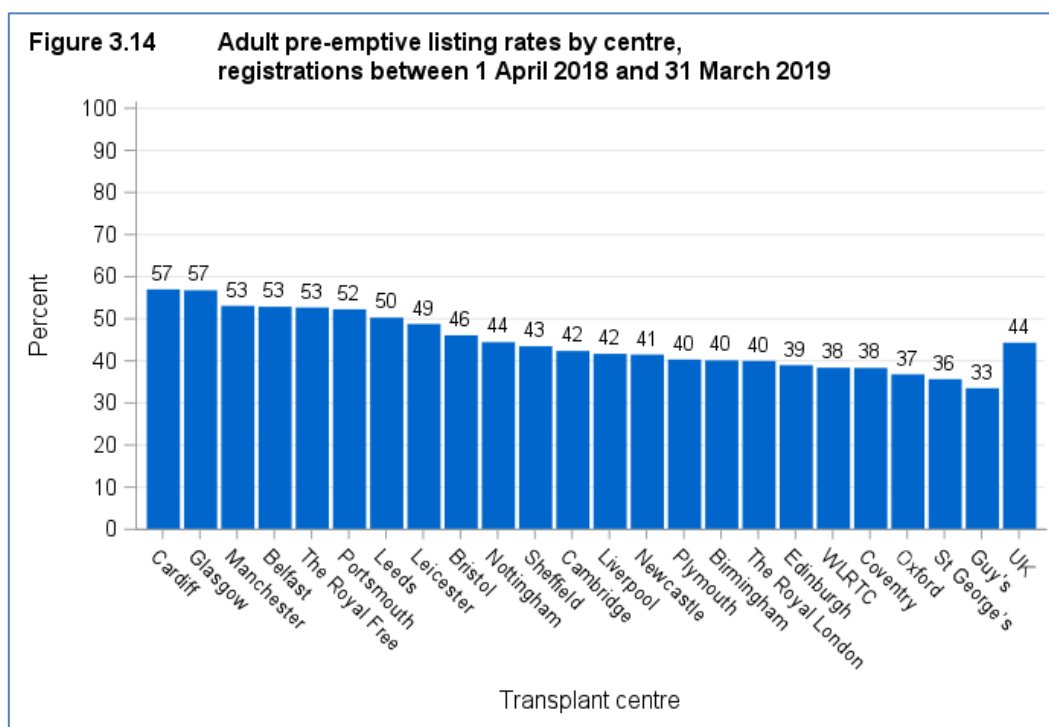


**Table 3.1 Median waiting time to kidney only transplant in the UK,
for adult patients registered 1 April 2014 - 31 March 2017**

Transplant centre	Code	Number of patients registered	Unadjusted Median	Waiting time (days) 95% Confidence interval	Risk-adjusted Median
Adult					
Leeds	K	449	356	318 - 394	386
Cambridge	D	386	360	312 - 408	411
Oxford	Q	407	373	330 - 416	388
Nottingham	P	241	478	353 - 603	578
Cardiff	E	237	499	427 - 571	513
Plymouth	R	141	526	442 - 610	569
Liverpool	M	296	535	465 - 605	553
Newcastle	O	357	554	487 - 621	582
Edinburgh	G	198	576	487 - 665	637
Guy's	J	463	588	530 - 646	551
Manchester	N	650	592	539 - 645	605
Leicester	L	278	617	512 - 722	679
Coventry	F	126	617	506 - 728	629
Glasgow	H	445	622	558 - 686	689
Portsmouth	S	272	625	553 - 697	694
Belfast	A	192	638	543 - 733	670
The Royal Free	V	346	727	616 - 838	699
Bristol	C	280	733	640 - 826	806
Birmingham	B	453	784	705 - 863	820
St George's	U	389	800	711 - 889	794
WLRTC	X	498	853	751 - 955	749
The Royal London	W	390	860	766 - 954	707
Sheffield	T	196	863	726 - 1000	796
UK		7690	603	587 - 619	

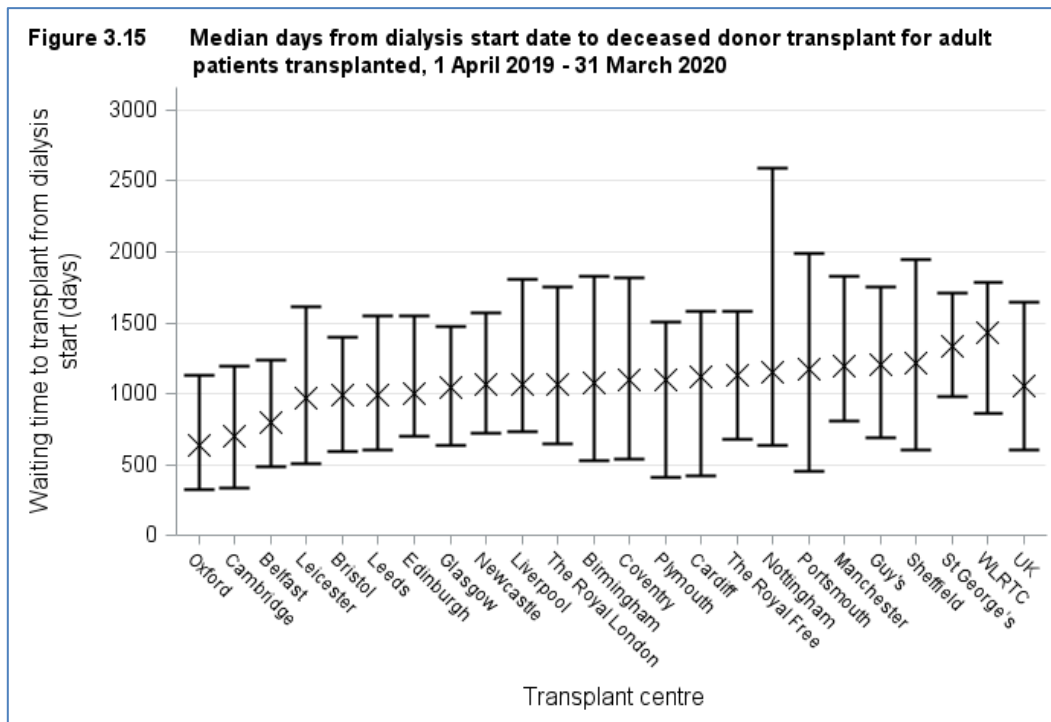
3.6 Pre-emptive listing rates, 1 April 2018 - 31 March 2019

Rates of [pre-emptive](#) kidney only listings are shown in **Figure 3.14** for adult patients joining the list between 1 April 2018 and 31 March 2019. Patients listed on the deceased donor [transplant list](#) prior to receiving a living donor transplant are excluded and in order to remove the effect of these patients an earlier cohort was selected. [Pre-emptive](#) listing accounted for 44% of all adult registrations across the UK ranging from 57% at Cardiff and Glasgow to 33% at Guy's.



3.7 Median time from start of dialysis to transplant, 1 April 2019 - 31 March 2020

The median time from dialysis start date to deceased donor transplant for adult patients transplanted between 1 April 2019 and 31 March 2020 is shown in **Figure 3.15**. The [median](#) time is 1060 days. This ranged from 637 days at Oxford to 1436 days at WLRTC.



Response to adult kidney offers

Offer decline rates

Kidney-only offers from [DBD](#) and [DCD](#) donors who had at least one kidney retrieved, offered directly and on behalf of a named individual patient and resulted in transplantation are included in the analysis. Any offers made through the reallocation of kidneys, declined kidney or fast track schemes were excluded. Only offers through the [DCD](#) kidney allocation scheme are presented, all local [DCD](#) offers are excluded.

In order to understand centre practices more fully, data are presented separately for [DBD](#) and [DCD](#) standard and extended criteria donors (SCD & ECD). ECD have been defined as donors aged ≥ 60 years at the time of death OR aged 50 to 59 years with at least two or three donor characteristics: hypertension, creatinine $> 130 \mu\text{mol/l}$ or death due to intracranial haemorrhage. SCD are donors that did not meet the ECD criteria.

[Funnel plots](#) were used to compare centre specific offer decline rates and indicate how consistent the rates of the individual transplant centres are with the national rate. The overall national unadjusted offer decline rate is shown by the solid line while the 95% and 99.8% confidence lines are indicated via a thin and thick dotted line, respectively. Each dot in the plot represents an individual transplant centre. Centres that are positioned above the upper limits indicate an offer decline rate that is higher than the national rate, while centres positioned below the lower limits indicate an offer decline rate that is lower than the national rate. Patient [case mix](#) is known to influence the number of offers a centre may receive. In this analysis however only individual offers for named patients were considered which excluded any [ABO](#)- and HLA-incompatible patients. For this reason it was decided not to risk adjust for known centre differences in patient [case mix](#).

4.1 DBD Standard criteria offer decline rates, 1 April 2017 – 31 March 2020

Figure 4.1 compares individual centre offer decline rates with the national rate for SCD over the time period, 1 April 2017 and 31 March 2020. Centres can be identified by the information shown in **Table 4.1**.

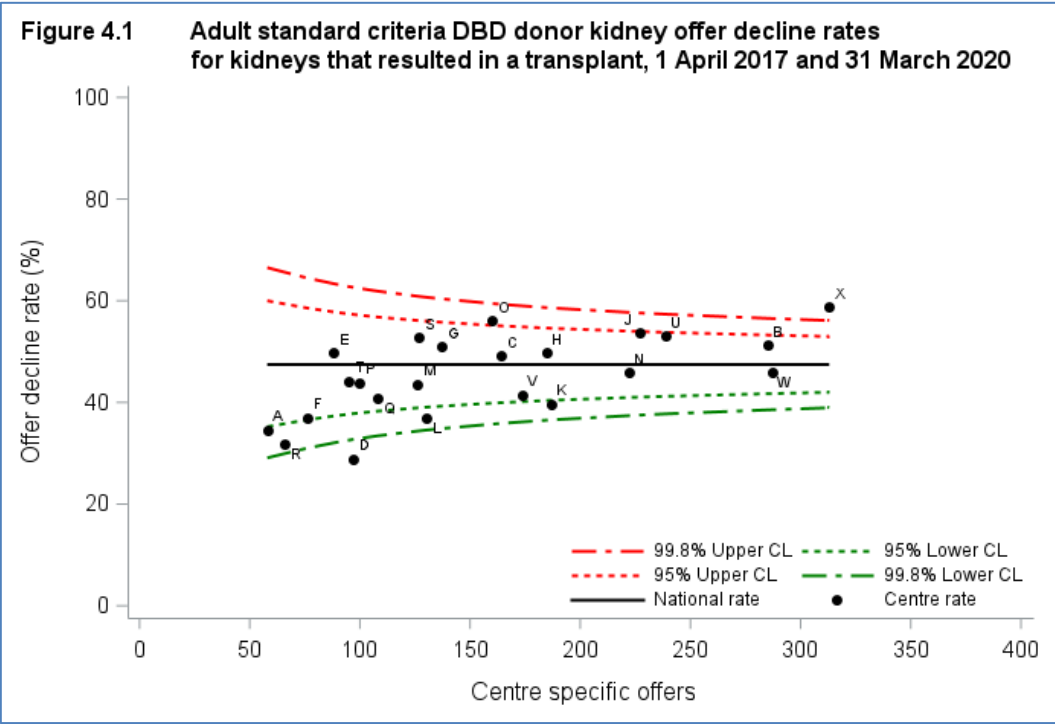


Table 4.1 compares individual centre offer decline rates for SCD over time by financial year. Belfast, Cambridge, Plymouth and Sheffield have shown improvements in their SCD offer decline rates over time.

Table 4.1 Adult standard criteria DBD donor kidney offer decline rates by transplant centre, 1 April 2017 and 31 March 2020									
Centre	Code	2017/18		2018/19		2019/20		Overall	
		N	(%)	N	(%)	N	(%)	N	(%)
Belfast	A	24	(38)	17	(53)	17	(12)	58	(34)
Birmingham	B	96	(51)	77	(43)	112	(57)	285	(51)
Bristol	C	61	(56)	55	(42)	48	(50)	164	(49)
Cambridge	D	36	(36)	31	(29)	30	(20)	97	(29)
Cardiff	E	22	(55)	35	(49)	31	(48)	88	(50)
Coventry	F	22	(23)	28	(25)	26	(62)	76	(37)
Edinburgh	G	44	(48)	47	(55)	46	(50)	137	(51)
Glasgow	H	63	(43)	58	(52)	64	(55)	185	(50)
Guy's	J	71	(59)	86	(51)	70	(51)	227	(54)
Leeds	K	47	(38)	78	(42)	62	(37)	187	(40)
Leicester	L	43	(42)	37	(27)	50	(40)	130	(37)
Liverpool	M	36	(33)	43	(42)	47	(53)	126	(44)
Manchester	N	70	(40)	70	(51)	82	(46)	222	(46)
Newcastle	O	47	(55)	60	(60)	53	(53)	160	(56)
Nottingham	P	32	(28)	26	(54)	42	(50)	100	(44)
Oxford	Q	38	(32)	41	(46)	29	(45)	108	(41)
Plymouth	R	23	(39)	23	(30)	20	(25)	66	(32)
Portsmouth	S	48	(56)	40	(45)	39	(56)	127	(53)
Sheffield	T	36	(53)	31	(45)	28	(32)	95	(44)
St George's	U	76	(54)	70	(49)	93	(56)	239	(53)
The Royal Free	V	58	(31)	47	(38)	69	(52)	174	(41)
The Royal London	W	86	(49)	104	(41)	97	(48)	287	(46)
WLRTC	X	107	(53)	96	(60)	110	(63)	313	(59)
UK		1186	(46)	1200	(46)	1265	(50)	3651	(47)
		Centre has reached the upper 99.8% confidence limit							
		Centre has reached the upper 95% confidence limit							
		Centre has reached the lower 95% confidence limit							
		Centre has reached the lower 99.8% confidence limit							

4.2 DBD Extended criteria offer decline rates, 1 April 2017 – 31 March 2020

Figure 4.2 compares individual centre offer decline rates with the national rate for ECD over the time period, 1 April 2017 and 31 March 2020. Centres can be identified by the information shown in **Table 4.2**.

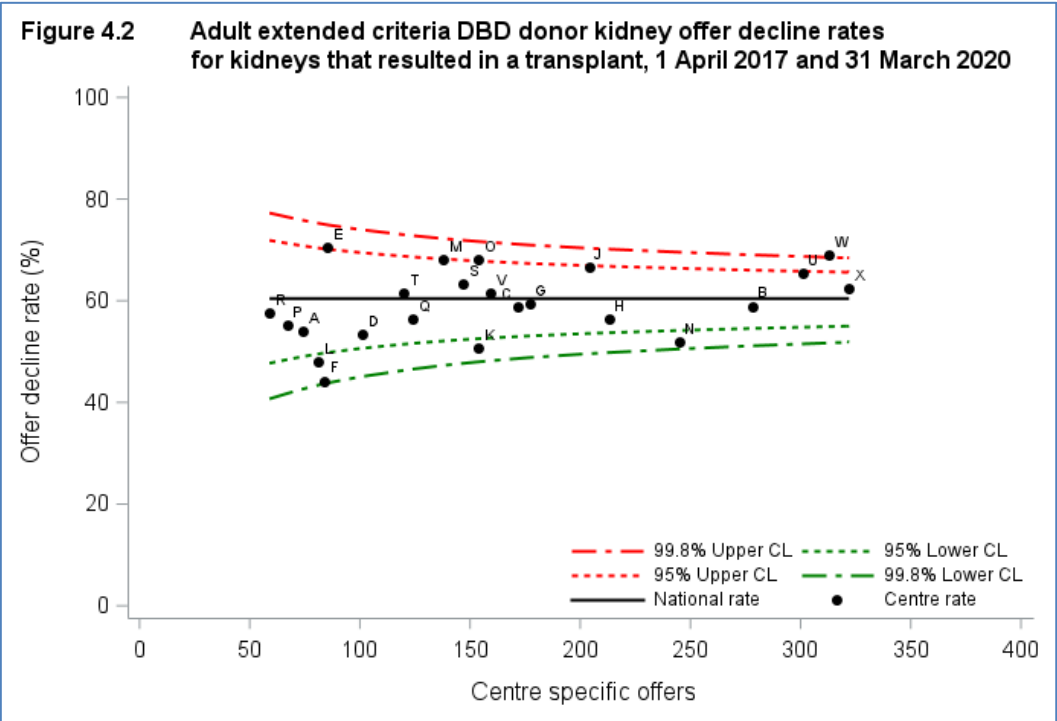


Table 4.2 compares individual centre offer decline rates for ECD over time by financial year. Cardiff, Oxford, Plymouth, St George's and The Royal London have shown improvements in their ECD offer decline rate over time.

Table 4.2 Adult extended criteria DBD donor kidney offer decline rates by transplant centre, 1 April 2017 and 31 March 2020									
Centre	Code	2017/18		2018/19		2019/20		Overall	
		N	(%)	N	(%)	N	(%)	N	(%)
Belfast	A	32	(44)	25	(64)	17	(59)	74	(54)
Birmingham	B	102	(49)	89	(64)	87	(66)	278	(59)
Bristol	C	72	(71)	58	(50)	42	(50)	172	(59)
Cambridge	D	32	(56)	39	(54)	30	(50)	101	(53)
Cardiff	E	28	(79)	35	(69)	22	(64)	85	(71)
Coventry	F	29	(34)	19	(53)	36	(47)	84	(44)
Edinburgh	G	55	(56)	67	(61)	56	(61)	178	(60)
Glasgow	H	96	(56)	71	(63)	46	(46)	213	(56)
Guy's	J	69	(59)	87	(75)	47	(62)	203	(67)
Leeds	K	56	(54)	57	(47)	41	(51)	154	(51)
Leicester	L	28	(46)	33	(42)	20	(60)	81	(48)
Liverpool	M	42	(74)	56	(68)	40	(63)	138	(68)
Manchester	N	83	(42)	91	(58)	71	(56)	245	(52)
Newcastle	O	36	(64)	65	(74)	53	(64)	154	(68)
Nottingham	P	24	(46)	23	(43)	20	(80)	67	(55)
Oxford	Q	53	(60)	42	(55)	29	(52)	124	(56)
Plymouth	R	17	(65)	26	(58)	16	(50)	59	(58)
Portsmouth	S	60	(65)	49	(61)	38	(63)	147	(63)
Sheffield	T	36	(61)	54	(69)	31	(52)	121	(62)
St George's	U	103	(72)	110	(70)	88	(52)	301	(65)
The Royal Free	V	74	(62)	41	(63)	44	(59)	159	(62)
The Royal London	W	96	(73)	128	(74)	89	(57)	313	(69)
WLRTC	X	114	(69)	103	(62)	105	(55)	322	(62)
UK		1337	(60)	1368	(63)	1068	(57)	3773	(60)
		Centre has reached the upper 99.8% confidence limit							
		Centre has reached the upper 95% confidence limit							
		Centre has reached the lower 95% confidence limit							
		Centre has reached the lower 99.8% confidence limit							

4.3 DCD Standard criteria offer decline rates, 1 April 2017 – 31 March 2020

Figure 4.3 compares individual centre offer decline rates with the national rate for SCD over the time period, 1 April 2017 and 31 March 2020. Centres can be identified by the information shown in **Table 4.3**.

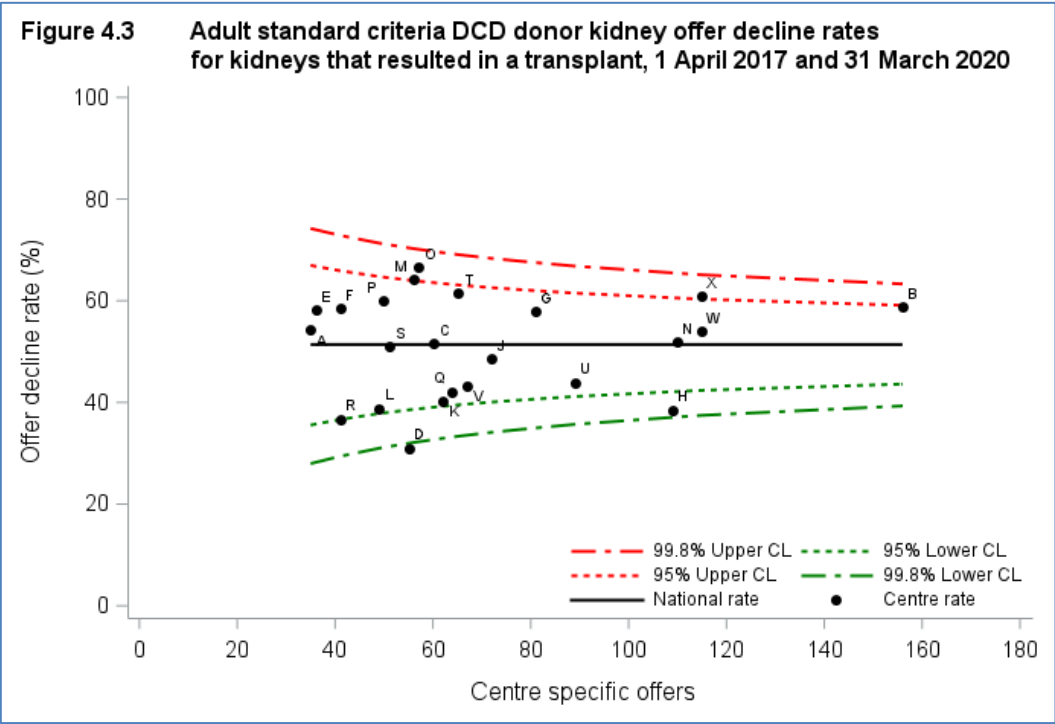


Table 4.3 compares individual centre offer decline rates for SCD over time by financial year.

Table 4.3 Adult standard criteria DCD donor kidney offer decline rates by transplant centre, 1 April 2017 and 31 March 2020									
Centre	Code	2017/18		2018/19		2019/20		Overall	
		N	(%)	N	(%)	N	(%)	N	(%)
Belfast	A	20	(60)	3	(0)	12	(58)	35	(54)
Birmingham	B	38	(45)	34	(47)	84	(70)	156	(59)
Bristol	C	19	(47)	24	(58)	17	(47)	60	(52)
Cambridge	D	14	(21)	24	(33)	17	(35)	55	(31)
Cardiff	E	11	(64)	13	(38)	12	(75)	36	(58)
Coventry	F	9	(56)	10	(40)	22	(68)	41	(59)
Edinburgh	G	22	(55)	23	(70)	36	(53)	81	(58)
Glasgow	H	35	(37)	30	(40)	44	(39)	109	(39)
Guy's	J	13	(62)	25	(36)	34	(53)	72	(49)
Leeds	K	17	(35)	15	(33)	30	(47)	62	(40)
Leicester	L	8	(50)	11	(18)	30	(43)	49	(39)
Liverpool	M	8	(38)	19	(53)	29	(79)	56	(64)
Manchester	N	33	(36)	17	(59)	60	(58)	110	(52)
Newcastle	O	14	(64)	15	(67)	28	(68)	57	(67)
Nottingham	P	16	(44)	10	(50)	24	(75)	50	(60)
Oxford	Q	23	(48)	15	(13)	26	(54)	64	(42)
Plymouth	R	12	(33)	17	(29)	12	(50)	41	(37)
Portsmouth	S	18	(50)	18	(56)	15	(47)	51	(51)
Sheffield	T	23	(57)	13	(77)	29	(59)	65	(62)
St George's	U	24	(46)	40	(28)	25	(68)	89	(44)
The Royal Free	V	17	(47)	17	(29)	33	(48)	67	(43)
The Royal London	W	22	(41)	41	(44)	52	(67)	115	(54)
WLRTC	X	26	(62)	35	(57)	54	(63)	115	(61)
UK		442	(47)	469	(44)	725	(59)	1636	(51)
		Centre has reached the upper 99.8% confidence limit							
		Centre has reached the upper 95% confidence limit							
		Centre has reached the lower 95% confidence limit							
		Centre has reached the lower 99.8% confidence limit							

4.4 Reallocation of kidneys, 1 April 2017 – 31 March 2020

Between 3 April 2006 and 11 September 2019 all kidneys from donation after brain death (DBD) donors have been allocated through the 2006 National Kidney Allocation Scheme. There are however certain situations when a kidney can be reallocated to an alternative patient of the centre's choice. This occurs when the kidney is accepted and dispatched to a named patient but is subsequently declined and there are no other patients listed nationally who fall within Tiers A to D of the kidney allocation scheme (000 mismatched adult and paediatric patients or favourably matched paediatric patients).

In this situation the centre in receipt of the kidney can reallocate the organ to a locally listed patient of their choice based on an individual centre matching run.

Since 11 September 2019 all kidneys from deceased donors have been allocated through the 2019 National Kidney Offering Scheme. In a similar fashion to the 2006 scheme, if a kidney needs to be reallocated because the patient for whom the kidney has been accepted cannot subsequently receive the transplant then the kidney can be reallocated to an alternative patient of the centre's choice if the kidney has been dispatched to the transplant centre and there are no suitable patients in Tier A.

[Funnel plots](#) were used to compare centre specific reallocation rates and indicate how consistent the rates of the individual transplant centres are with the national rate. The overall national reallocation rate is shown by the solid line while the 95% and 99.8% confidence lines are indicated via a thin and thick dotted line, respectively. Each dot in the plot represents an individual transplant centre. Centres that are positioned above the upper limits indicate a reallocation rate that is higher than the national rate, while centres positioned below the lower limits indicates a reallocation rate that is lower than the national rate.

Figure 4.4 compares individual centre reallocation rates with the national rate over the time period, 1 April 2017 and 31 March 2020. Centres can be identified by the information shown in **Table 4.4**. Nationally 3% of all [DBD](#) kidney only transplants used kidneys that had been reallocated.

Figure 4.4

Local reallocation of DBD donor kidneys following an acceptance of an adult offer through the national allocation scheme

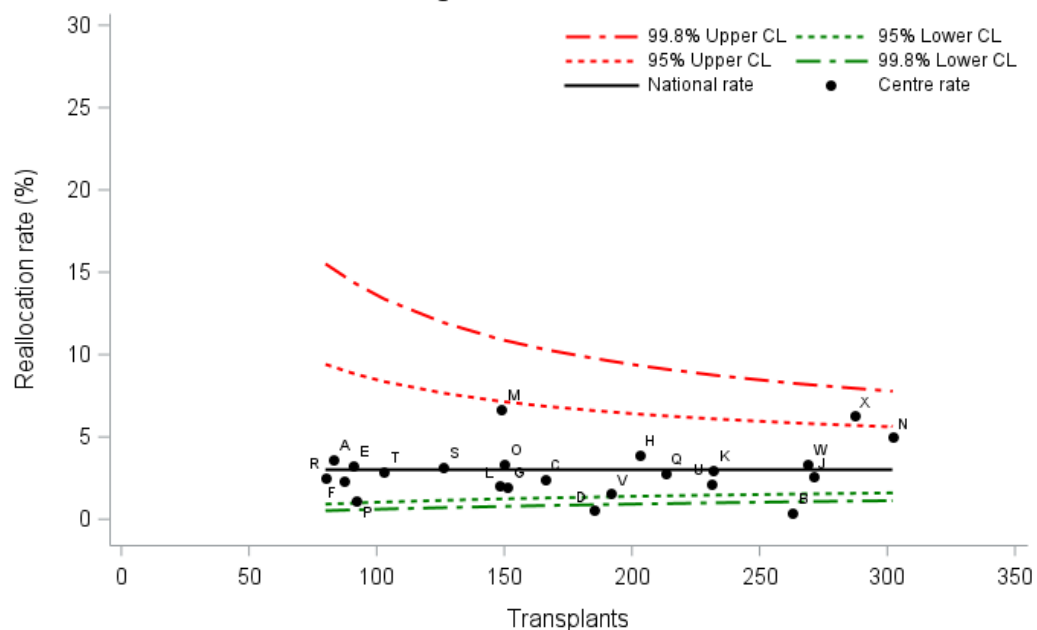


Table 4.4 compares individual reallocation rates over time by financial year.

Table 4.4 Local reallocation of DBD donor kidneys following an acceptance of an adult offer through the national allocation scheme								
Centre	Code	2017/18		2018/19		2019/20		Overall
		N	(%)	N	(%)	N	(%)	N (%)
Belfast	A	38	(3)	20	(10)	25	(0)	83 (4)
Birmingham	B	101	(0)	79	(1)	83	(0)	263 (0)
Bristol	C	55	(5)	62	(0)	49	(2)	166 (2)
Cambridge	D	55	(0)	66	(2)	64	(0)	185 (1)
Cardiff	E	20	(5)	37	(3)	34	(3)	91 (3)
Coventry	F	39	(5)	23	(0)	25	(0)	87 (2)
Edinburgh	G	48	(0)	53	(4)	50	(2)	151 (2)
Glasgow	H	80	(3)	60	(7)	63	(3)	203 (4)
Guy's	J	90	(1)	93	(1)	88	(6)	271 (3)
Leeds	K	70	(6)	88	(2)	74	(1)	232 (3)
Leicester	L	43	(2)	57	(0)	48	(4)	148 (2)
Liverpool	M	47	(2)	54	(7)	48	(10)	149 (7)
Manchester	N	110	(3)	103	(7)	89	(6)	302 (5)
Newcastle	O	45	(4)	51	(2)	54	(4)	150 (3)
Nottingham	P	39	(3)	25	(0)	28	(0)	92 (1)
Oxford	Q	80	(1)	78	(4)	55	(4)	213 (3)
Plymouth	R	23	(4)	30	(3)	27	(0)	80 (3)
Portsmouth	S	46	(4)	43	(5)	37	(0)	126 (3)
Sheffield	T	33	(3)	35	(3)	35	(3)	103 (3)
St George's	U	70	(6)	72	(0)	89	(1)	231 (2)
The Royal Free	V	82	(0)	56	(4)	54	(2)	192 (2)
The Royal London	W	68	(0)	100	(5)	101	(4)	269 (3)
WLRTC	X	97	(5)	84	(8)	106	(6)	287 (6)
UK		1379	(3)	1369	(3)	1326	(3)	4074 (3)
		Centre has reached the upper 99.8% confidence limit						
		Centre has reached the upper 95% confidence limit						
		Centre has reached the lower 95% confidence limit						
		Centre has reached the lower 99.8% confidence limit						

Adult kidney transplants

5.1 Kidney only transplants, 1 April 2010 – 31 March 2020

Figure 5.1 shows the total number of adult kidney only transplants performed in the last ten years, by type of donor. The number of adult transplants from donors after circulatory death (DCD) steadily increased from 539 in 2010/11 to 970 in 2018/19 with a slight dip to 915 in 2019/20. The number of adult transplants from donors after brain death (DBD) increased from 893 in 2010/11 to 1379 in 2017/18 with a decrease to 1326 in 2019/20. The number of adult living kidney transplants performed was steadily increasing over time from 955 in 2010/11 to 1053 in 2013/14 before decreasing by 10% to 949 transplants in the latest financial year.

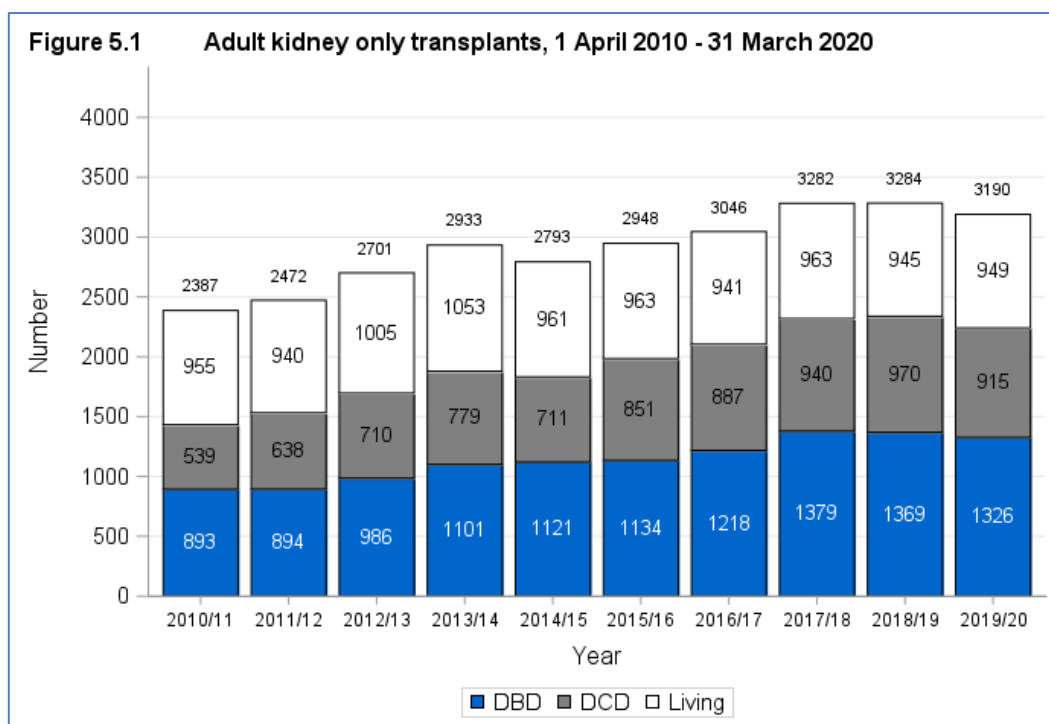


Figure 5.2 shows the total number of adult kidney only transplants performed in 2019/20, by centre and type of donor. The same information is presented in **Figure 5.3** but this shows the proportion of [DBD](#), [DCD](#) and living donor transplants performed at each centre.

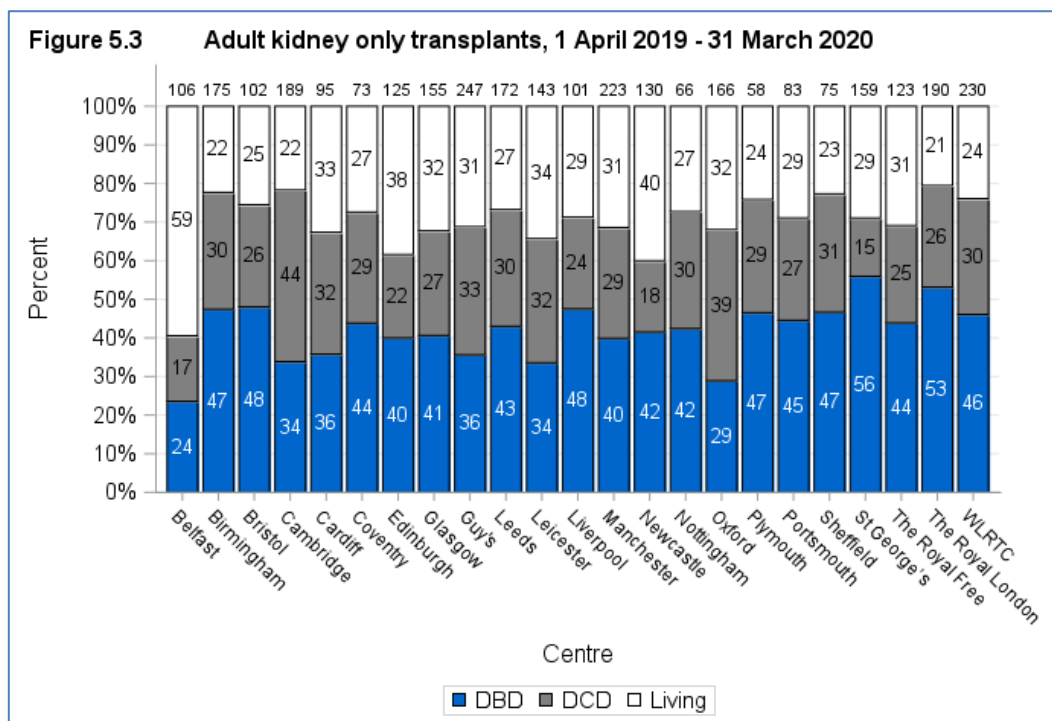
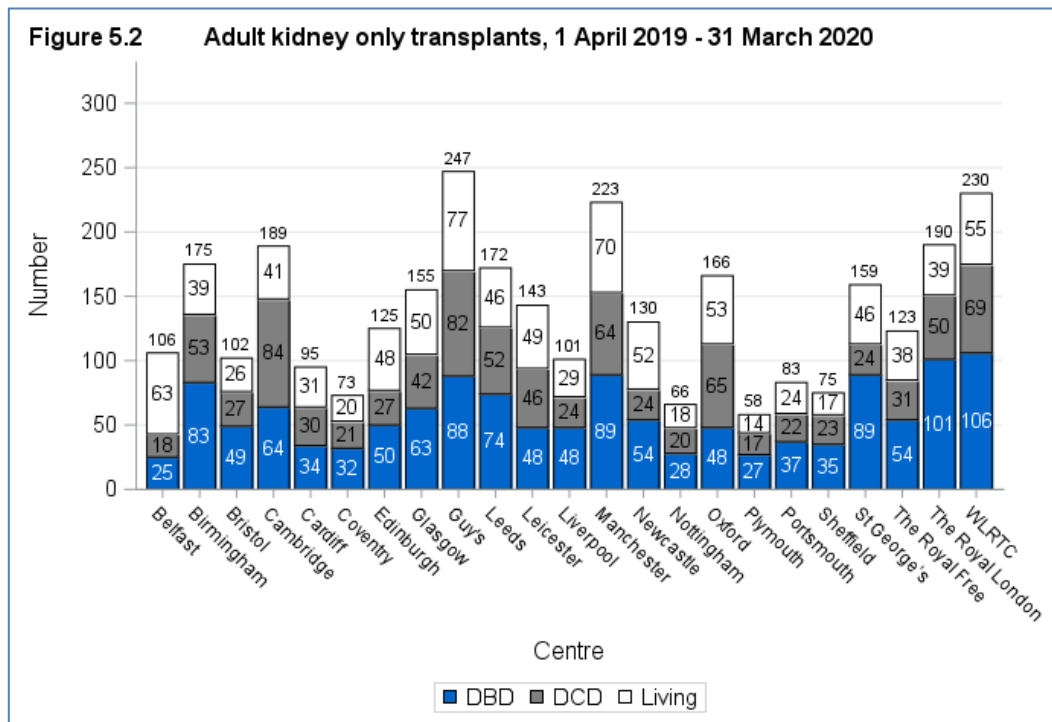
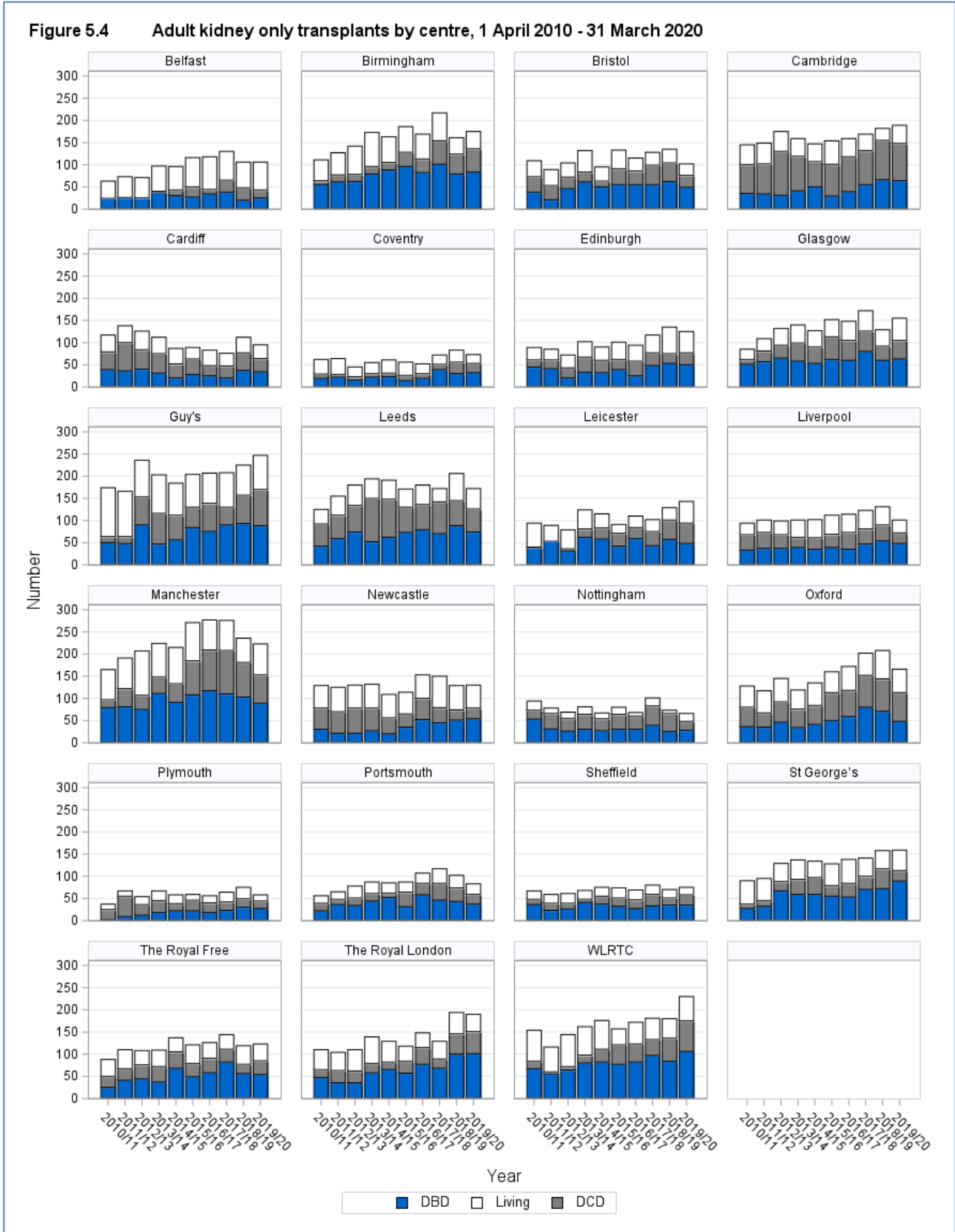


Figure 5.4 shows the total number of adult kidney only transplants performed in last ten years, by centre and type of donor.



5.2 Demographic characteristics of recipients, 1 April 2019 - 31 March 2020

The sex, ethnicity and age group of patients who received a kidney only transplant are shown by centre in **Figure 5.5**, **5.6** and **5.7**, respectively. Note that all percentages quoted are based only on data where relevant information was available.

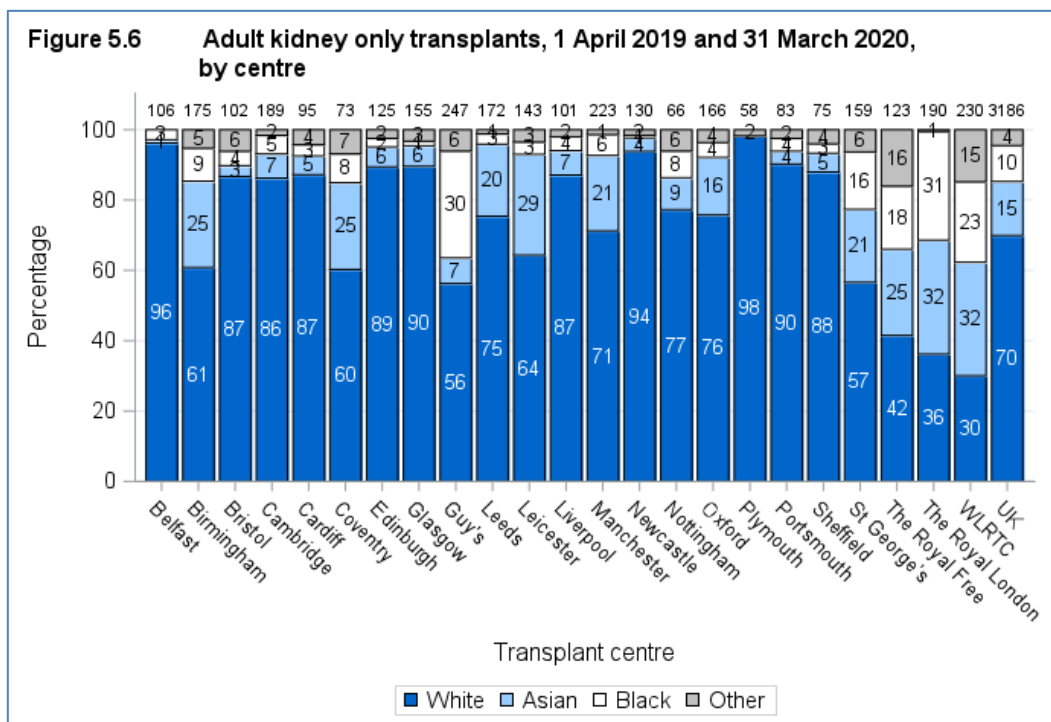
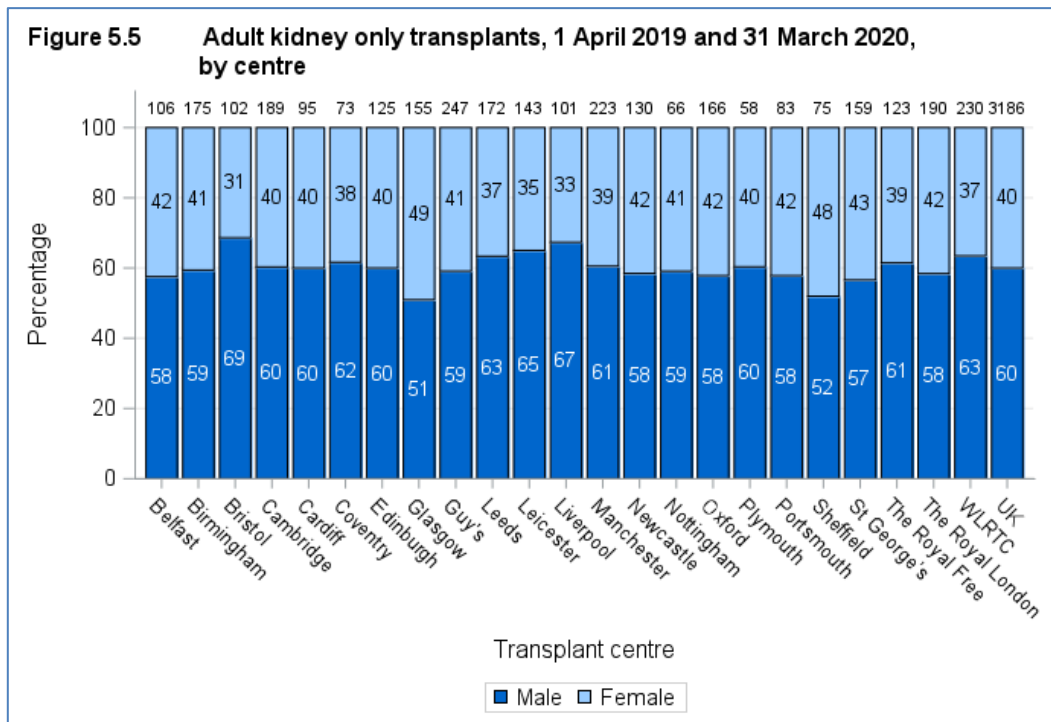
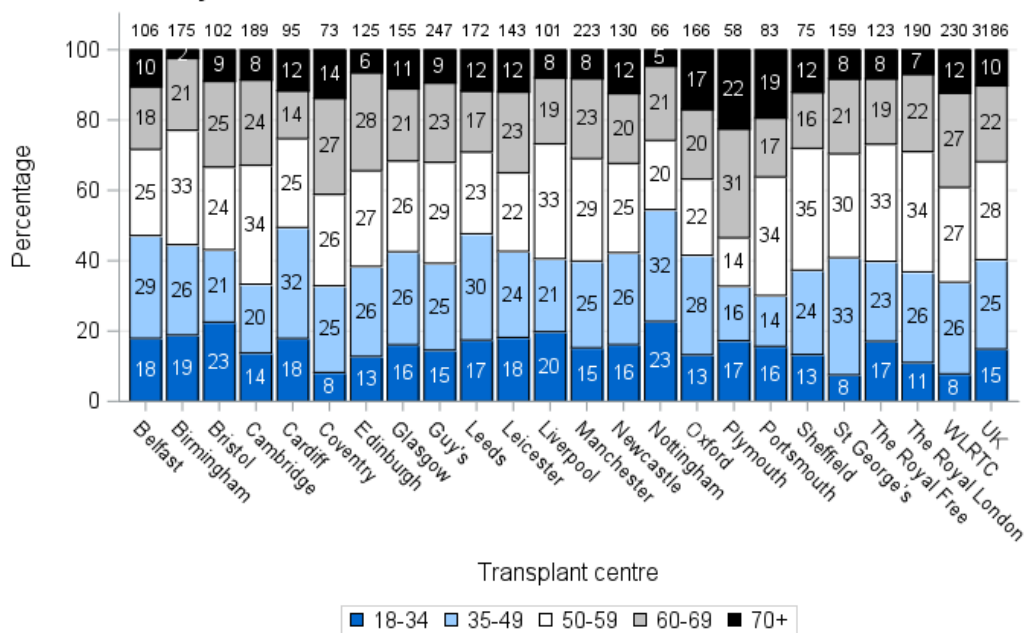
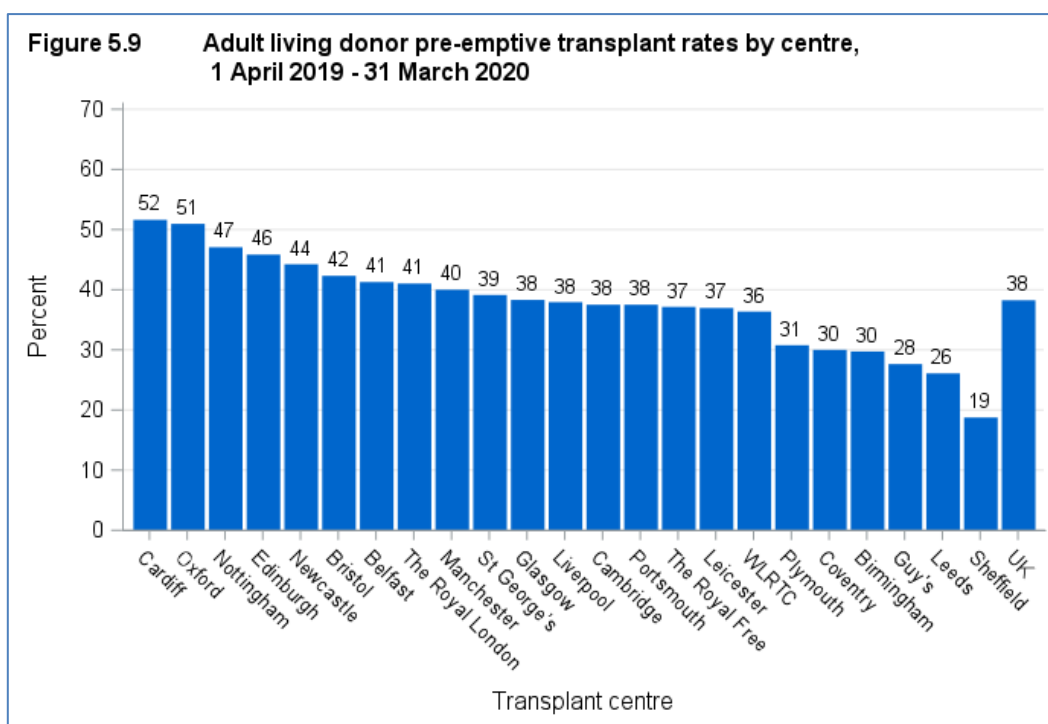
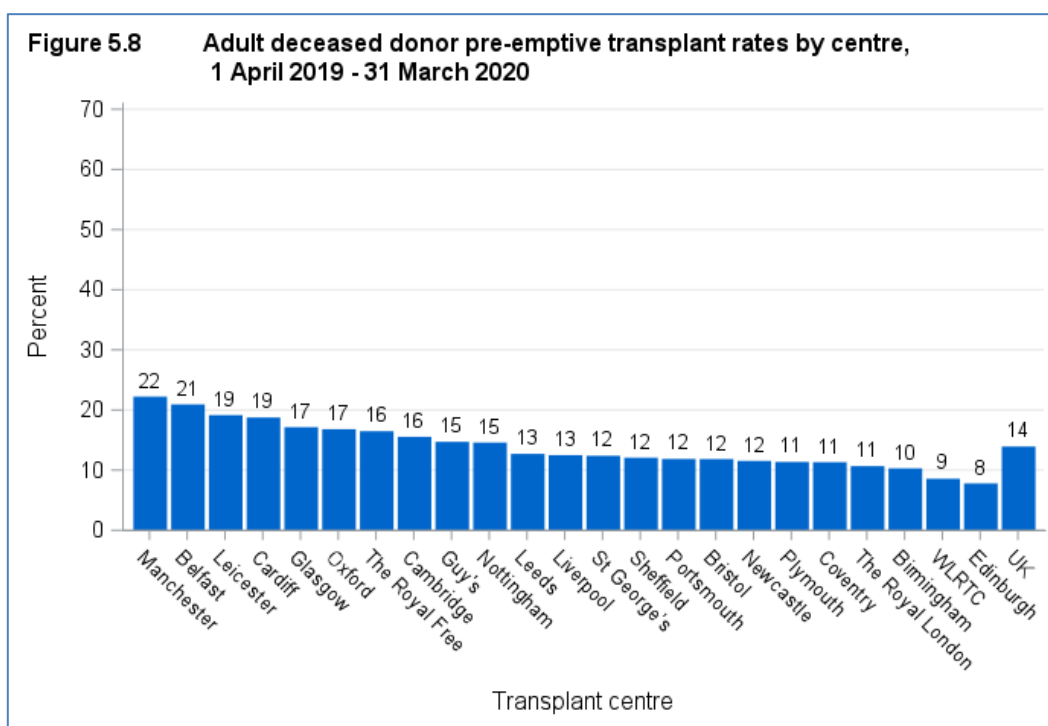


Figure 5.7 Adult kidney only transplants, 1 April 2019 and 31 March 2020, by centre



5.3 Pre-emptive transplant rates, 1 April 2019 - 31 March 2020

Rates of [pre-emptive](#) kidney only transplantation are shown in **Figure 5.8** for adult deceased donor transplants and **Figure 5.9** for adult living donor transplants. Living donor transplants are more likely to be carried out before the need for dialysis than deceased donor transplants: 38% and 14% respectively. This is because a living donor transplant can often be carried out more quickly than a deceased donor kidney transplant as the latter often necessitates a long waiting time. Adult deceased donor [pre-emptive](#) transplant rates ranged from 22% at Manchester to 8% at Edinburgh. Adult living donor [pre-emptive](#) transplant rates ranged from 52% at Cardiff to 19% at Sheffield.



5.4 Kidney donor risk-index¹, 1 April 2017 – 31 March 2020

The severe shortage of deceased donor (DD) organs available for transplantation has led to increased use of kidneys from suboptimal donors with potentially less good transplant outcome. Categorising such kidneys according to anticipated outcome is important because it enables clinicians to be better informed when making decisions about organ allocation and allows appropriate counselling of potential recipients. Kidneys from suboptimal donors are variously referred to as marginal, extended criteria, or expanded criteria organs. Although categorising DD kidneys as either standard or expanded criteria has the advantage of simplicity, it does not adequately reflect the wide spectrum of donor kidney quality, and this has led to the development of more refined approaches to assessing the quality of DD kidneys. A donor risk index was developed by determining the factors that influence transplant survival, the time from transplant to the earlier of graft failure or patient death. A UK donor risk index was derived from the parameter estimates of the donor factors in the Cox model developed for overall transplant survival. This gives the following index:

$$\begin{aligned} \text{UKKDRI} = & \exp\{-0.245 \times (\text{donor age} < 40) + \\ & 0.396 \times (\text{donor age} \geq 60) + \\ & 0.265 \times (\text{history of hypertension}) + \\ & 0.0253 \times [\text{donor weight(kg)} - 75] / 10) + \\ & 0.00461 \times (\text{days in hospital}) + \\ & 0.0465 \times (\text{adrenaline})\} \end{aligned}$$

Reference

- 1 Watson CJE, Johnson RJ, Birch R, Collett D, Bradley JA. A simplified donor risk index for predicting outcome after deceased donor kidney transplantation. *Transplantation*, 2012; 93: 314-318

Figure 5.10 shows the number of transplanted [DBD](#) donor kidneys over the last ten financial years by kidney donor risk index group. In 2010/11 30% of all transplants were performed using kidneys from donors categorised as high risk (UK Donor risk index ≥ 1.35) compared with 36% in 2019/20.

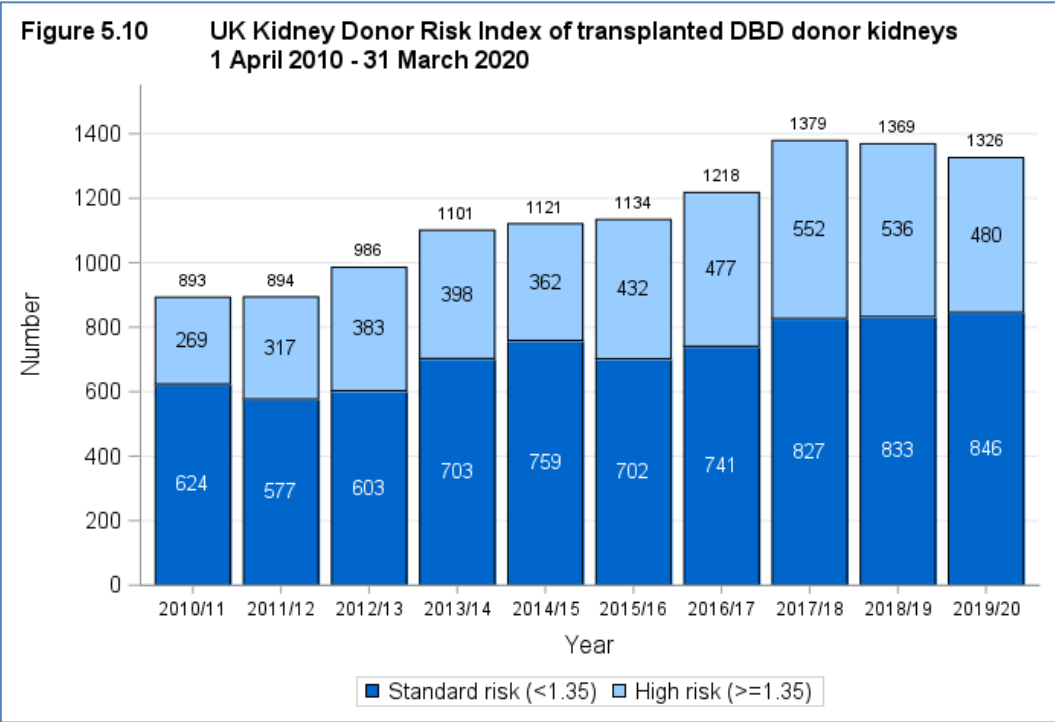
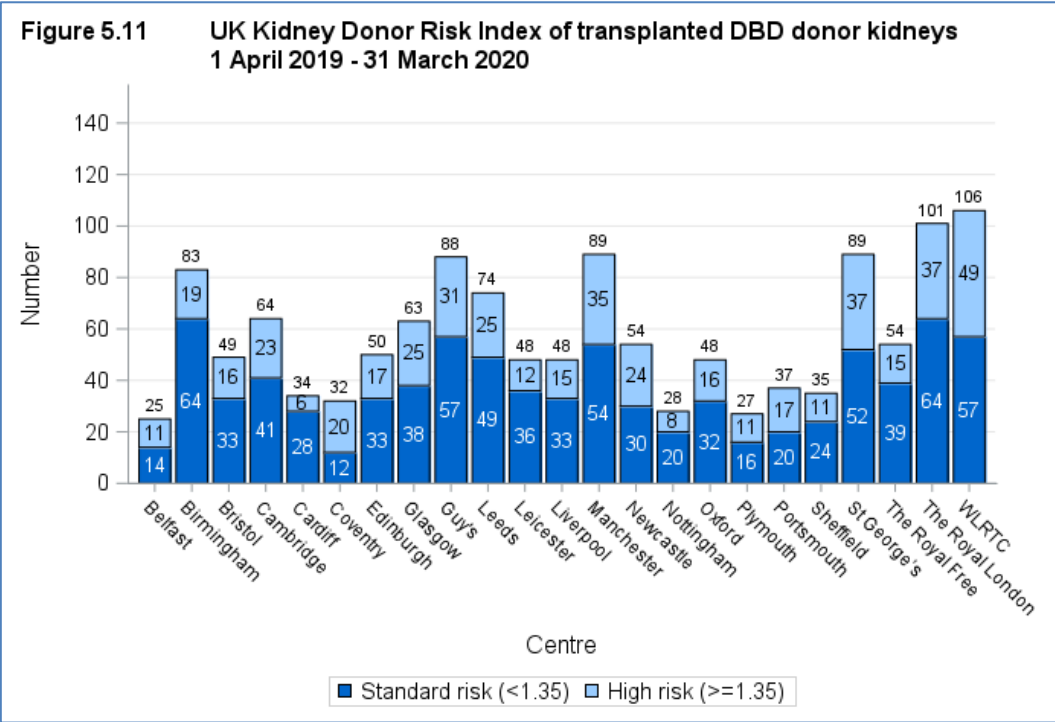


Figure 5.11 shows the number of transplanted [DBD](#) donor kidneys in 2019/20 by kidney donor risk index group for each transplant centre. The same information is presented in **Figure 5.12** but this shows the proportion of standard risk and high risk donor transplants performed at each centre.



**Figure 5.12 UK Kidney Donor Risk Index of transplanted DBD donor kidneys
1 April 2019 - 31 March 2020**

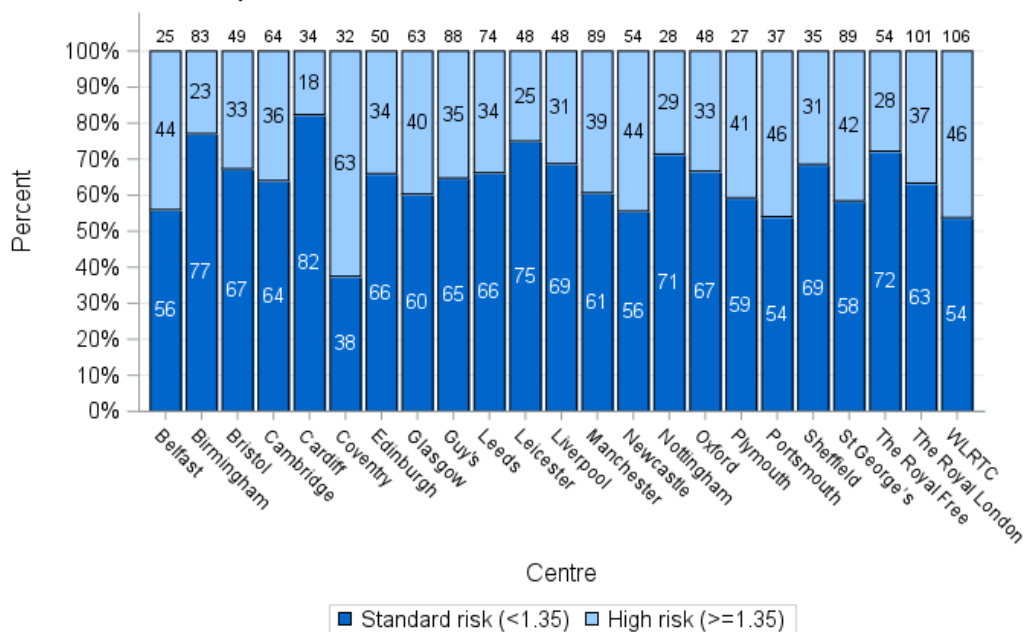
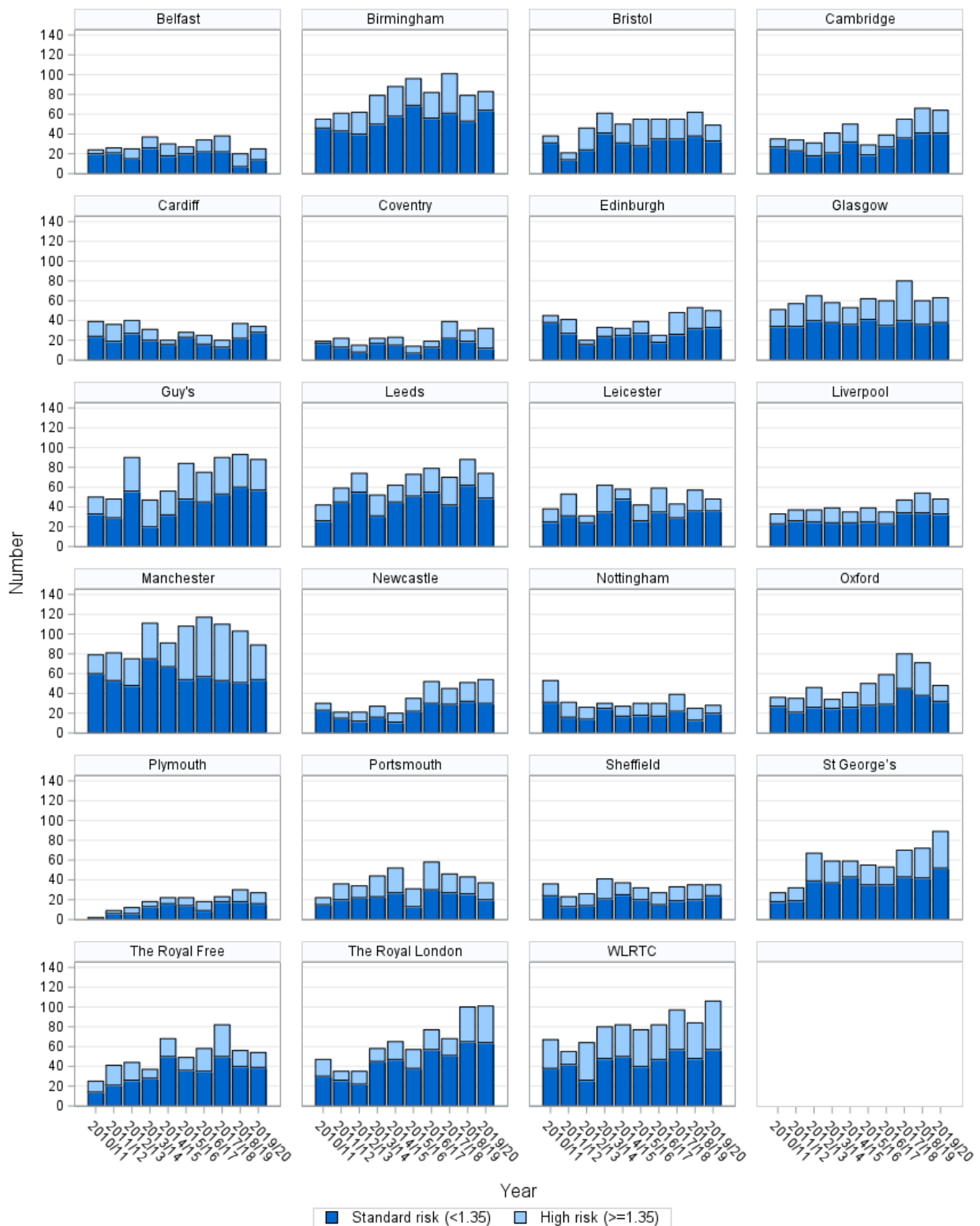


Figure 5.13 shows the number of transplanted [DBD](#) donor kidneys in the last ten years by kidney donor risk index group for each transplant centre.

Figure 5.13 UK Kidney Donor Risk Index of transplanted DBD donor kidneys by centre, 1 April 2010 - 31 March 2020



5.5 Cold ischaemia time, 1 April 2017 – 31 March 2020

The length of time that elapses between a kidney being removed from the donor to its transplantation into the recipient is called the Cold Ischaemia Time (CIT). Generally, the shorter this time, the more likely the kidney is to work immediately and the better the long-term outcome. One of the reasons why [live donor](#) kidney transplantation is so successful is because the CIT is only one to two hours long. For deceased donor renal transplants, CIT can never be as short as this, but efforts are made to keep the time to a minimum. Evidence indicates that the outcome is only adversely affected when CIT is longer than 20 hours, although many deceased donor kidney transplants with a CIT of more than 20 hours have been very successful.

The factors which determine CIT include a) transportation of the kidney from the retrieval hospital to the hospital where the transplant is performed, b) the need to tissue type the donor and [cross-match](#) the donor and potential recipients, c) the occasional necessity of moving the kidney to another hospital if a transplant cannot go ahead, d) contacting and preparing the recipient for the transplant and e) access to the operating theatre.

[Median](#) CITs are shown in addition to [inter-quartile ranges](#). Fifty percent of the transplants have a CIT within the [inter-quartile range](#). There is some variation in average ([median](#)) CIT between different transplant centres although all centres continually try to reduce this time.

Figure 5.14 shows the [median](#) total cold ischaemia time in adult [DBD](#) donor kidney only transplants over the last 10 years. The [median](#) total cold ischaemia time has fallen over the last 10 years from 15 hours in 2010/11 to 13 hours in 2019/20.

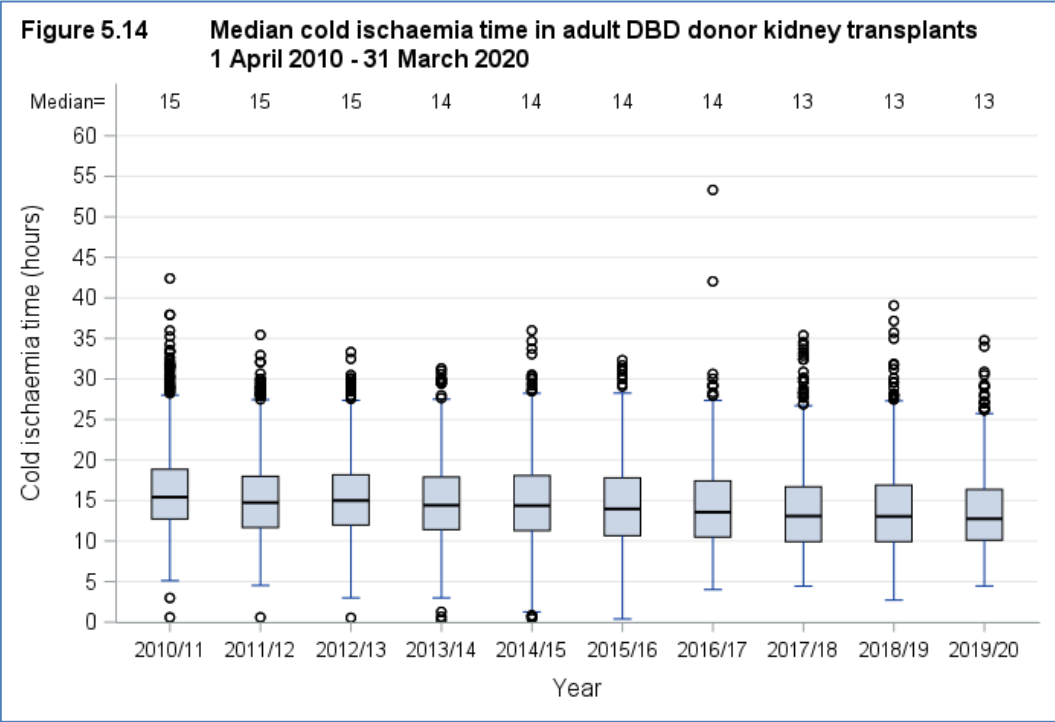


Figure 5.15 shows the [median](#) total cold ischaemia time in adult [DBD](#) donor kidney only transplants in 2019/20 for each transplant centre. Newcastle had the longest [median](#) cold ischaemia time, 16 hours in 2019/20 compared with Cardiff who had the shortest, 10 hours.

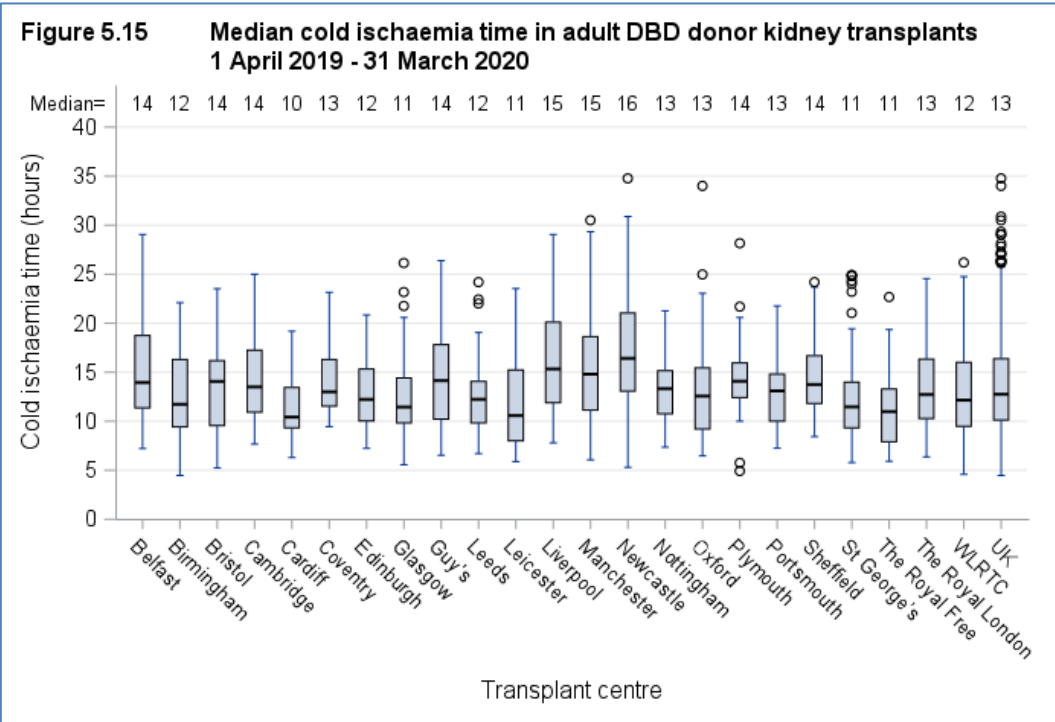


Figure 5.16 shows the [median](#) total cold ischaemia time in adult [DBD](#) donor kidney only transplants over the last ten years for each transplant centre.



Figure 5.17 shows the proportion of adult [DBD](#) donor kidney only transplants in 2019/20 that have been performed within 18 hours of CIT for each transplant centre. All centres have at least half of all [DBD](#) kidney only transplants performed within 18 hours CIT.

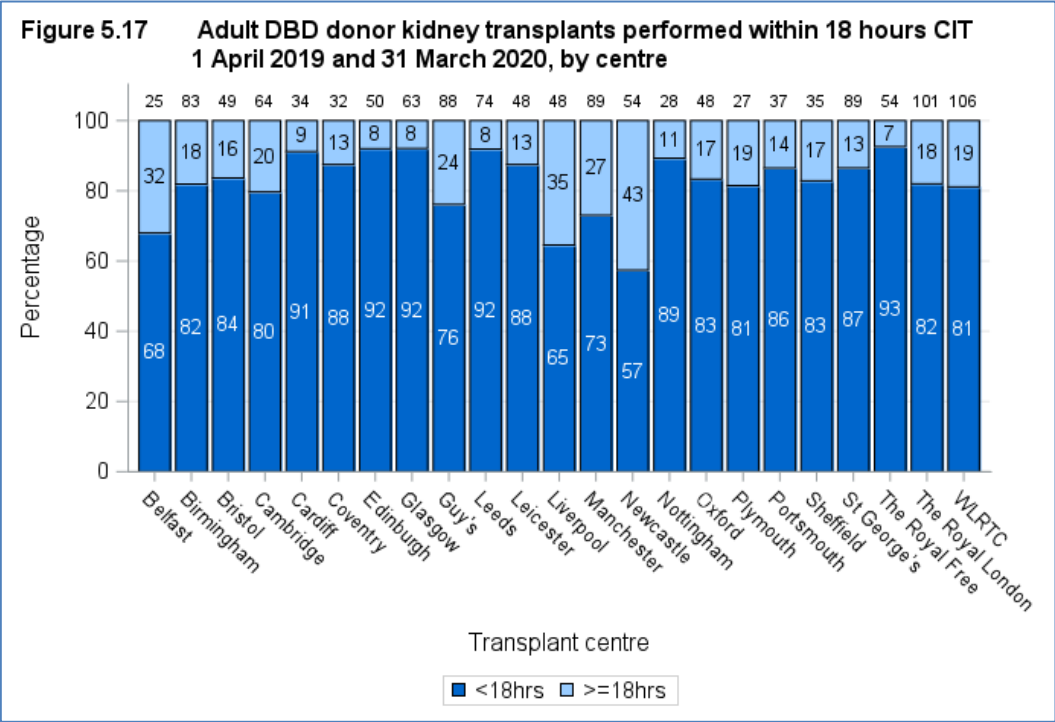


Figure 5.18 shows the [median](#) total cold ischaemia time in adult [DCD](#) donor kidney only transplants over the last 10 years. The [median](#) total ischaemia time has fallen over the last 10 years from 15 hours in 2010/11 to 13 hours in 2019/20.

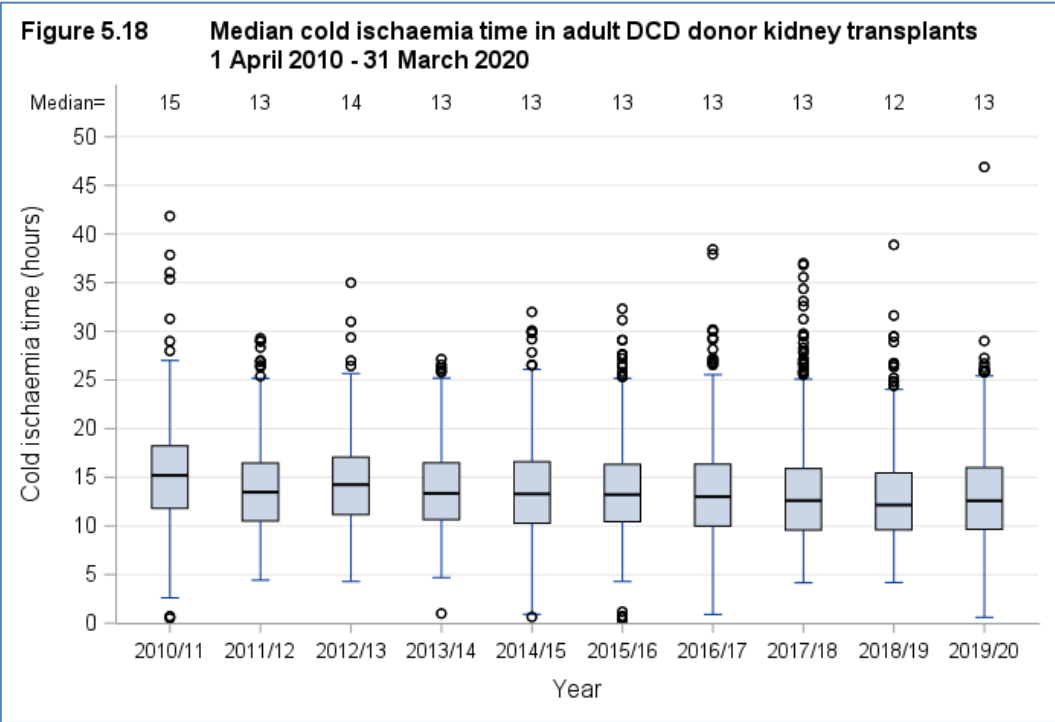


Figure 5.19 shows the [median](#) total cold ischaemia time in adult [DCD](#) donor kidney only transplants in 2019/20 for each transplant centre. Newcastle had the longest [median](#) cold ischaemia time, 17 hours in 2019/20 compared with Glasgow, Nottingham, Portsmouth, St George's and The Royal Free who had the shortest, 10 hours.

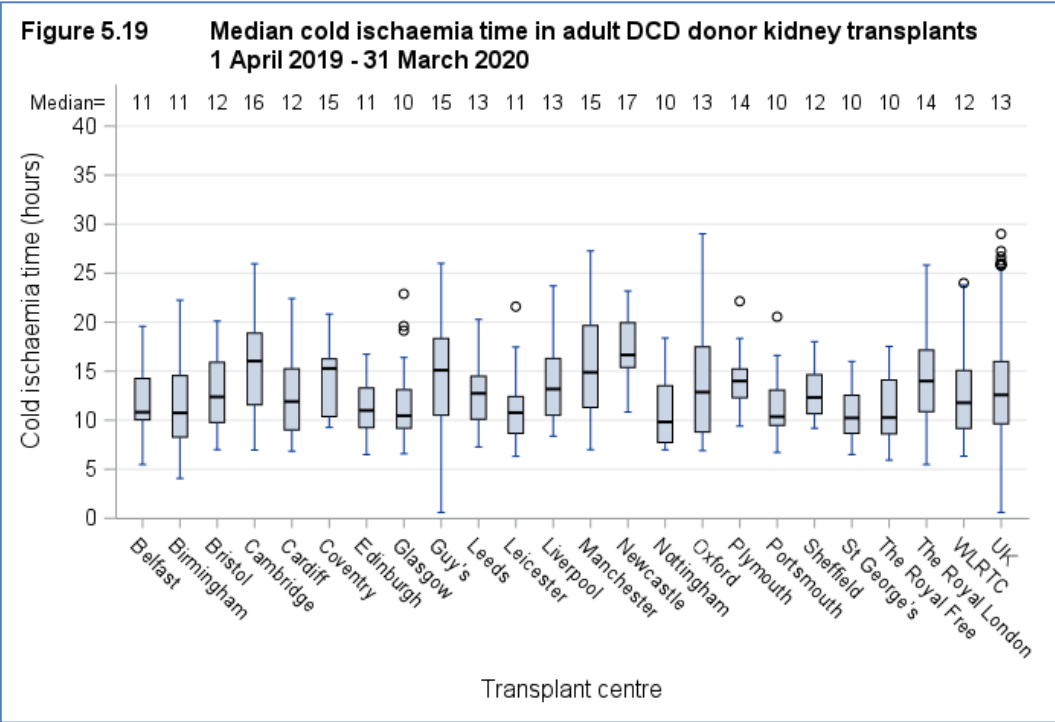


Figure 5.20 shows the median total cold ischaemia time in adult DCD donor kidney only transplants over the last ten years for each transplant centre.

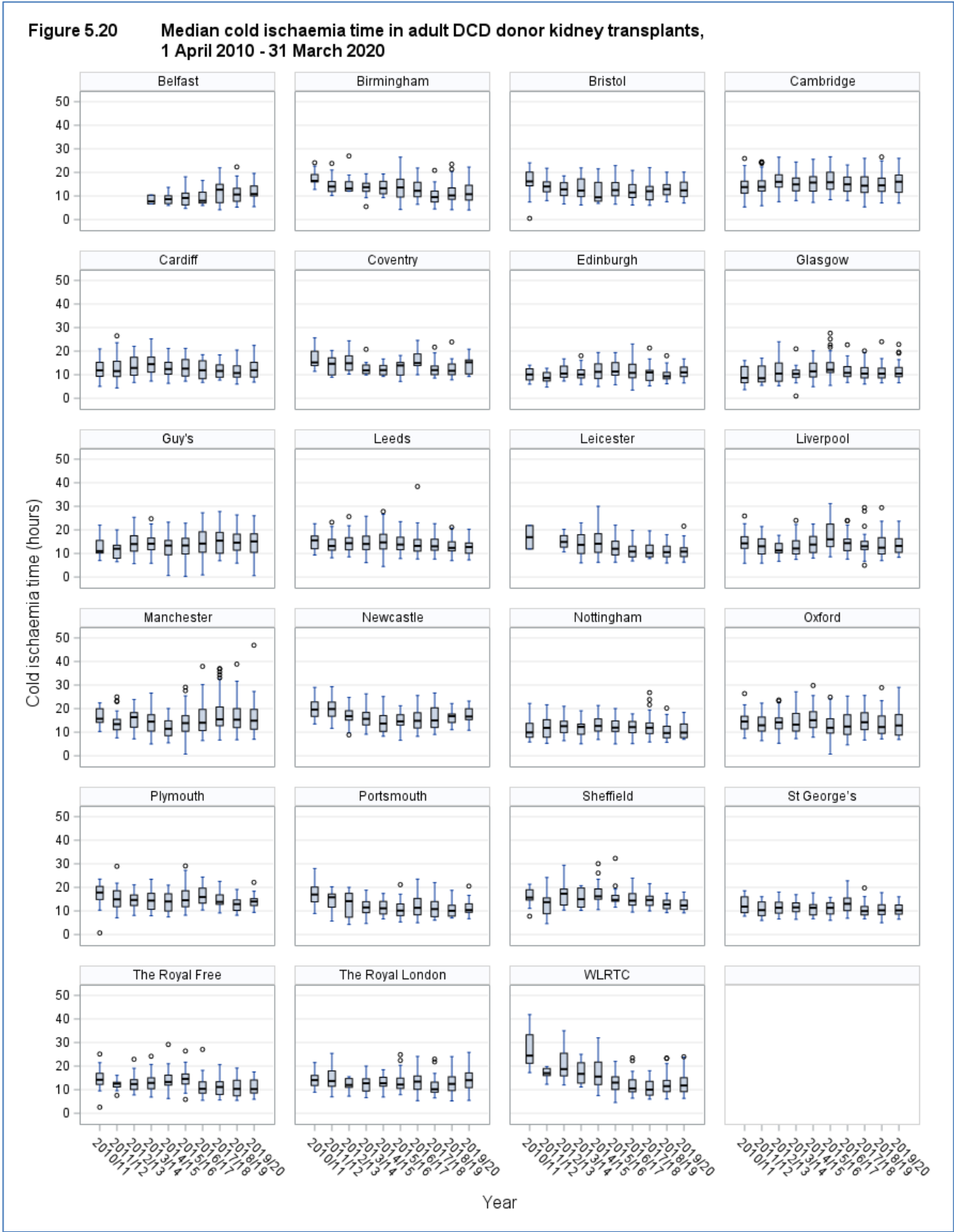


Figure 5.21 shows the proportion of adult [DCD](#) donor kidney only transplants in 2019/20 that have been performed within 12 hours of CIT for each transplant centre. The wide variability across centres can partly be explained by the proportion of kidneys that the centre imports from across the UK.

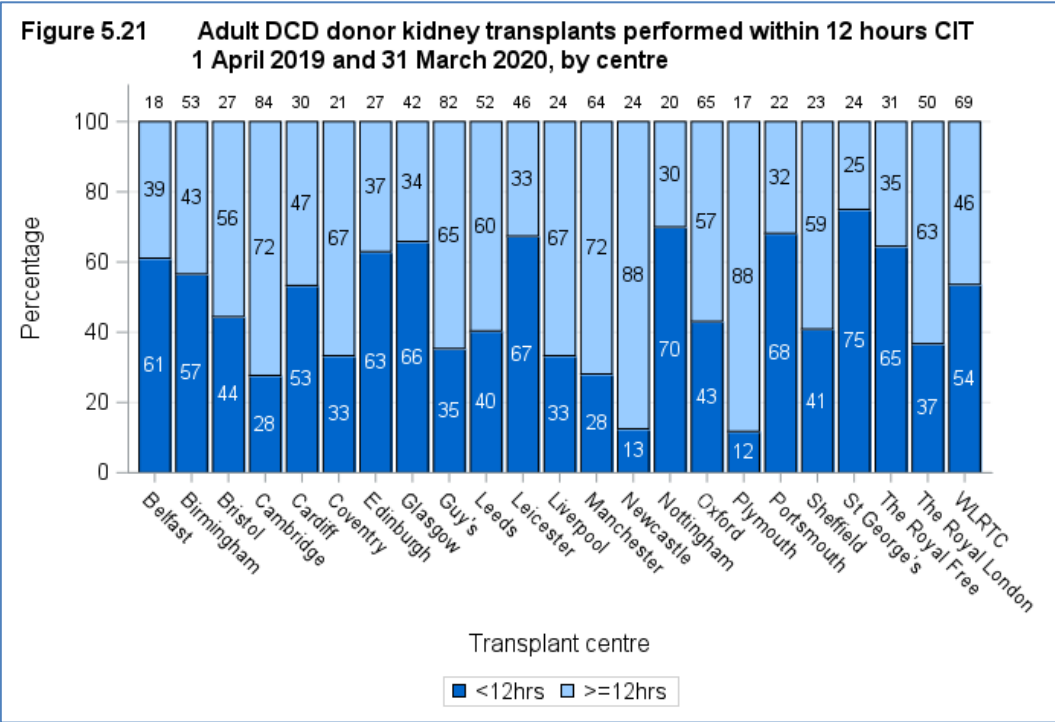


Figure 5.22 shows the [median](#) total cold ischaemia time in adult living donor kidney transplants over the last 10 years. The [median](#) total cold ischaemia time has increased marginally over the last ten years.

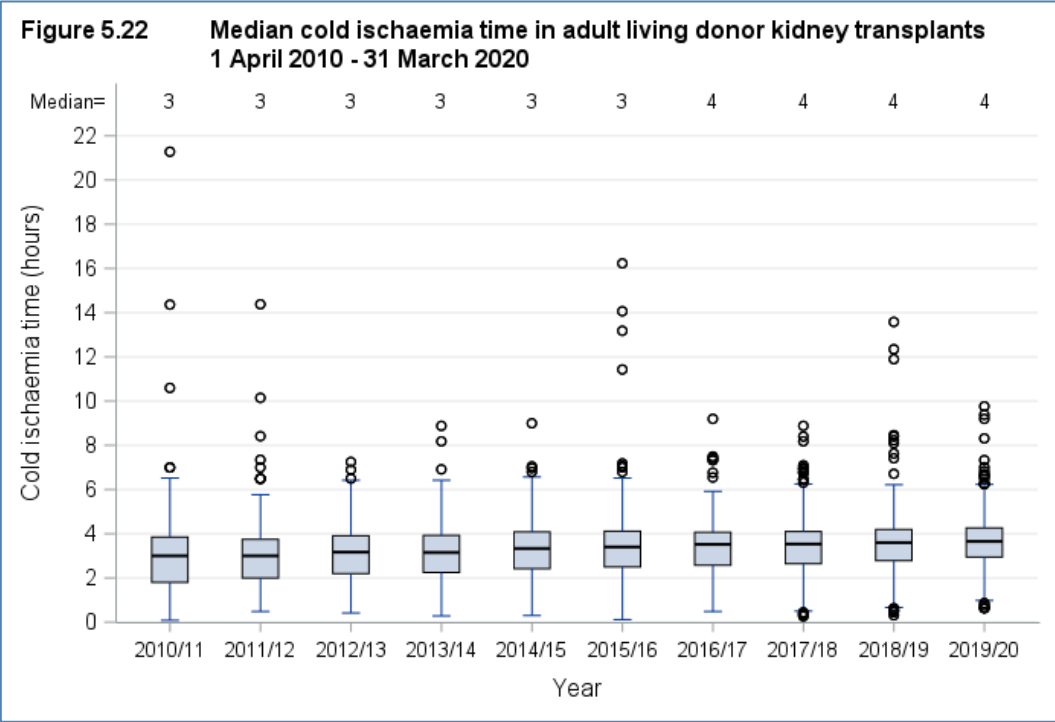


Figure 5.23 shows the median total cold ischaemia time in adult living donor kidney transplants in 2019/20 for each transplant centre.

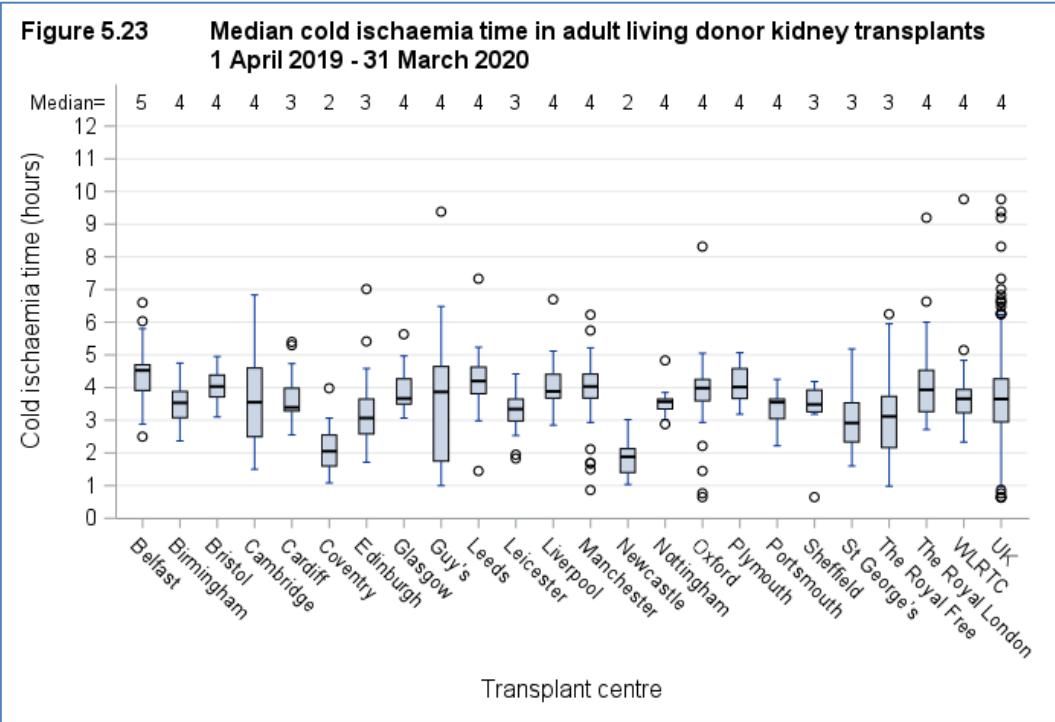
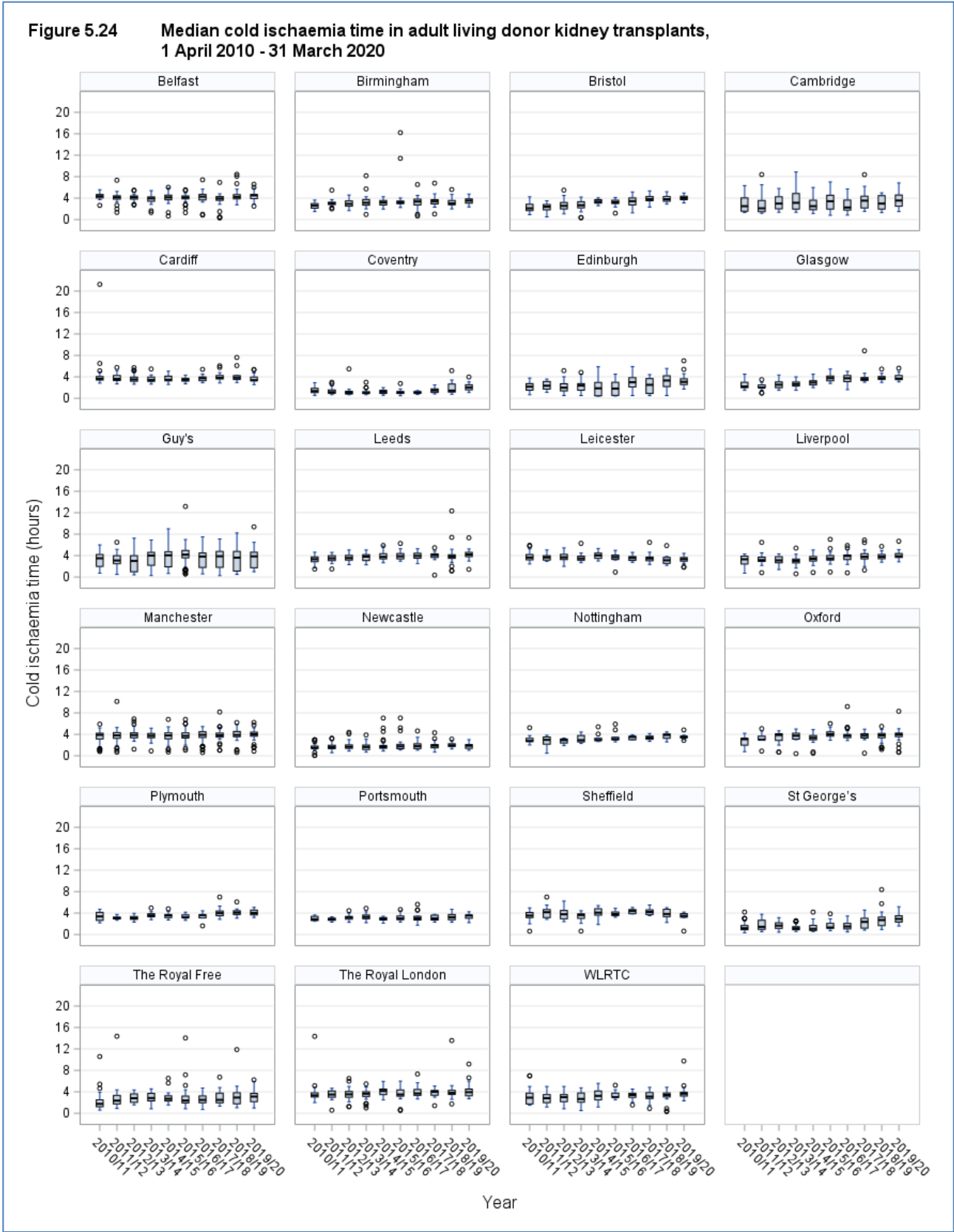


Figure 5.24 shows the [median](#) total cold ischaemia time in adult living donor kidney transplants over the last ten years for each transplant centre.



Adult kidney outcomes

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 [risk-adjusted survival rate](#) plotted against the number of transplants for each centre, with the overall national [unadjusted 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.

6.1 Deceased donor graft and patient survival

The [funnel plots](#) show that, for the most part, the centres lie within the [confidence limits](#). Some of the [funnel plots](#) show some centres lie outside the lower 95% [confidence limits](#), indicating that these centres have survival rates that are significantly lower than the national rate. Some of the [funnel plots](#) show some centres to be above the upper 99.8% [confidence limit](#). This suggests that these centres may have survival rates that are considerably higher than the national rate. Centres can be identified by the information shown in **Table 6.1**.

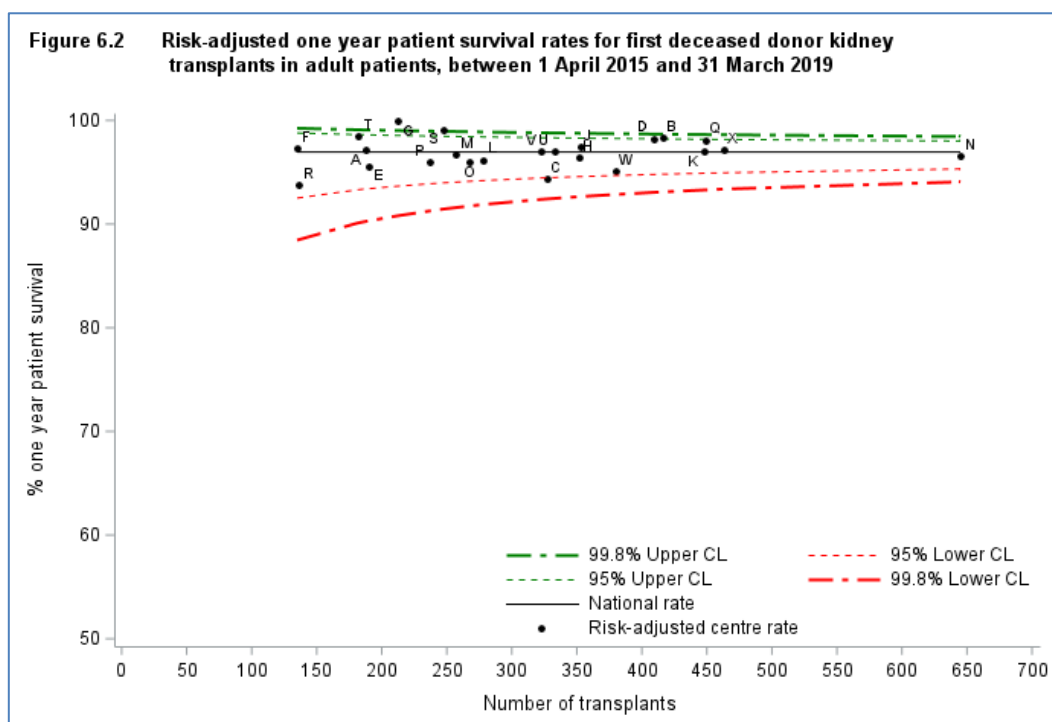
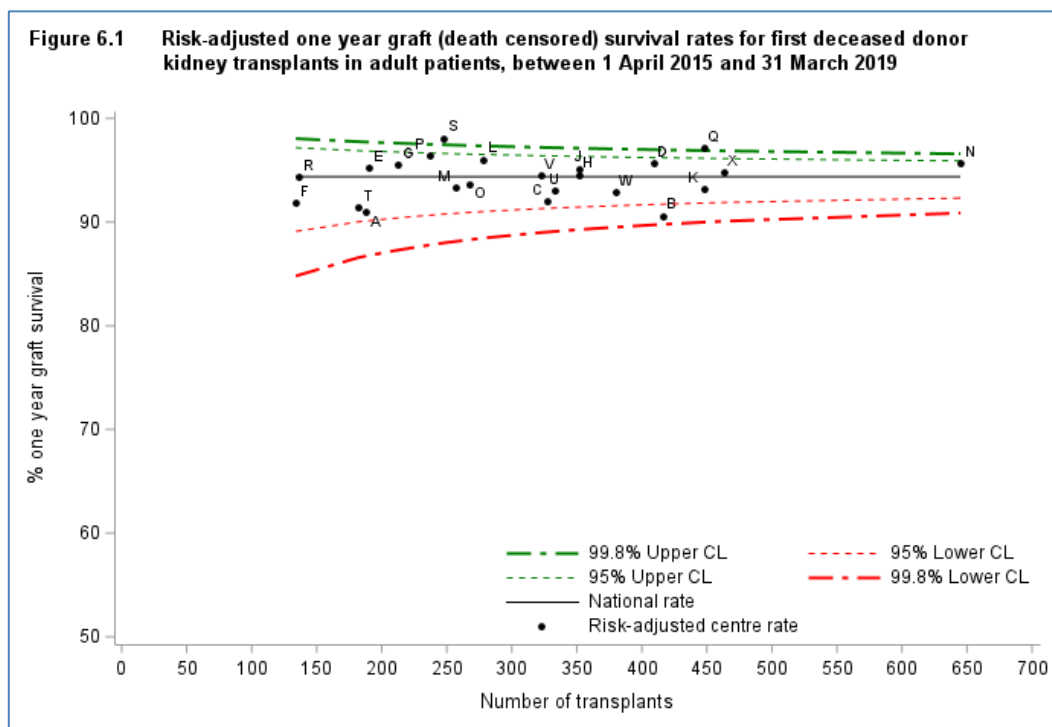


Figure 6.3 Risk-adjusted five year graft (death censored) survival rates for first deceased donor kidney transplants in adult patients, between 1 April 2011 and 31 March 2015

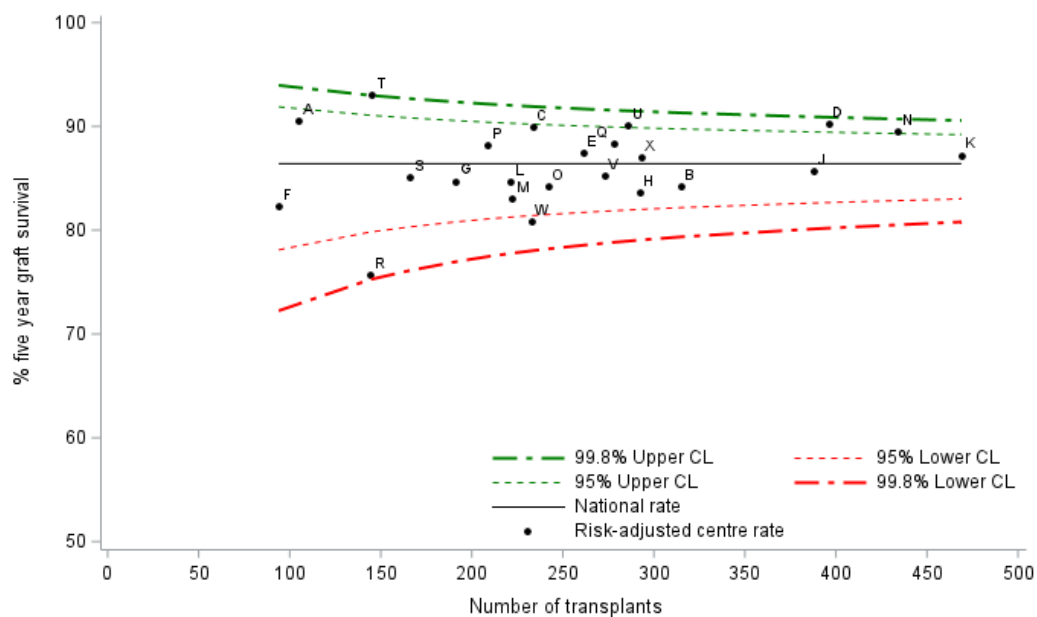


Figure 6.4 Risk-adjusted five year patient survival rates for first deceased donor kidney transplants in adult patients, between 1 April 2011 and 31 March 2015

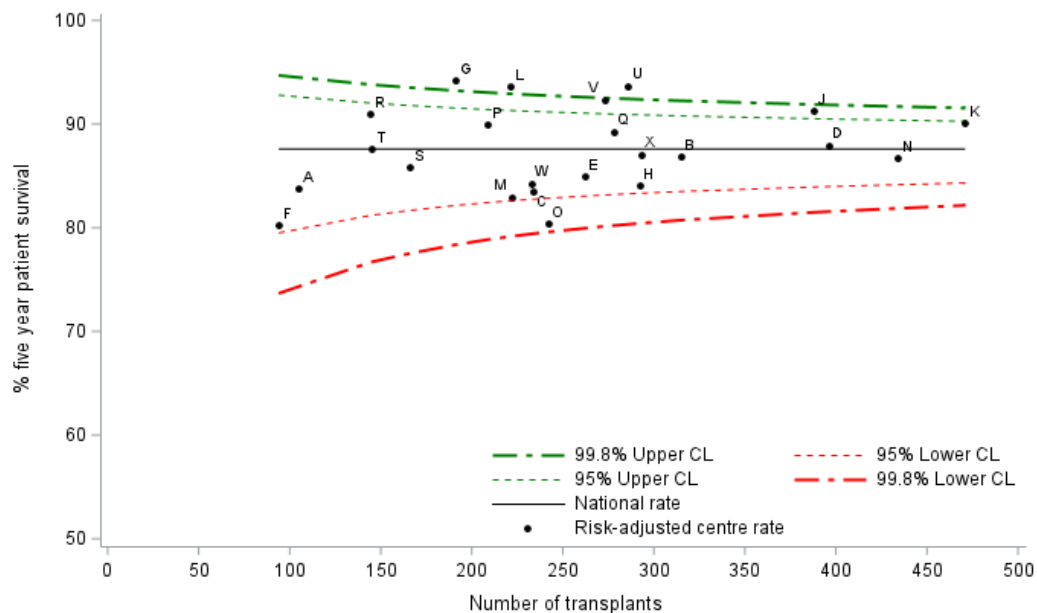


Table 6.1 One and five year first adult kidney-only graft and patient survival using kidneys from deceased donors

Centre	Code	Kidney graft survival				Patient survival			
		One-year*		Five-year**		One-year*		Five-year**	
		%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Belfast	A	91	(85 - 95)	91	(81 - 96)	97	(93 - 99)	84	(74 - 91)
Birmingham	B	91	(87 - 93)	84	(79 - 88)	98	(96 - 99)	87	(81 - 91)
Bristol	C	92	(88 - 95)	91	(85 - 95)	95	(91 - 97)	84	(76 - 89)
Cambridge	D	96	(93 - 97)	90	(87 - 93)	98	(96 - 99)	88	(84 - 91)
Cardiff	E	95	(91 - 98)	87	(82 - 91)	96	(92 - 98)	85	(80 - 89)
Coventry	F	92	(85 - 96)	82	(70 - 91)	97	(92 - 99)	81	(68 - 89)
Edinburgh	G	96	(91 - 98)	84	(76 - 90)	100	N/A	94	(89 - 98)
Glasgow	H	95	(91 - 97)	84	(78 - 88)	96	(94 - 98)	84	(78 - 89)
Guy's	J	95	(92 - 97)	86	(81 - 89)	98	(95 - 99)	91	(87 - 94)
Leeds	K	93	(91 - 96)	87	(83 - 90)	97	(95 - 99)	90	(86 - 93)
Leicester	L	96	(93 - 98)	85	(79 - 89)	96	(93 - 98)	94	(89 - 97)
Liverpool	M	93	(89 - 96)	83	(76 - 89)	97	(93 - 99)	83	(76 - 88)
Manchester	N	96	(94 - 97)	89	(85 - 92)	97	(95 - 98)	87	(83 - 90)
Newcastle	O	94	(90 - 96)	84	(78 - 89)	96	(93 - 98)	80	(74 - 86)
Nottingham	P	97	(93 - 99)	88	(83 - 92)	96	(92 - 98)	89	(84 - 94)
Oxford	Q	97	(95 - 98)	88	(83 - 92)	98	(96 - 99)	89	(85 - 93)
Plymouth	R	94	(88 - 98)	76	(65 - 84)	94	(87 - 98)	91	(85 - 95)
Portsmouth	S	98	(95 - 99)	85	(78 - 91)	99	(97 - 100)	85	(79 - 90)
Sheffield	T	92	(87 - 95)	93	(87 - 97)	99	(96 - 100)	87	(79 - 92)
St George's	U	93	(89 - 96)	90	(85 - 94)	97	(94 - 99)	94	(90 - 96)
The Royal Free	V	95	(91 - 97)	85	(80 - 89)	97	(94 - 99)	92	(88 - 95)
The Royal London	W	93	(90 - 95)	81	(74 - 85)	96	(93 - 98)	85	(77 - 90)
WLRTC	X	95	(92 - 97)	87	(82 - 91)	97	(95 - 98)	87	(83 - 91)
UK		94	(94 - 95)	86	(85 - 87)	97	(97 - 97)	88	(87 - 88)
		Centre has reached the upper 99.8% confidence limit							
		Centre has reached the upper 95% confidence limit							
		Centre has reached the lower 95% confidence limit							
		Centre has reached the lower 99.8% confidence limit							

* Includes transplants performed between 1 April 2015 - 31 March 2019

** Includes transplants performed between 1 April 2011 - 31 March 2015

6.2 Living donor graft and patient survival

The [funnel plots](#) show that, for the most part, the centres lie within the [confidence limits](#). None of the [funnel plots](#) show any centres that lie outside the lower 95% [confidence limits](#). Some of the [funnel plots](#) show some centres to be above the upper 95% [confidence limit](#). This suggests that these centres may have survival rates that are considerably higher than the national rate. Centres can be identified by the information shown in **Table 6.2**. Living donor antibody incompatible kidney transplants are included in the analysis and these transplants are known to have inferior graft survival rates. **Table 6.3** shows the number of such transplants performed by each centre for each of the time periods analysed.

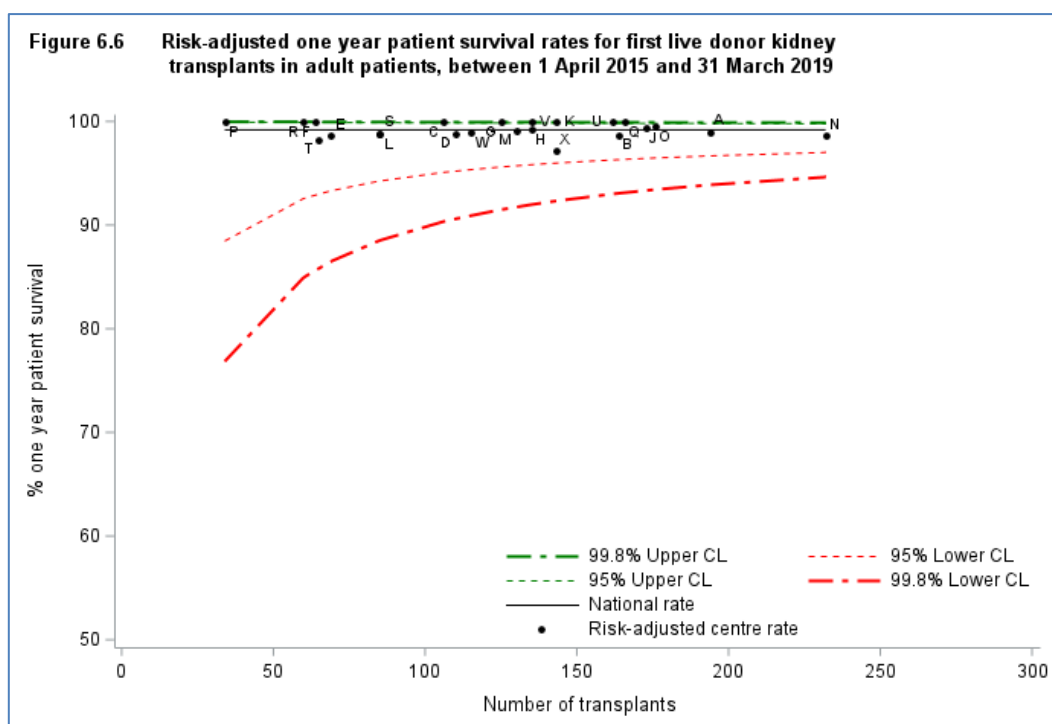
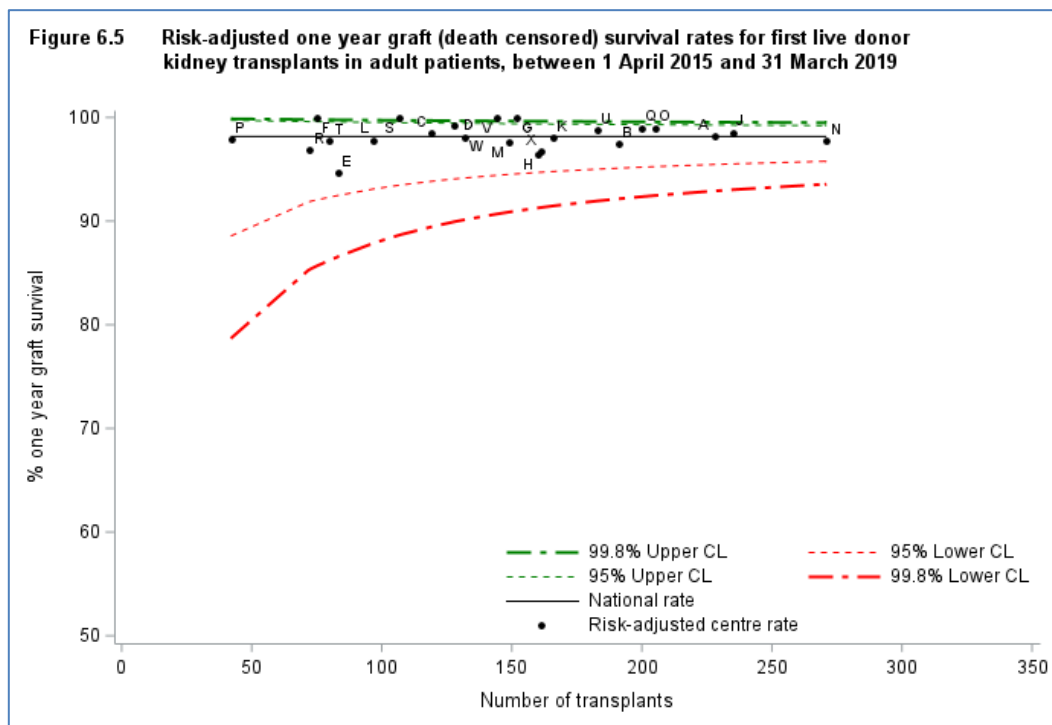


Figure 6.7 Risk-adjusted five year graft (death censored) survival rates for first live donor kidney transplants in adult patients, between 1 April 2011 and 31 March 2015

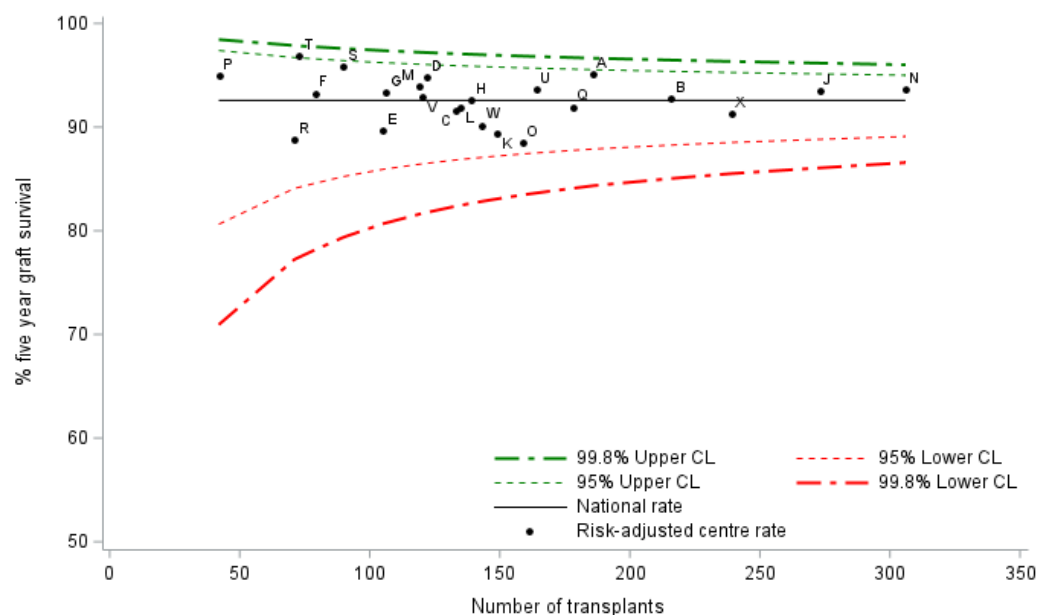


Figure 6.8 Risk-adjusted five year patient survival rates for first live donor kidney transplants in adult patients, between 1 April 2011 and 31 March 2015

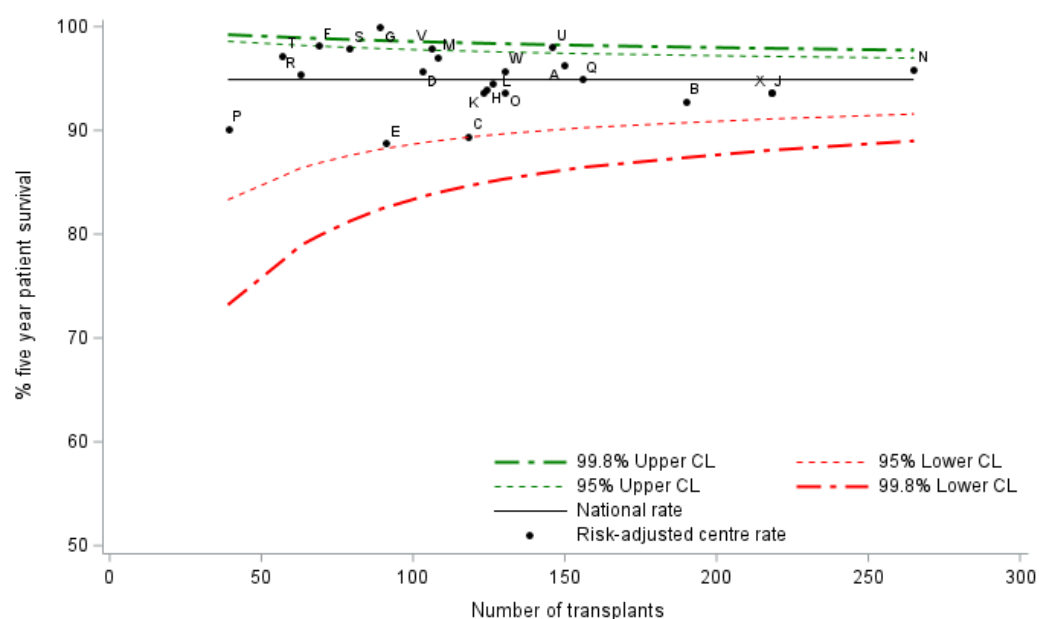


Table 6.2 One and five year first adult kidney-only graft and patient survival using kidneys from living donors

Centre	Code	Kidney graft survival				Patient survival			
		One-year*		Five-year**		One-year*		Five-year**	
		%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Belfast	A	98	(95 - 100)	95	(90 - 98)	99	(96 - 100)	96	(91 - 99)
Birmingham	B	97	(94 - 99)	93	(88 - 96)	99	(95 - 100)	93	(87 - 96)
Bristol	C	98	(94 - 100)	92	(83 - 96)	100	N/A	89	(81 - 95)
Cambridge	D	99	(96 - 100)	95	(89 - 98)	99	(94 - 100)	96	(89 - 99)
Cardiff	E	95	(88 - 98)	90	(81 - 95)	99	(93 - 100)	89	(79 - 95)
Coventry	F	100	N/A	93	(84 - 98)	100	N/A	98	(90 - 100)
Edinburgh	G	100	N/A	93	(85 - 98)	100	N/A	100	N/A
Glasgow	H	96	(92 - 99)	93	(86 - 96)	99	(96 - 100)	94	(87 - 98)
Guy's	J	99	(96 - 100)	93	(89 - 96)	99	(96 - 100)	94	(89 - 97)
Leeds	K	98	(94 - 100)	89	(82 - 94)	100	N/A	94	(87 - 97)
Leicester	L	98	(92 - 100)	92	(86 - 96)	99	(93 - 100)	95	(88 - 98)
Liverpool	M	98	(93 - 100)	94	(87 - 98)	99	(95 - 100)	97	(91 - 99)
Manchester	N	98	(95 - 99)	94	(90 - 96)	99	(96 - 100)	96	(93 - 98)
Newcastle	O	99	(96 - 100)	88	(81 - 93)	99	(97 - 100)	94	(88 - 97)
Nottingham	P	98	(88 - 100)	95	(82 - 99)	100	N/A	90	(75 - 97)
Oxford	Q	99	(96 - 100)	92	(86 - 96)	100	N/A	95	(90 - 98)
Plymouth	R	97	(89 - 100)	89	(76 - 96)	100	N/A	95	(84 - 99)
Portsmouth	S	100	N/A	96	(88 - 99)	99	(94 - 100)	98	(93 - 100)
Sheffield	T	98	(92 - 100)	97	(91 - 99)	98	(90 - 100)	97	(85 - 100)
St George's	U	99	(96 - 100)	94	(87 - 97)	100	N/A	98	(94 - 100)
The Royal Free	V	100	N/A	93	(86 - 97)	100	N/A	98	(93 - 100)
The Royal London	W	98	(95 - 100)	90	(84 - 94)	99	(94 - 100)	96	(89 - 99)
WLRTC	X	97	(93 - 99)	91	(87 - 95)	97	(93 - 99)	94	(89 - 97)
UK		98	(98 - 99)	93	(92 - 93)	99	(99 - 99)	95	(94 - 96)
		Centre has reached the upper 99.8% confidence limit							
		Centre has reached the upper 95% confidence limit							
		Centre has reached the lower 95% confidence limit							
		Centre has reached the lower 99.8% confidence limit							

* Includes transplants performed between 1 april 2015 - 31 March 2019

** Includes transplants performed between 1 april 2011 - 31 March 2015

6.3 Graft and patient survival from listing

Survival from listing was analysed for all adult (≥ 18 years) patients registered for the first time for a kidney only between 1 January 2008 and 31 December 2019. Survival time was defined as the time from joining the [transplant list](#) to death, regardless of the length of time on the [transplant list](#), whether or not the patient was transplanted and any factors associated with such a transplant eg donor type. Survival time was censored at either the date of removal from the list, or at the last known follow up date post transplant when no death date was recorded, or at the time of analysis if the patient was still active on the [transplant list](#).

Renal patients may receive a [live donor](#) kidney without prior registration on the [transplant list](#), although centre practices differ in relation to listing of potential [live donor](#) recipients. Consequently, patients who received a [live donor](#) kidney transplant within 6 months of listing were excluded from the analysis to minimise centre bias.

Ten year [risk-adjusted survival rates](#) from the point of kidney transplant listing are shown by centre in **Figure 6.9**. Seven centres were above the upper 99.8% [confidence limit](#) indicating that these centres have 10 year survival rates from listing that are considerably higher than the national rate. Leicester, Newcastle and Manchester fell below the 99.8% lower [confidence limit](#). This suggests that 10 year survival from listing at Leicester, Newcastle and Manchester may be significantly lower than the national rate.

Centres can be identified by the information shown in **Table 6.3**, which also shows one, five and ten year [risk-adjusted survival rates](#) from the point of kidney transplant listing.

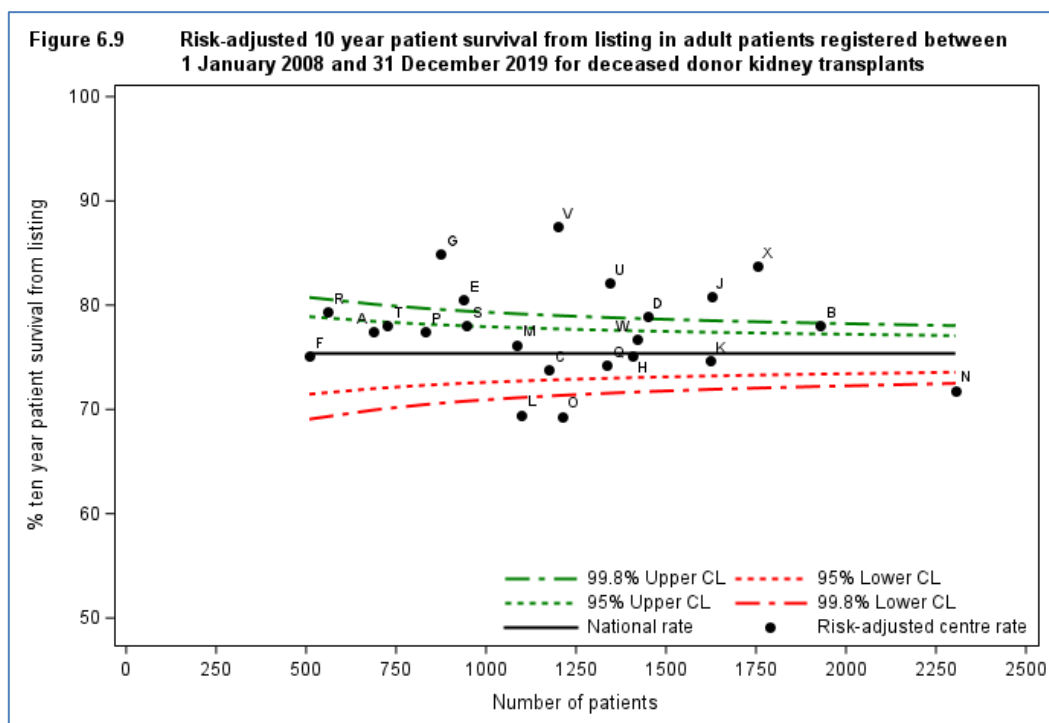


Table 6.3 Risk-adjusted 1, 5 and 10 year patient survival from listing for adult patients registered between 1 January 2008 and 31 December 2019 for deceased donor kidney transplants

Centre	Code	One year		Five year		Ten year	
		N	(%)	N	(%)	N	(%)
Belfast	A	687	(99)	687	(88)	687	(78)
Birmingham	B	1930	(99)	1930	(90)	1930	(78)
Bristol	C	1176	(99)	1176	(88)	1176	(74)
Cambridge	D	1450	(99)	1450	(90)	1450	(79)
Cardiff	E	938	(99)	938	(91)	938	(81)
Coventry	F	509	(99)	509	(89)	509	(75)
Edinburgh	G	874	(99)	874	(92)	874	(85)
Glasgow	H	1408	(99)	1408	(88)	1408	(75)
Guy's	J	1626	(99)	1626	(90)	1626	(81)
Leeds	K	1622	(99)	1622	(88)	1622	(75)
Leicester	L	1096	(98)	1096	(84)	1096	(69)
Liverpool	M	1087	(99)	1087	(88)	1087	(76)
Manchester	N	2304	(98)	2304	(85)	2304	(72)
Newcastle	O	1210	(99)	1210	(86)	1210	(69)
Nottingham	P	830	(99)	830	(89)	830	(77)
Oxford	Q	1337	(99)	1337	(87)	1337	(74)
Plymouth	R	561	(99)	561	(89)	561	(79)
Portsmouth	S	946	(99)	946	(89)	946	(78)
Sheffield	T	725	(99)	725	(89)	725	(78)
St Georges	U	1342	(99)	1342	(90)	1342	(82)
The Royal Free	V	1198	(99)	1198	(95)	1198	(88)
The Royal London	W	1421	(99)	1421	(88)	1421	(77)
WLRTC	X	1754	(99)	1754	(93)	1754	(84)
UK		28031	(98)	28031	(88)	28031	(75)

Centre has reached the upper 99.8% confidence limit

Centre has reached the upper 95% confidence limit

Centre has reached the lower 95% confidence limit

Centre has reached the lower 99.8% confidence limit

Form Return Rates

7.1 Deceased donor form return rates, 1 April 2019 – 31 March 2020

Form return rates are reported in **Table 7.1** for the kidney transplant record, three month and one year follow up form, along with lifetime follow up (more than two years). These include all adult deceased donor kidney only transplants between 1 April 2019 and 31 March 2020 for the transplant record, and all requests for follow up forms issued in this time period. Centres highlighted are transplant centres.

Table 7.1 Deceased donor form return rates, 1 April 2019 and 31 March 2020								
Centre	Transplant record		3 month follow-up		1 year follow-up		Lifetime follow-up	
	N	% returned	N	% returned	N	% returned	N	% returned
Aberdeen, Aberdeen Royal Infirmary							169	98
Airdrie, Monklands District General Hospital							36	100
Bangor, Ysbyty Gwynedd District General Hospital							63	98
Basildon, Basildon Hospital							63	87
Belfast, Antrim Hospital							63	92
Belfast, Belfast City Hospital	43	100	47	100	34	62	286	33
Belfast, The Ulster Hospital							40	3
Birmingham, Birmingham Heartlands Hospital							99	92
Birmingham, Queen Elizabeth Hospital Birmingham	136	100	145	99	110	95	673	99
Bodelwyddan, Glan Clwyd District General Hospital							47	100
Bradford, St Lukes Hospital							269	96
Brighton, Royal Sussex County Hospital							257	96
Bristol, Southmead Hospital	76	100	81	100	87	44	709	54
Cambridge, Addenbrooke's Hospital	148	100	160	100	149	94	483	100
Canterbury, Kent And Canterbury Hospital							290	90
Cardiff, University Of Wales Hospital	64	100	60	100	73	99	668	83
Carlisle, Cumberland Infirmary							94	94
Carshalton, St Helier Hospital							376	90
Chelmsford, Broomfield Hospital							84	100
County Down, Daisy Hill Hospital							80	84
Coventry, University Hospital	43	100	44	100	34	71	246	66
Derby, Royal Derby Hospital							182	98
Doncaster, Doncaster Royal Infirmary							60	98
Dorchester, Dorset County Hospital							242	7
Dudley, Russells Hall Hospital							62	98
Dundee, Ninewells Hospital							120	94
Edinburgh, Royal Infirmary Of Edinburgh	77	100	75	96	65	38	464	4
Exeter, Royal Devon And Exeter Hospital (Wonford)							219	99
Glasgow, Queen Elizabeth University Hospital	105	100	118	99	97	98	1002	93
Gloucester, Gloucestershire Royal Hospital							135	20
Great Yarmouth, James Paget Hospital							32	100
Hull, Hull Royal Infirmary							263	100
Inverness, Raigmore Hospital							83	96
Ipswich, Ipswich Hospital							155	99
Kings Lynn, The Queen Elizabeth Hospital							22	100
Leeds, St James's University Hospital	126	100	126	98	129	98	724	94
Leicester, Leicester General Hospital	94	100	102	100	95	98	631	99

Table 7.1 Deceased donor form return rates, 1 April 2019 and 31 March 2020

Centre	Transplant record		3 month follow-up		1 year follow-up		Lifetime follow-up	
	N	% returned	N	% returned	N	% returned	N	% returned
Liverpool, Royal Liverpool University Hospital	72	100	80	95	85	85	420	80
London, Guy's Hospital	170	100	191	70	151	65	537	98
London, Royal Free Hospital	85	100	86	100	68	93	828	88
London, St George's Hospital	113	100	127	96	104	66	351	2
London, St Mary's Hospital							180	98
London, The Royal London Hospital (Whitechapel)	151	99	174	97	139	91	647	98
London, West London Renal And Transplant Centre	176	100	156	99	130	98	774	98
Londonderry, Altnagelvin Area Hospital							50	66
Manchester, Manchester Royal Infirmary	153	100	167	85	165	84	784	91
Middlesbrough, The James Cook University Hospital							299	89
Newcastle, Freeman Hospital	78	100	89	97	70	96	368	100
Northampton, Northampton General Hospital							51	75
Norwich, Norfolk And Norwich University Hospital							266	100
Nottingham, Nottingham City Hospital	48	100	62	100	65	71	468	80
Oxford, Churchill Hospital	123	100	150	97	163	66	684	68
Plymouth, Derriford Hospital	44	100	43	77	40	78	207	96
Portsmouth, Queen Alexandra Hospital	59	100	73	100	69	14	714	23
Preston, Royal Preston Hospital							401	92
Reading, Royal Berkshire Hospital							293	74
Salford, Salford Royal							409	93
Sheffield, Northern General Hospital	58	100	58	98	49	76	498	79
Shrewsbury, Royal Shrewsbury Hospital							81	95
St Helier, Jersey General Hospital							21	100
Stevenage, Lister Hospital							219	86
Stoke-On-Trent, Royal Stoke University Hospital							206	94
Sunderland, Sunderland Royal Hospital							149	99
Swansea, Morriston Hospital							186	99
Truro, Royal Cornwall Hospital (Treliske)							200	15
Westcliff On Sea, Southend Hospital							61	56
Wirral, Arrowe Park Hospital							109	14
Wolverhampton, New Cross Hospital							115	98
Wrexham, Maelor General Hospital							93	100
York, York District Hospital							214	95

7.2 Living donor form return rates, 1 April 2019 – 31 March 2020

Form return rates are reported in **Table 7.2** for the kidney transplant record, three month and one year follow up form, along with lifetime follow up (more than two years). These include all adult living donor kidney only transplants between 1 April 2019 and 31 March 2020 for the transplant record, and all requests for follow up forms issued in this time period. Centres highlighted are transplant centres.

Table 7.2 Living donor form return rates, 1 April 2019 and 31 March 2020								
Centre	Transplant record		3 month follow-up		1 year follow-up		Lifetime follow-up	
	N	% returned	N	% returned	N	% returned	N	% returned
Aberdeen, Aberdeen Royal Infirmary							78	99
Bangor, Ysbyty Gwynedd District General Hospital							21	90
Basildon, Basildon Hospital							36	81
Belfast, Antrim Hospital							50	88
Belfast, Belfast City Hospital	63	100	63	100	59	54	263	33
Belfast, The Ulster Hospital							40	3
Birmingham, Birmingham Heartlands Hospital							39	82
Birmingham, Queen Elizabeth Hospital Birmingham	39	95	42	98	31	97	422	99
Bodelwyddan, Glan Clwyd District General Hospital							26	100
Bradford, St Lukes Hospital							52	100
Brighton, Royal Sussex County Hospital							162	99
Bristol, Southmead Hospital	26	100	28	71	28	39	353	54
Cambridge, Addenbrooke's Hospital	41	98	43	100	30	93	264	100
Canterbury, Kent And Canterbury Hospital							227	89
Cardiff, University Of Wales Hospital	31	100	33	76	38	74	352	84
Carlisle, Cumberland Infirmary							36	86
Carshalton, St Helier Hospital							268	91
Chelmsford, Broomfield Hospital							28	96
County Down, Daisy Hill Hospital							53	79
Coventry, University Hospital	21	100	27	89	33	70	227	68
Derby, Royal Derby Hospital							44	100
Doncaster, Doncaster Royal Infirmary							24	100
Dorchester, Dorset County Hospital							96	4
Dudley, Russells Hall Hospital							23	96
Dulwich, King's College Hospital							165	1
Dundee, Ninewells Hospital							68	94
Edinburgh, Royal Infirmary Of Edinburgh	48	100	52	90	57	47	217	3
Exeter, Royal Devon And Exeter Hospital (Wonford)							97	99
Glasgow, Queen Elizabeth University Hospital	51	94	48	100	34	94	430	92
Gloucester, Gloucestershire Royal Hospital							55	31
Hull, Hull Royal Infirmary							127	96
Inverness, Raigmore Hospital							38	97
Ipswich, Ipswich Hospital							47	98
Leeds, St James's University Hospital	46	100	55	93	61	95	236	94
Leicester, Leicester General Hospital	49	94	49	98	27	93	426	99

Table 7.2 Living donor form return rates, 1 April 2019 and 31 March 2020

Centre	Transplant record		3 month follow-up		1 year follow-up		Lifetime follow-up	
	N	% returned	N	% returned	N	% returned	N	% returned
Liverpool, Royal Liverpool University Hospital	29	100	31	100	39	77	266	83
London, Cromwell Hospital	3	33						
London, Guy's Hospital	77	99	79	77	71	80	459	99
London, Royal Free Hospital	38	92	37	100	40	83	420	87
London, St George's Hospital	46	100	45	100	43	65	157	3
London, St Mary's Hospital							132	98
London, The Royal London Hospital (Whitechapel)	39	100	40	98	45	87	343	98
London, West London Renal And Transplant Centre	56	100	54	100	48	96	510	99
Londonderry, Altnagelvin Area Hospital							39	67
Manchester, Manchester Royal Infirmary	70	100	72	81	56	82	373	91
Middlesbrough, The James Cook University Hospital							192	89
Newcastle, Freeman Hospital	52	100	56	98	55	93	233	100
Northampton, Northampton General Hospital							22	86
Norwich, Norfolk And Norwich University Hospital							73	99
Nottingham, Nottingham City Hospital	18	94	19	95	8	88	142	87
Omagh, Tyrone County Hospital							32	6
Oxford, Churchill Hospital	52	100	57	89	56	64	407	65
Plymouth, Derriford Hospital	14	93	18	78	26	81	86	94
Portsmouth, Queen Alexandra Hospital	24	100	27	100	29	10	300	26
Preston, Royal Preston Hospital							225	87
Reading, Royal Berkshire Hospital							104	73
Salford, Salford Royal							165	93
Sheffield, Northern General Hospital	17	94	13	92	16	94	231	77
Shrewsbury, Royal Shrewsbury Hospital							57	98
Stevenage, Lister Hospital							73	81
Stoke-On-Trent, Royal Stoke University Hospital							152	94
Sunderland, Sunderland Royal Hospital							82	98
Swansea, Morriston Hospital							59	100
Truro, Royal Cornwall Hospital (Treliske)							75	24
Westcliff On Sea, Southend Hospital							45	53
Wirral, Arrowe Park Hospital							54	19
Wolverhampton, New Cross Hospital							51	100
Wrexham, Maelor General Hospital							42	98
York, York District Hospital							63	97

Paediatric kidney transplant list

8.1 Patients on the kidney transplant list as at 31 March, 2011 – 2020 and 29 February 2020

Figure 8.1 shows the number of paediatric patients on the kidney only [transplant list](#) at 31 March each year between 2010 and 2019 and at 29 February 2020. The number of patients actively waiting for a kidney transplant fell from 93 in 2011 to 62 in 2018, with an increase to 108 patients in 2020.

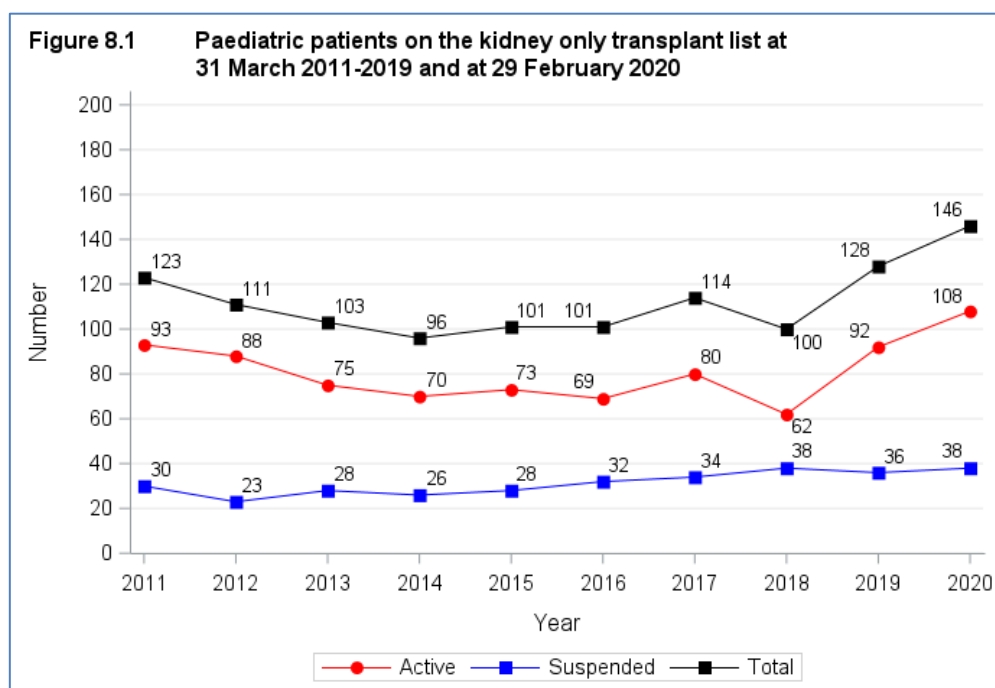


Figure 8.2 shows the number of paediatric patients on the active kidney only [transplant list](#) at 29 February 2020 by centre. In total, there were 108 paediatric patients. Birmingham had the largest proportion of the [transplant list](#) (29%) and Belfast had the smallest (0%).

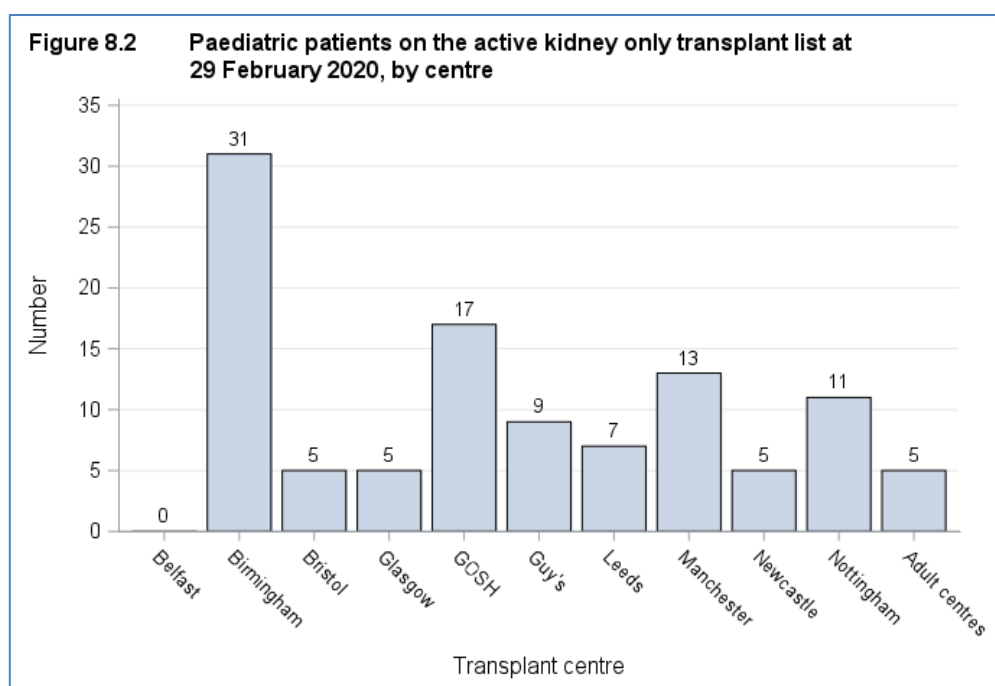


Figure 8.3 shows the number of paediatric patients on the suspended kidney only [transplant list](#) at 29 February 2020 by centre. In total, there were 38 paediatric patients. GOSH had the largest proportion of the [transplant list](#) (26%) and Belfast and Glasgow had the smallest (0%).

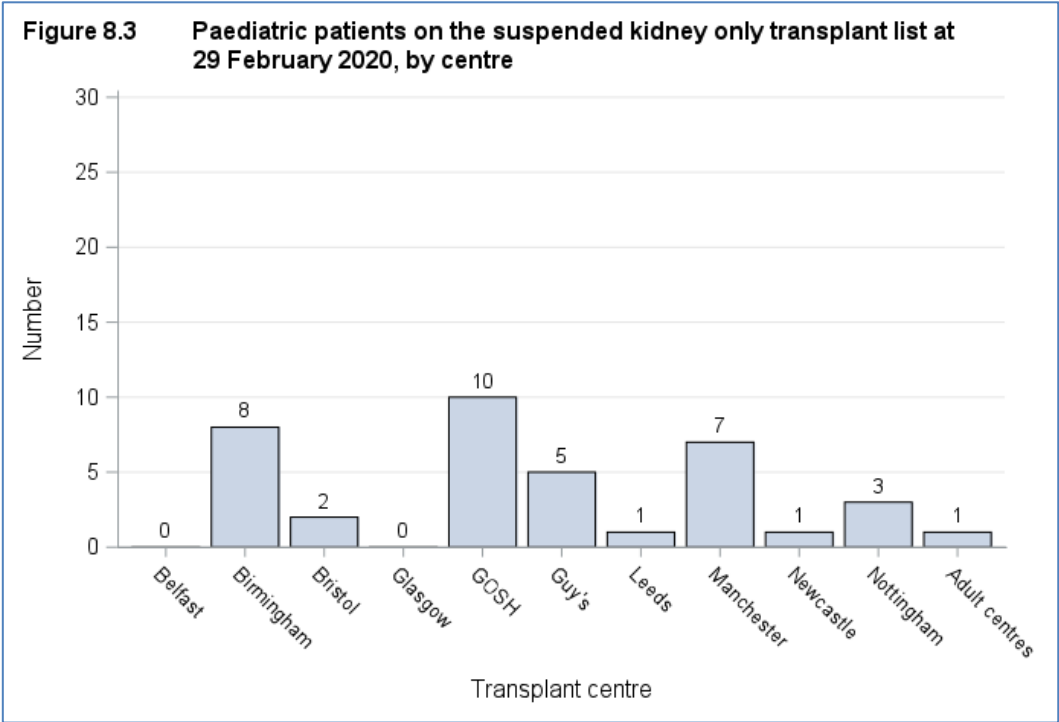
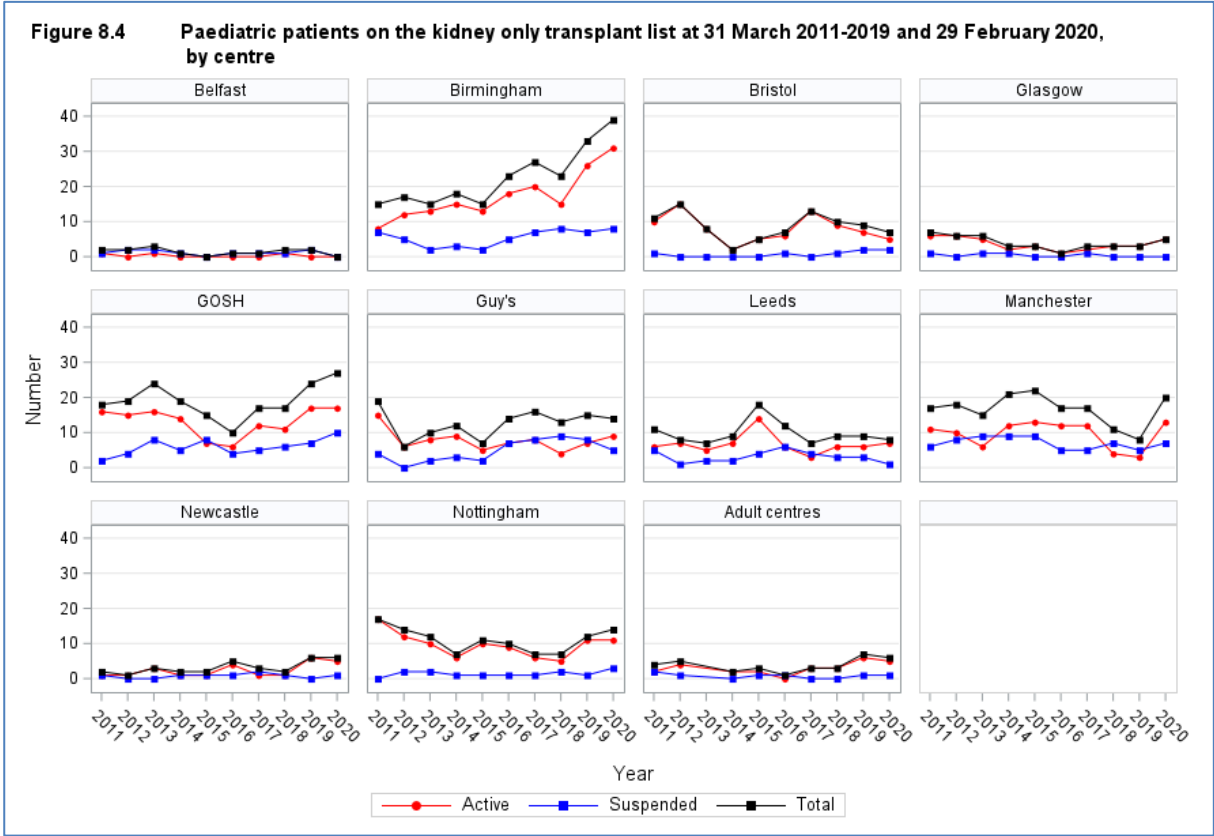


Figure 8.4 shows the number of paediatric patients on the [transplant list](#) at 31 March each year between 2011 and 2019 and at 29 February for each transplant centre.



8.2 Demographic characteristics, 1 April 2019 – 31 March 2020

The sex, ethnicity and age group of patients on the transplant are shown by centre in **Figure 8.5, 8.6** and **8.7**, respectively. Note that all percentages quoted are based only on data where relevant information was available. Changes made to the Kidney Allocation Scheme in 2006 and the 2019 National Kidney Offering Scheme mean that tissue matching criteria between donor and recipient are less strict than previously and waiting time to transplant is now more important than it was in deciding kidney allocation. These changes have an indirect benefit for patients from ethnic minority groups, who are less often a good tissue match with the predominantly white donor pool. As a result, access to transplantation is becoming more equitable.

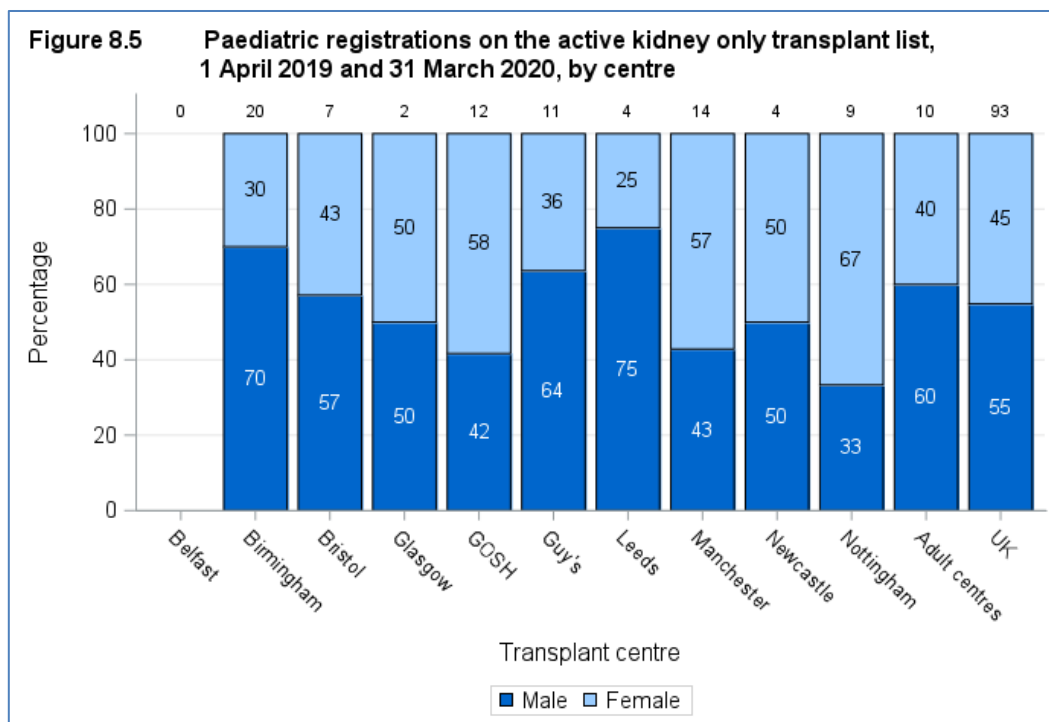


Figure 8.6 Paediatric registrations on the active kidney only transplant list, 1 April 2019 and 31 March 2020, by centre

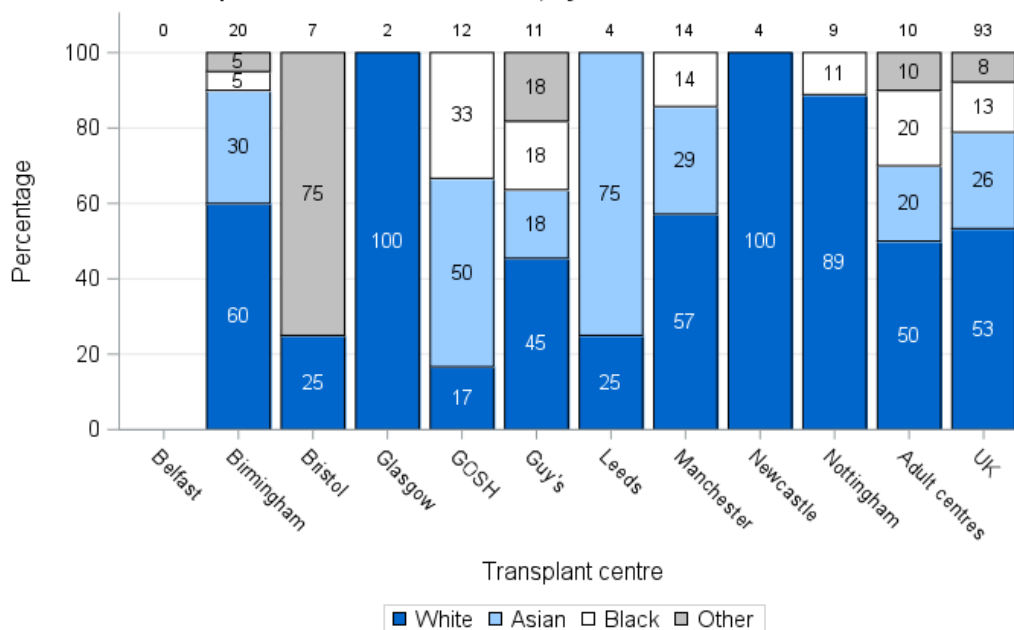
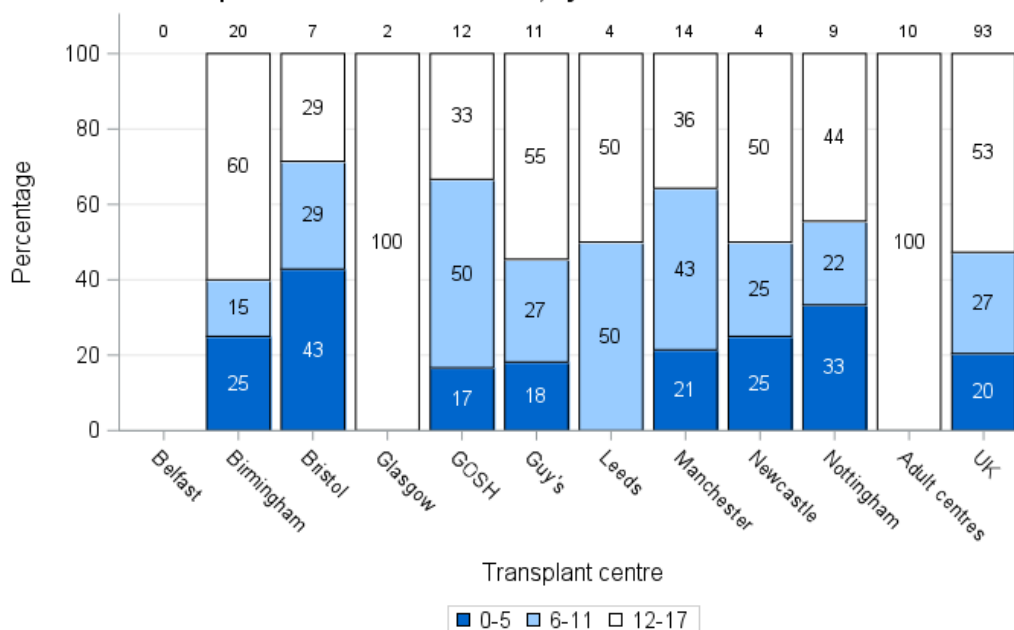
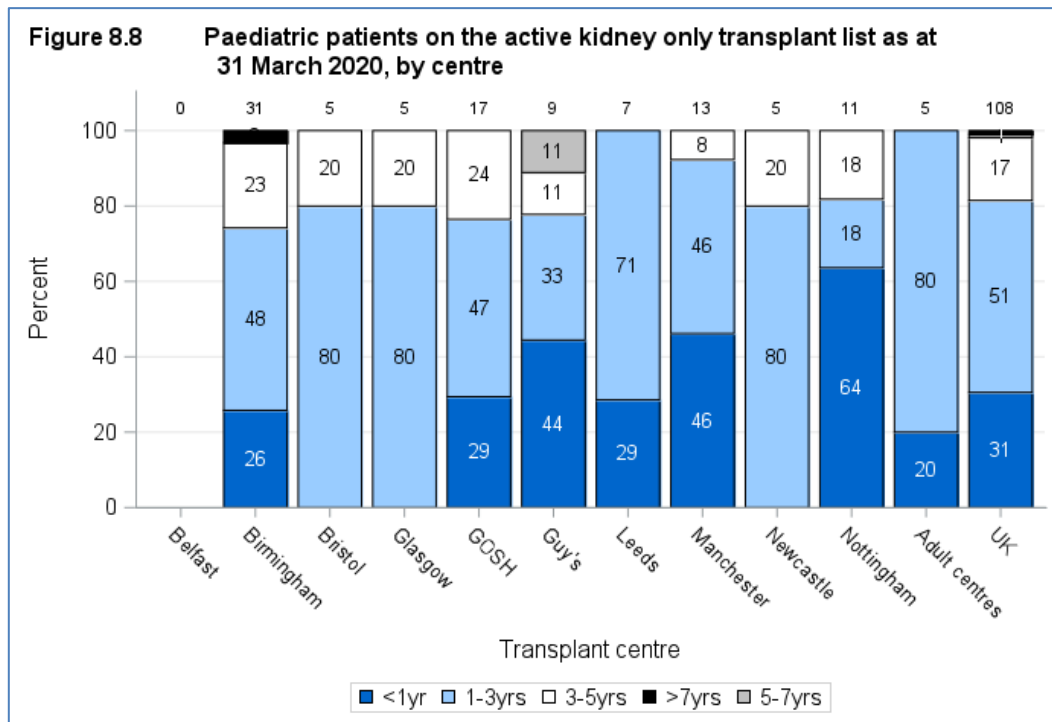


Figure 8.7 Paediatric registrations on the active kidney only transplant list, 1 April 2019 and 31 March 2020, by centre



8.3 Patient waiting times for those currently on the list, 29 February 2020

Figure 8.8 shows the length of time patients have been waiting on the kidney only [transplant list](#) at 29 February 2020 by centre.



8.4 Median waiting time to transplant, 1 April 2014 - 31 March 2017

The length of time a patient waits for a kidney transplant varies across the UK. The [median](#) waiting time for paediatric deceased donor kidney only transplantation is shown in **Figure 8.8** and **Table 38.1** for patients registered at each individual unit. The data shown are for all paediatric patients, joining the list within the time period shown, including those still awaiting a transplant on the day of analysis. Patients who received a [live donor](#) or [multi-organ transplant](#) are not included. The national allocation scheme introduced in April 2006 helped to reduce the variability in deceased donor kidney waiting times across the country but currently some variability remains. Waiting times across centres continue to differ in a way that it is difficult for centres to control, given that the 2006 [National Kidney Allocation Scheme](#) determined allocation of all kidneys available for transplant from donors after brain death (DBD). This has continued following the introductions of the 2019 National Kidney Offering Scheme which determines allocation of all DBD kidneys and kidneys from donations after circulatory death (DCD).

2006 National Kidney Allocation Scheme

Only kidneys from donors after brain death were allocated via a national allocation scheme during the majority of the time period analysed. DCD kidneys were allocated to patients through local allocation arrangements and these vary across the country because some centres have a larger DCD programme than others. From 3 September 2014 one kidney from DCD donors aged between 5 and 49 years were allocated within four pre-defined regions using the 2006 DBD allocation principles and as such should reduce variability in waiting times across the country.

Kidneys from DBD are allocated to patients listed nationally through the 2006 Kidney Allocation Scheme. The 2006 Kidney Allocation Scheme introduced in April 2006 prioritised patients with ideal tissue matches (000 HLA mismatches) and then assigned points to patients based on the level of tissue match between donor and recipient, the length of time spent waiting for a transplant, age of the recipient (with a progressive reduction in points given after the age of thirty) and location points such that patients geographically close to the retrieval centre received more points. The patients with the highest number of points for a donated kidney were preferentially offered the kidney, no matter where in the UK they received their treatment.

2019 National Kidney Offering Scheme

The 2019 Kidney Offering Scheme was introduced on 11 September 2019 and this is a single scheme for offering all kidneys from deceased donors in the UK. This scheme prioritises patients who are difficult to match or have waited a long time for a transplant

The [median](#) waiting time to transplant for paediatric patients registered on the kidney only [transplant list](#) between 1 April 2014 and 31 March 2017 is 312 days. This ranged from 159 days at Leeds to 471 days at Bristol.

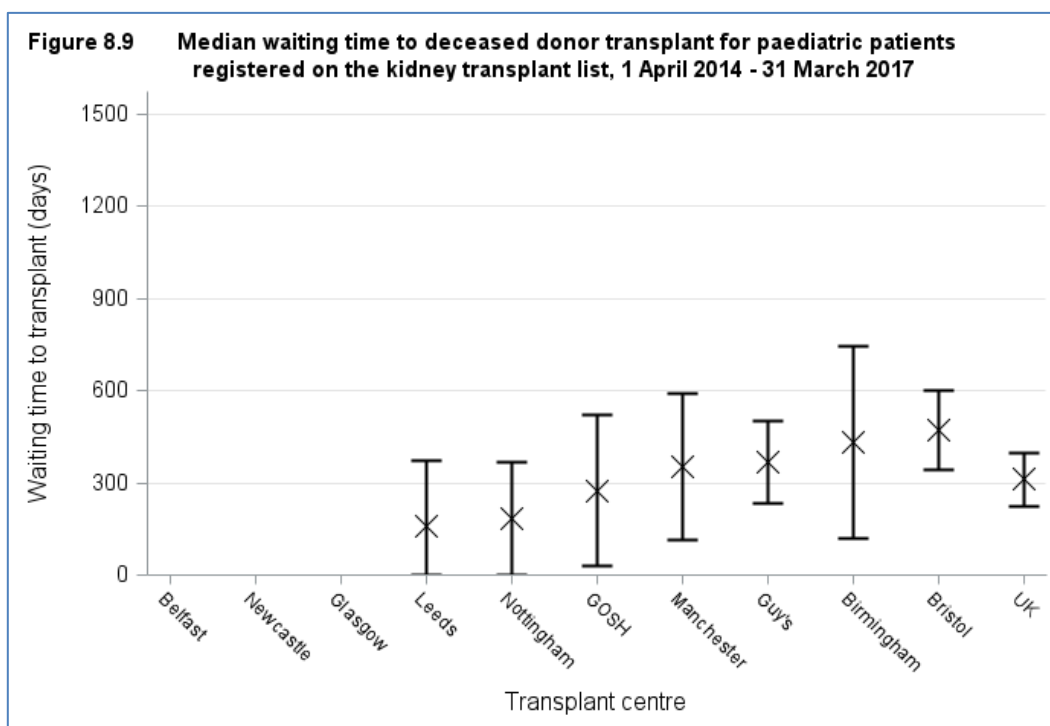
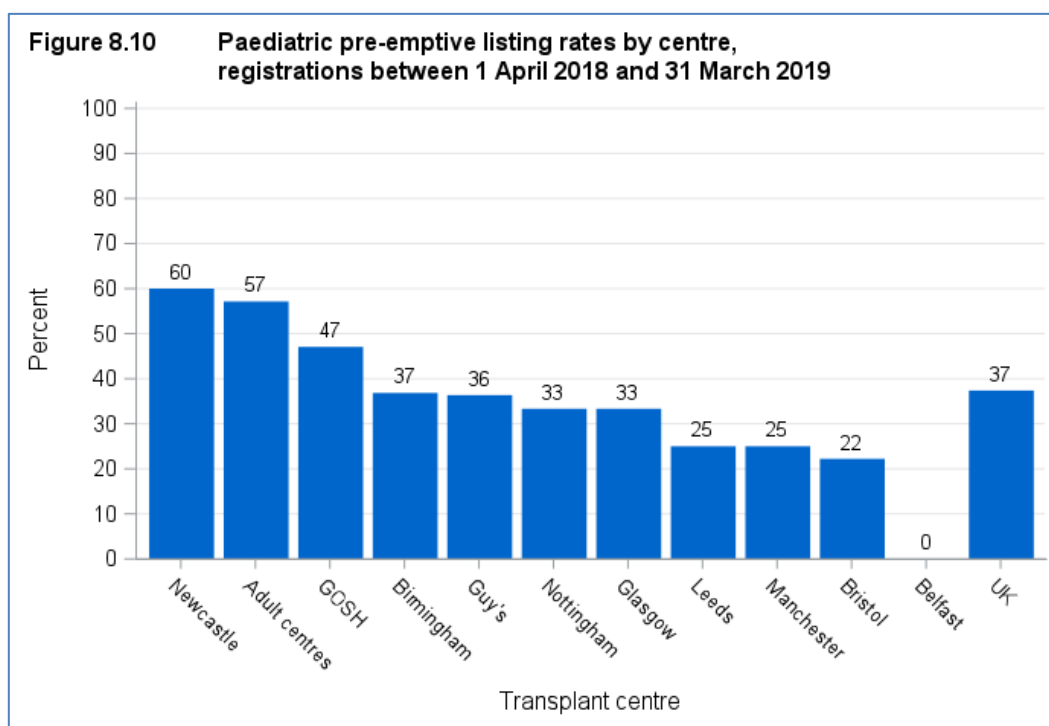


Table 8.1 Median waiting time to kidney only transplant in the UK, for paediatric patients registered 1 April 2014 - 31 March 2017

Transplant centre	Number of patients registered	Waiting time (days)	
		Median	95% Confidence interval
Paediatric			
Belfast	0	-	
Newcastle	0	-	
Glasgow	0	-	
Leeds	25	159	0 - 373
Nottingham	24	185	3 - 367
GOSH	20	276	31 - 521
Manchester	21	353	114 - 592
Guy's	19	367	232 - 502
Birmingham	37	432	119 - 745
Bristol	25	471	341 - 601
UK	202	312	225 - 399

8.5 Pre-emptive listing rates, 1 April 2018 - 31 March 2019

Rates of [pre-emptive](#) kidney only listings are shown in **Figure 8.10** for paediatric patients joining the list between 1 April 2018 and 31 March 2019. Patients listed on the deceased donor [transplant list](#) prior to receiving a living donor transplant are excluded and in order to remove the effect of these patients an earlier cohort was selected. [Pre-emptive](#) listing accounted for 37% of all paediatric registrations across the UK ranging from 60% at Newcastle to 0% at Belfast.



Response to paediatric kidney offers

Offer decline rates

Kidney-only offers from [DBD](#) donors who had at least one kidney retrieved, offered directly and on behalf of a named individual patient and resulted in transplantation are included in the analysis. Any offers made through the reallocation of kidneys, declined kidney or fast track schemes were excluded, as were offers of kidneys from donations after circulatory death donors.

Data are presented for standard criteria donors (SCD). SCD are [DBD](#) donors aged <50 at the time of death.

[Funnel plots](#) were used to compare centre specific offer decline rates and indicate how consistent the rates of the individual transplant centres are with the national rate. The overall national unadjusted offer decline rate is shown by the solid line while the 95% and 99.8% confidence lines are indicated via a thin and thick dotted line, respectively. Each dot in the plot represents an individual transplant centre. Centres that are positioned above the upper limits indicate an offer decline rate that is higher than the national rate, while centres positioned below the lower limits indicate an offer decline rate that is lower than the national rate. Patient [case mix](#) is known to influence the number of offers a centre may receive. In this analysis however only individual offers for named patients were considered which excluded any [ABO](#)- and HLA-incompatible patients. For this reason it was decided not to risk adjust for known centre differences in patient [case mix](#).

9.1 Standard criteria offer decline rates, 1 April 2017 – 31 March 2020

Figure 9.1 compares individual centre offer decline rates with the national rate for SCD over the time period, 1 April 2017 and 31 March 2020. Centres can be identified by the information shown in **Table 9.1**. All centres have an offer decline rate that is in line with the national rate.

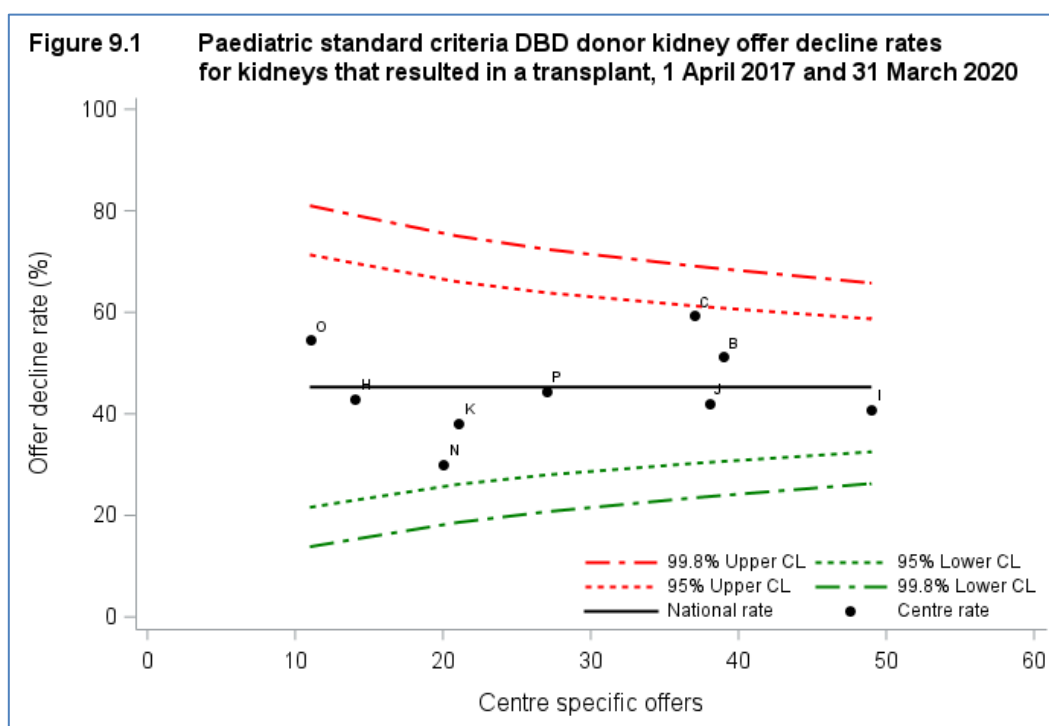


Table 9.1 compares individual centre offer decline rates for SCD over time by financial year.

Table 9.1 Paediatric standard criteria DBD donor kidney offer decline rates by transplant centre, 1 April 2017 and 31 March 2020									
Centre	Code	2017/18		2018/19		2019/20		Overall	
		N	(%)	N	(%)	N	(%)	N	(%)
Birmingham	B	14	(64)	12	(42)	39	(51)	13	(46)
Bristol	C	13	(62)	10	(70)	37	(59)	14	(50)
GOSH	I	17	(41)	15	(47)	49	(41)	17	(35)
Glasgow	H	7	(29)			14	(43)	7	(57)
Guy's	J	14	(43)	8	(38)	38	(42)	16	(44)
Leeds	K	6	(33)	3	(33)	21	(38)	12	(42)
Manchester	N	9	(22)	3	(33)	20	(30)	8	(38)
Newcastle	O	6	(67)	5	(40)	11	(55)		
Nottingham	P	10	(40)	5	(60)	27	(44)	12	(42)
UK		96	(46)	61	(48)	256	(45)	99	(43)

Paediatric kidney transplants

10.1 Kidney only transplants, 1 April 2010 – 31 March 2020

Figure 10.1 shows the total number of paediatric kidney only transplants performed in the last ten years, by type of donor. Only a small number of paediatric transplants use kidneys from donors after circulatory death ([DCD](#)), 6 in 2019/20.

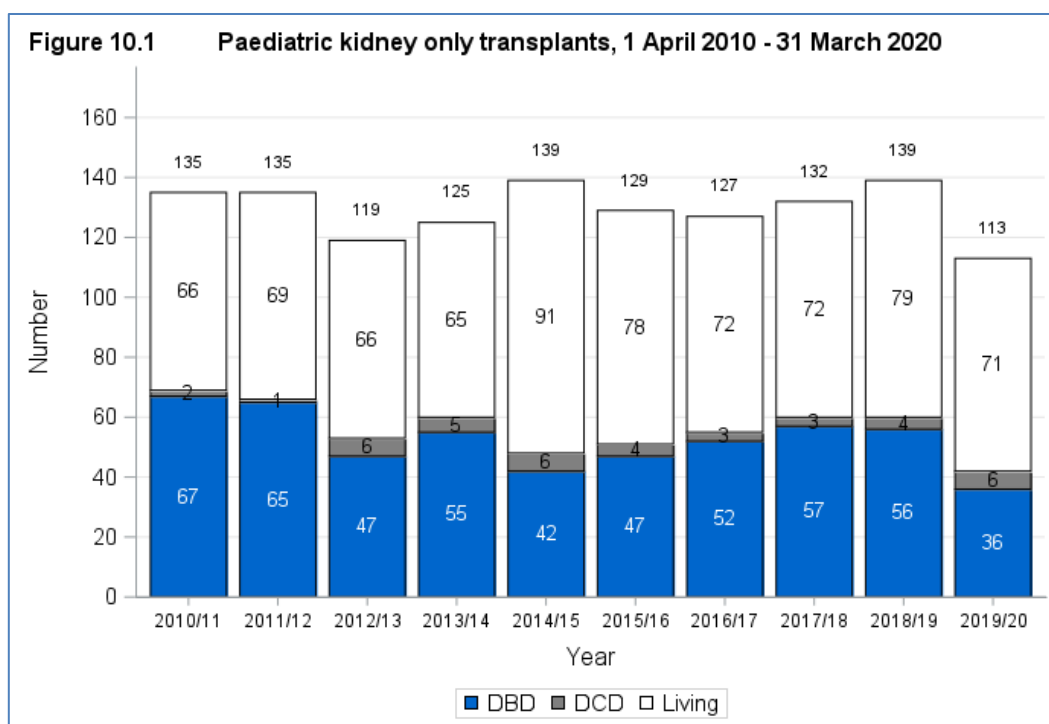
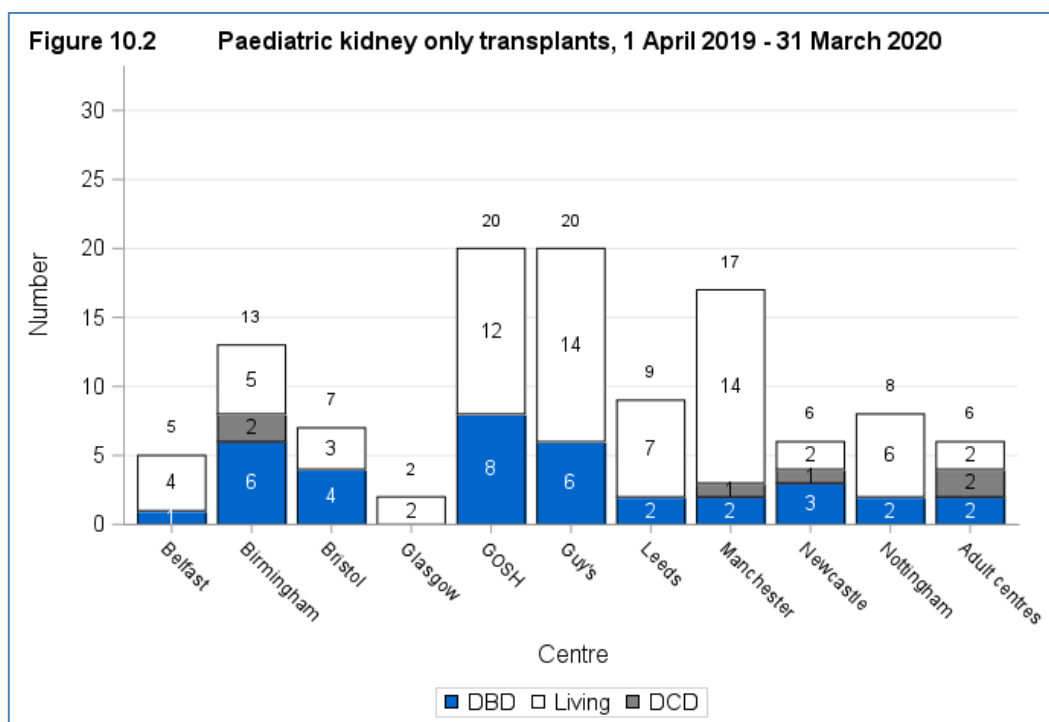


Figure 10.2 shows the total number of paediatric kidney only transplants performed in 2019/20, by centre and type of donor. The same information is presented in **Figure 10.3** but this shows the proportion of [DBD](#), [DCD](#) and living donor transplants performed at each centre.



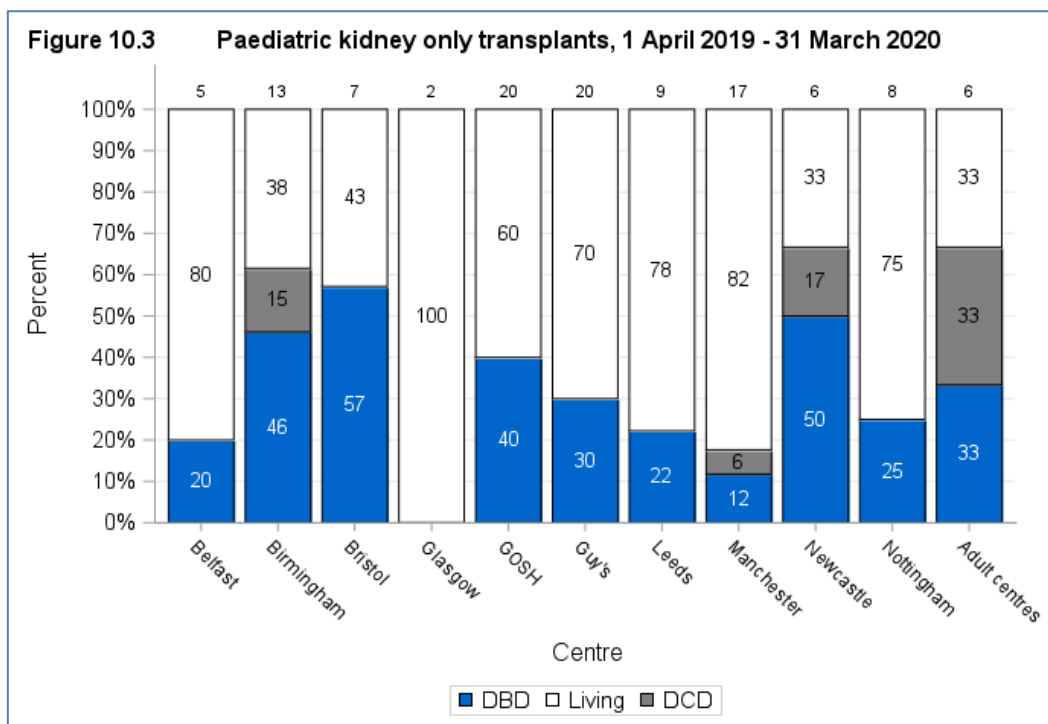
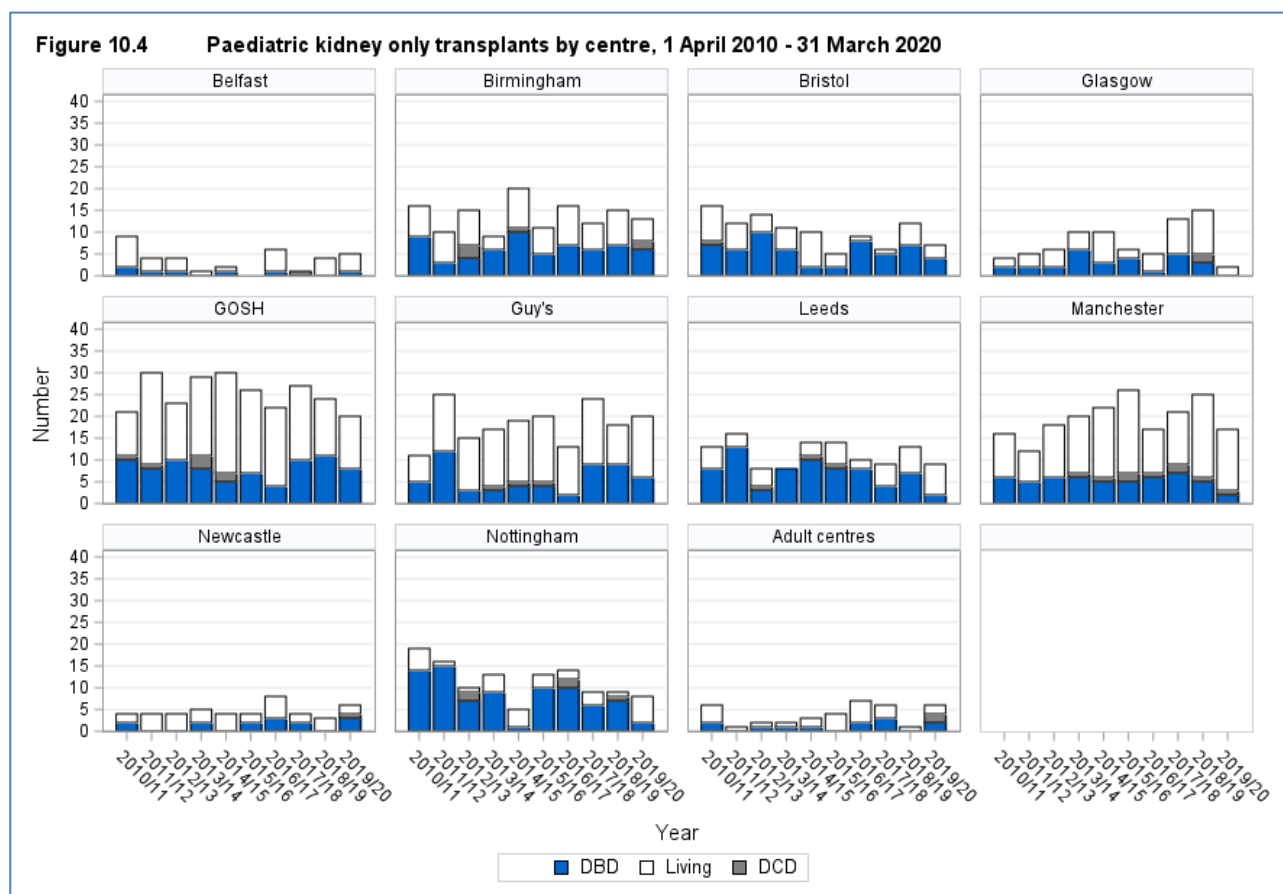
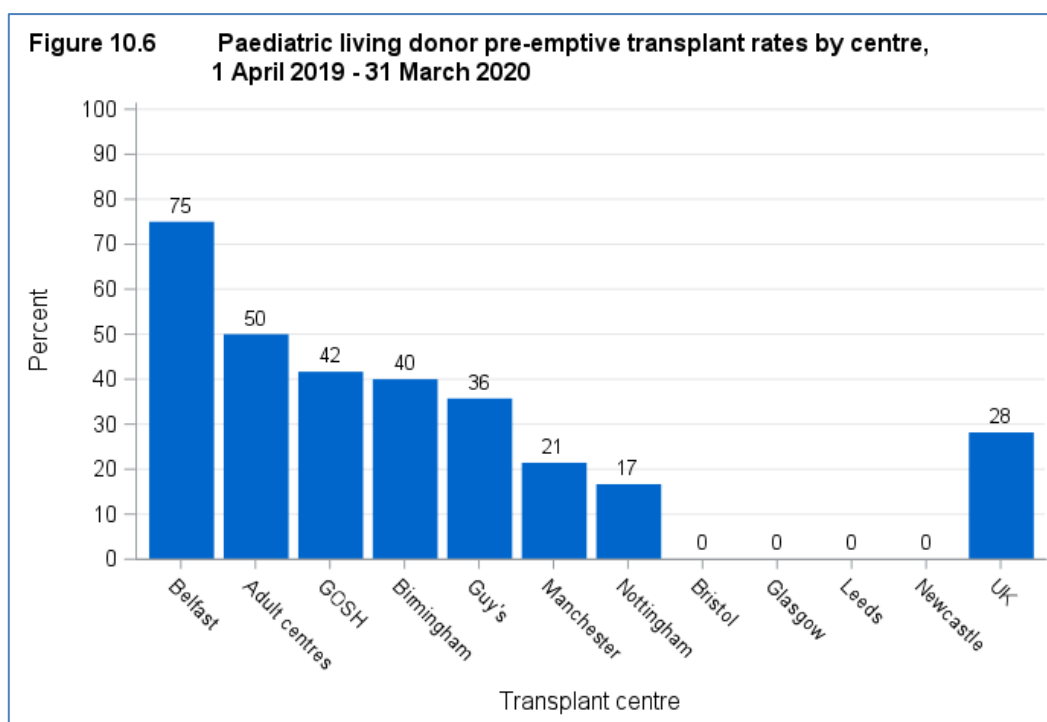
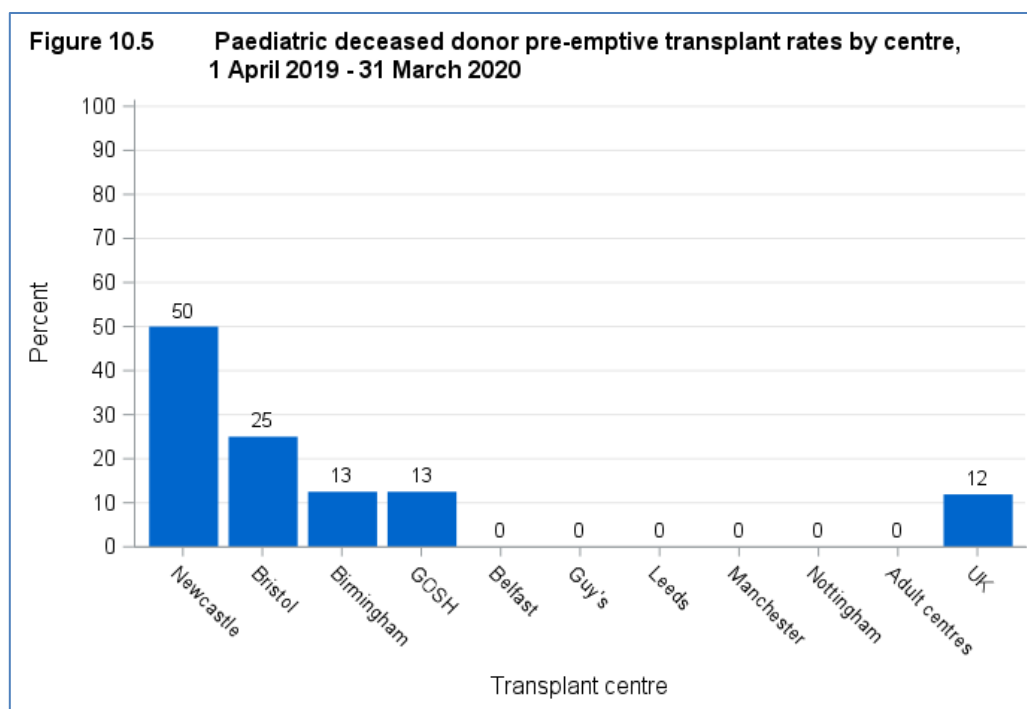


Figure 10.4 shows the total number of paediatric kidney only transplants performed in last ten years, by centre and type of donor.



10.2 Pre-emptive transplant rates, 1 April 2019 - 31 March 2020

Rates of [pre-emptive](#) kidney only transplantation are shown in **Figure 10.5** for paediatric deceased donor transplants and **Figure 10.6** for paediatric living donor transplants. Living donor transplants are more likely to be carried out before the need for dialysis than deceased donor transplants: 26% and 12% respectively. This is because a living donor transplant can often be carried out more quickly than a deceased donor kidney transplant as the latter often necessitates a long waiting time. Paediatric deceased donor [pre-emptive](#) transplant rates ranged from 50% at Newcastle to 0% at Belfast, Guy's, Leeds, Manchester, Nottingham and Adults centres. Paediatric living donor [pre-emptive](#) transplant rates ranged from 75% at Belfast to 0% at Bristol, Glasgow, Leeds and Newcastle.



Paediatric kidney outcomes

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 [risk-adjusted survival rate](#) plotted against the number of transplants for each centre, with the overall national [unadjusted 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.

11.1 Deceased donor graft and patient survival

The [funnel plots](#) show that, for the most part, the centres lie within the [confidence limits](#). None of the [funnel plots](#) show any centres that lie outside the lower 95% [confidence limits](#). Some of the [funnel plots](#) show some centres to be above the upper 99.8% [confidence limit](#). This suggests that these centres may have survival rates that are considerably higher than the national rate. Centres can be identified by the information shown in **Table 11.1**.

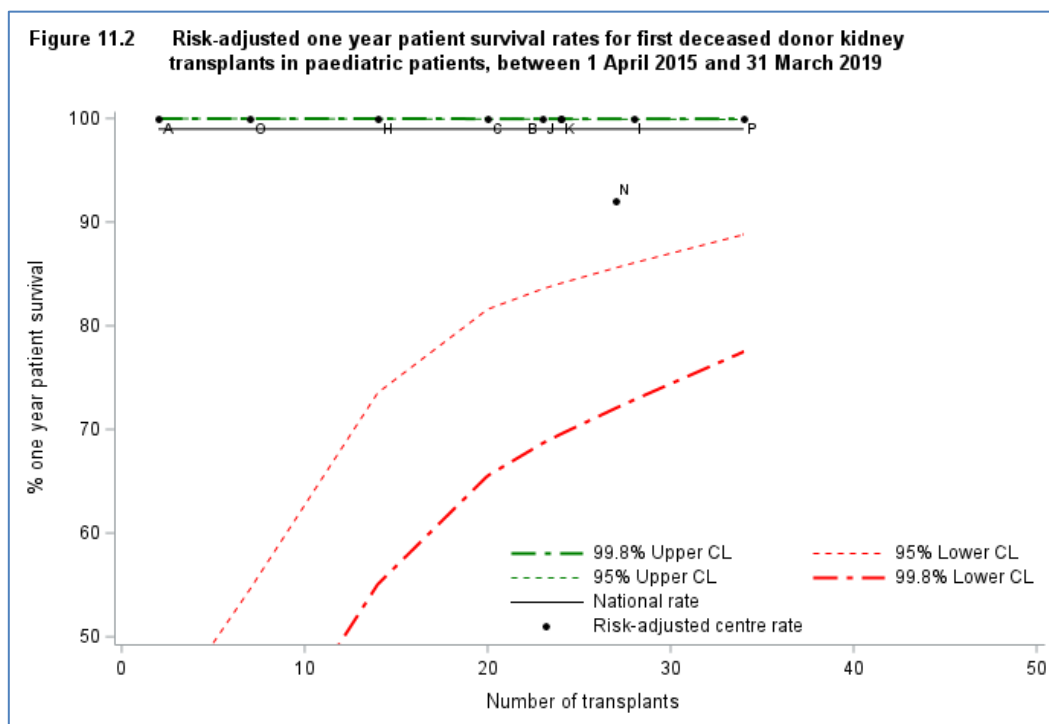
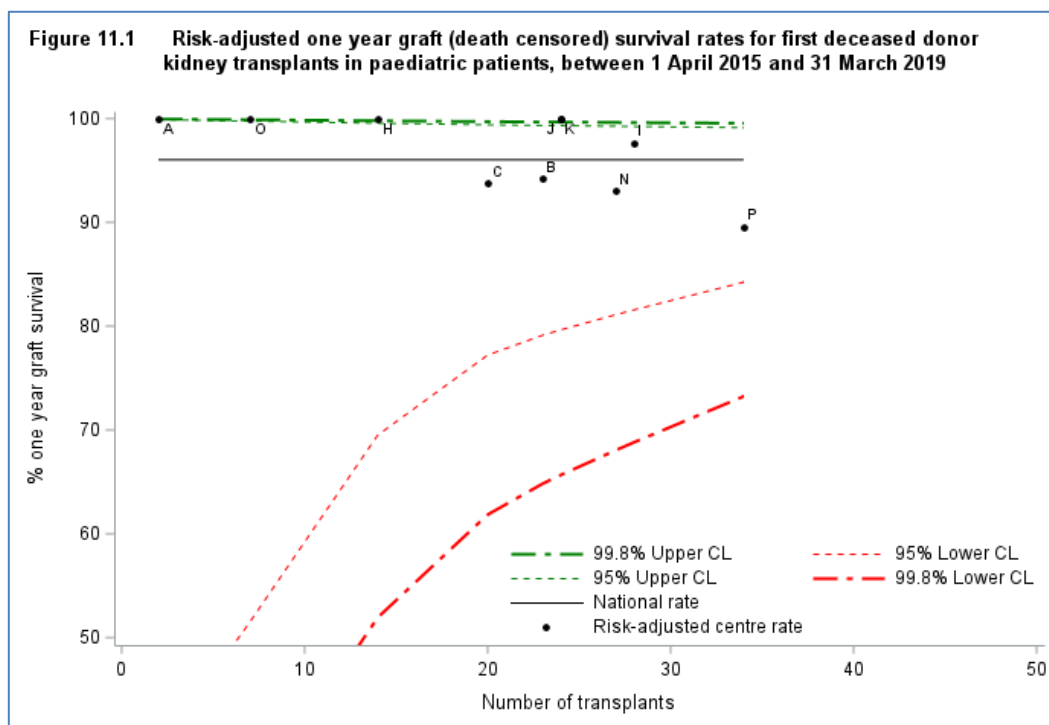


Figure 11.3 Risk-adjusted five year graft (death censored) survival rates for first deceased donor kidney transplants in paediatric patients, between 1 April 2011 and 31 March 2015

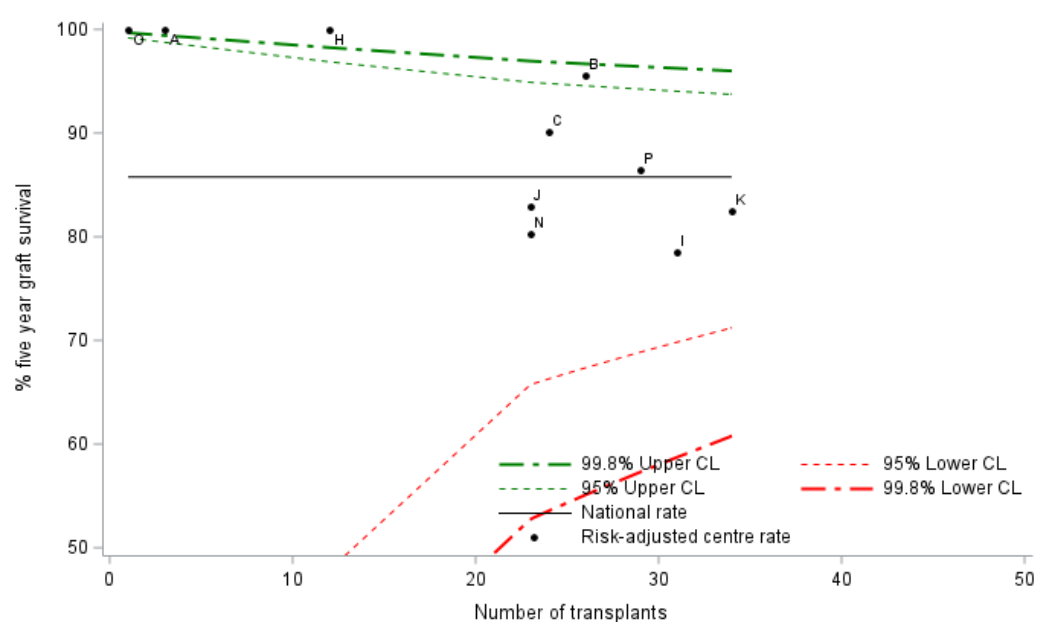


Figure 11.4 Risk-adjusted five year patient survival rates for first deceased donor kidney transplants in paediatric patients, between 1 April 2011 and 31 March 2015

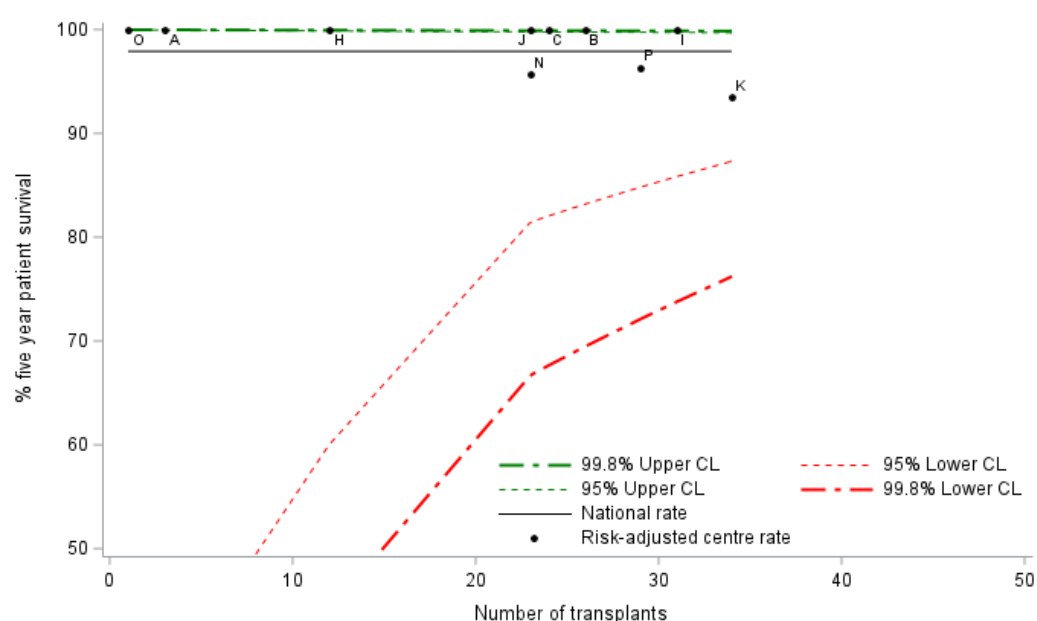


Table 11.1 One and five year first paediatric kidney-only graft and patient survival using kidneys from deceased donors

Centre	Code	Kidney graft survival				Patient survival			
		One-year*		Five-year**		One-year*		Five-year**	
		%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Belfast	A	100	N/A	100	N/A	100	N/A	100	N/A
Birmingham	B	94	(79 - 99)	96	(75 - 100)	100	N/A	100	N/A
Bristol	C	94	(65 - 100)	90	(64 - 99)	100	N/A	100	N/A
GOSH	I	98	(87 - 100)	78	(56 - 91)	100	N/A	100	N/A
Glasgow	H	100	N/A	100	N/A	100	N/A	100	N/A
Guy's	J	100	N/A	83	(56 - 95)	100	N/A	100	N/A
Leeds	K	100	N/A	82	(59 - 94)	100	N/A	94	(77 - 99)
Manchester	N	93	(75 - 99)	80	(50 - 95)	92	(71 - 99)	96	(76 - 100)
Newcastle	O	100	N/A	100	N/A	100	N/A	100	N/A
Nottingham	P	90	(62 - 99)	86	(65 - 96)	100	N/A	96	(80 - 100)
UK		96	(92 - 98)	86	(80 - 90)	99	(96 - 100)	98	(95 - 99)

* Includes transplants performed between 1 april 2015 - 31 March 2019

** Includes transplants performed between 1 april 2011 - 31 March 2015

11.2 Living donor graft and patient survival

The [funnel plots](#) show that, for the most part, the centres lie within the [confidence limits](#). None of the [funnel plots](#) show any centres that lie outside the lower 95% [confidence limits](#). Some of the [funnel plots](#) show some centres to be above the upper 99.8% [confidence limit](#). This suggests that these centres may have survival rates that are considerably higher than the national rate. Centres can be identified by the information shown in **Table 11.2**.

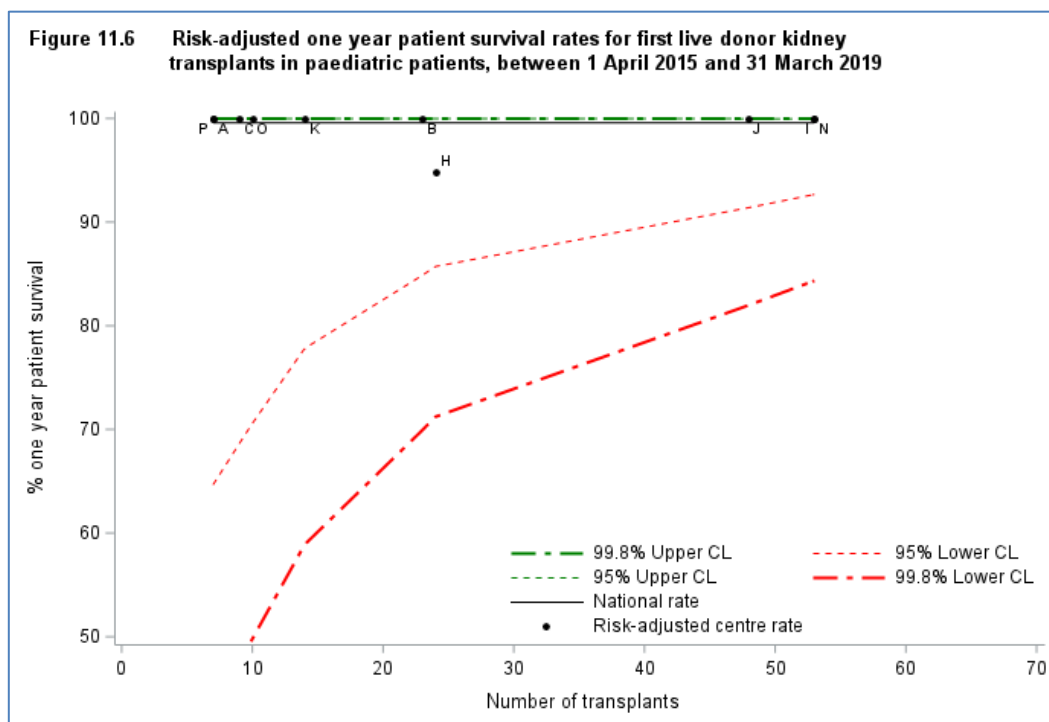
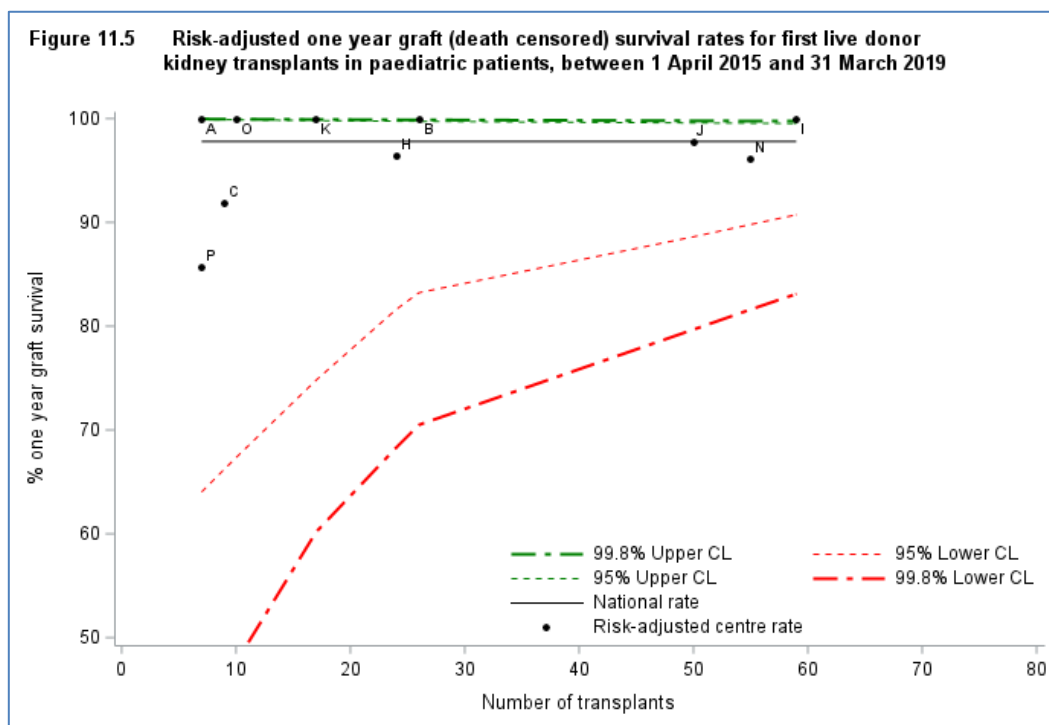


Figure 11.7 Risk-adjusted five year graft (death censored) survival rates for first live donor kidney transplants in paediatric patients, between 1 April 2011 and 31 March 2015

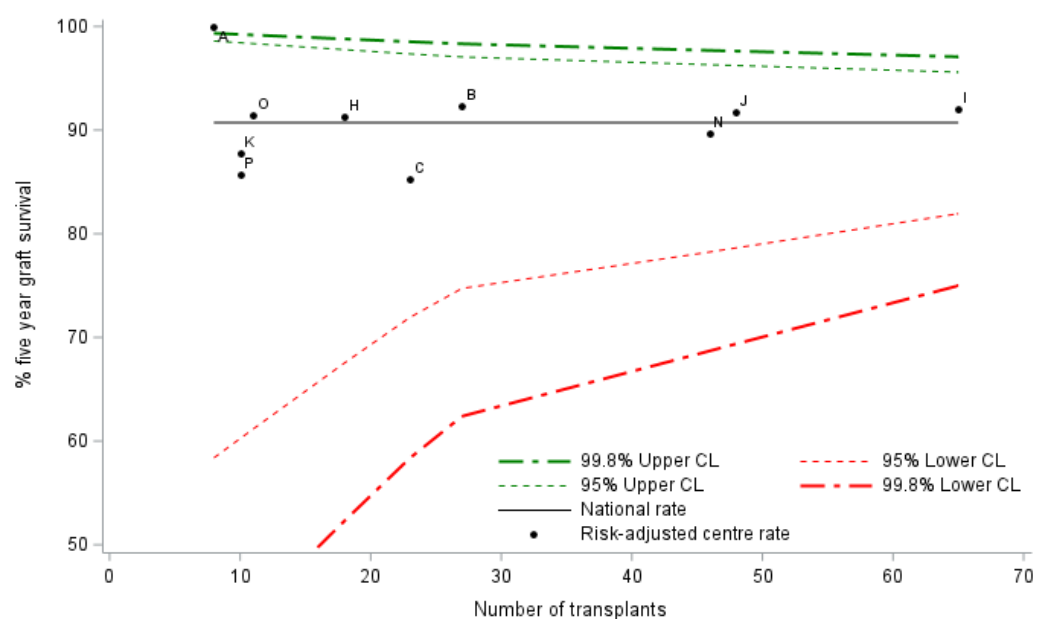


Figure 11.8 Risk-adjusted five year patient survival rates for first live donor kidney transplants in paediatric patients, between 1 April 2011 and 31 March 2015

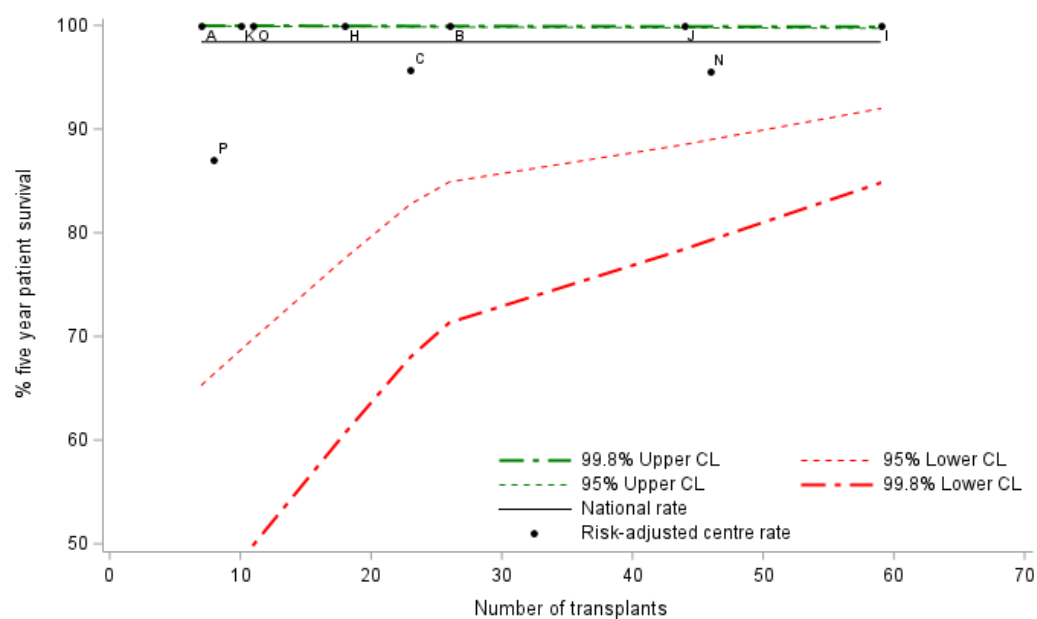


Table 11.2 One and five year first paediatric kidney-only graft and patient survival using kidneys from living donors

Centre	Code	Kidney graft survival				Patient survival			
		One-year*		Five-year**		One-year*		Five-year**	
		%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Belfast	A	100	N/A	100	N/A	100	N/A	100	N/A
Birmingham	B	100	N/A	92	(73 - 99)	100	N/A	100	N/A
Bristol	C	92	(55 – 100)	86	(58 - 97)	100	N/A	96	(76 – 100)
GOSH	I	100	N/A	92	(79 - 98)	100	N/A	100	N/A
Glasgow	H	96	(80 – 100)	91	(69 - 99)	95	(71 – 100)	100	N/A
Guy's	J	98	(87 – 100)	92	(79 - 98)	100	N/A	100	N/A
Leeds	K	100	N/A	87	(29 - 100)	100	N/A	100	N/A
Manchester	N	96	(86 – 100)	92	(79 - 98)	100	N/A	96	(84 - 99)
Newcastle	O	100	N/A	91	(52 - 100)	100	N/A	100	N/A
Nottingham	P	86	(20 – 100)	85	(18 - 100)	100	N/A	87	(28 - 100)
UK		98	(95 - 99)	91	(87 - 94)	100	(97 – 100)	98	(96 - 99)

* Includes transplants performed between 1 april 2015 - 31 March 2019

** Includes transplants performed between 1 april 2011 - 31 March 2015

Form return rates

12.1 Deceased donor form return rates, 1 April 2019 – 31 March 2020

Form return rates are reported in **Table 12.1** for the kidney transplant record, three month and one year follow up form, along with lifetime follow up (more than two years). These include all paediatric deceased donor kidney only transplants between 1 April 2019 and 31 March 2020 for the transplant record, and all requests for follow up forms issued in this time period.

Table 12.1 Deceased donor form return rates, 1 April 2019 and 31 March 2020								
Centre	Transplant record		3 month follow-up		1 year follow-up		Lifetime follow-up	
	N	% returned	N	% returned	N	% returned	N	% returned
Birmingham, Birmingham Children's Hospital	1	100					22	95
Birmingham, Queen Elizabeth Hospital Birmingham	8	100	8	88	8	100	72	79
Bradford, St Lukes Hospital							22	86
Bristol, Bristol Royal Hospital For Children							25	80
Bristol, Southmead Hospital	4	100	5	100	5	60	56	39
Cardiff, University Of Wales Hospital	1	100	1	100			42	79
Glasgow, Queen Elizabeth University Hospital							39	74
Leeds, St James's University Hospital	2	100	3	100	7	100	112	81
Leicester, Leicester General Hospital							24	96
London, Great Ormond Street Hospital For Children	8	100	12	92	11	100	38	100
London, Guy's Hospital	6	100	7	100	8	75	70	80
London, Royal Free Hospital							37	78
London, The Royal London Hospital (Whitechapel)	1	100					25	44
Manchester, Manchester Royal Infirmary	3	100	4	75	6	100	60	88
Nottingham, Nottingham City Hospital	2	100	4	100	5	40	79	65
Portsmouth, Queen Alexandra Hospital							22	36
Sheffield, Northern General Hospital							33	48

12.2 Living donor form return rates, 1 April 2019 – 31 March 2020

Form return rates are reported in **Table 12.2** for the kidney transplant record, three month and one year follow up form, along with lifetime follow up (more than two years). These include all paediatric living donor kidney only transplants between 1 April 2019 and 31 March 2020 for the transplant record, and all requests for follow up forms issued in this time period.

Table 12.2 Living donor form return rates, 1 April 2019 and 31 March 2020								
Centre	Transplant record		3 month follow-up		1 year follow-up		Lifetime follow-up	
	N	% returned	N	% returned	N	% returned	N	% returned
Belfast, Royal Belfast Hospital For Sick Children							24	8
Birmingham, Birmingham Children's Hospital							39	97
Birmingham, Queen Elizabeth Hospital Birmingham	5	100	6	83	7	86	25	92
Cardiff, University Of Wales Hospital							38	71
Glasgow, Queen Elizabeth University Hospital							29	86
Leeds, St James's University Hospital	7	100	6	100	5	100	29	86
Liverpool, Alder Hey Children's Hospital							25	100
Liverpool, Royal Liverpool University Hospital							20	95
London, Great Ormond Street Hospital For Children	12	100	10	100	14	93	78	100
London, Guy's Hospital	14	86	13	100	11	82	116	75
London, Royal Free Hospital							28	75
Manchester, Manchester Royal Infirmary	14	100	15	93	22	100	19	95
Manchester, Royal Manchester Children's Hospital							41	100
Newcastle, Royal Victoria Infirmary							28	46
Nottingham, Nottingham City Hospital	6	100	5	100	2	50	32	53
Oxford, Churchill Hospital							20	35
Portsmouth, Queen Alexandra Hospital							24	42
Southampton, Southampton University Hospitals							20	100

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.

Donor after brain death (DBD)

A donor whose heart is still beating when their entire brain has stopped working so that they cannot survive without the use of a ventilator. Organs for transplant are removed from the donor while their heart is still beating, but only after extensive tests determine that the brain cannot recover and they have been certified dead.

Donor after circulatory death (DCD)

A donor whose heart stops beating before their brain stops working and who is then certified dead. The organs are then removed.

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 and risk-adjustment for survival rate estimation

Unadjusted and risk-adjusted 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. In reality, patients differ and a risk-adjusted rate that allows for these differences would give a more meaningful estimate of survival.

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.

Computing risk-adjusted survival rates

A risk-adjusted survival rate is an estimate of what the survival rate at a centre would have been if they had had the same mix of patients as that seen nationally. The risk-adjusted rate therefore presents estimates in which differences in patient mix across centres have been removed as much as possible. For that reason, it is valid to only compare centres using risk-adjusted rather than unadjusted rates, as differences among the latter can be attributed to differences in patient mix.

Risk-adjusted survival estimates were obtained through indirect standardisation. A [Cox Proportional Hazards model](#) was used to determine the probability of survival for each patient based on their individual risk factor values. The sum of these probabilities for all patients at a centre gives the number, E , of patients or grafts expected to survive at least one year or five years after transplant at that centre. The number of patients who actually survive the given time period is given by O . The risk-adjusted estimate is then calculated by multiplying the ratio O/E by the overall unadjusted survival rate across all centres. The risk-adjustment models used were based on results from previous studies that looked at factors affecting the survival rates of interest. The factors included in the models are shown in the table below.

Systematic component of variation

For a given individual who is a resident in a given English Strategic Health Authority (SHA), registration to the transplant list is modelled as a Bernoulli trial. At the whole area level, this becomes a Binomial process which can be approximated by a Poisson distribution when rare events are modelled. Transplant counts follow similar assumptions.

To allow for the possibility that, even after allowing for area-specific Poisson rates, area differences remain, introduce an additional multiplicative rate factor which varies from area to area. Postulate a non-parametric distribution for the multiplicative factor, with variance σ^2 . If the factor is one for all areas, then area differences are fully explained by the area-specific Poisson rate. If the factor varies with a nonzero variance, σ^2 , then we conclude that there are unexplained area differences.

The systematic component of variation (SCV; McPherson *et al.*, *N Engl J Med* 1982, **307**: 1310-4) is the moment estimator of σ^2 . Under the null hypothesis of homogeneity across areas, the SCV would be zero. The SCV, therefore, allows us to detect variability across areas beyond that expected by chance; the larger the SCV, the greater the evidence of systematic variation across areas.

Risk adjustment factors

Adult waiting time

Median waiting time Age at registration, sex, ethnicity, highly sensitised, blood group, dialysis status, matchability score, primary renal disease

Adult patient transplants

First transplants from deceased donors

1 year graft survival	Donor age, donor type, donor cause of death, recipient age, waiting time to transplant, primary renal disease, HLA mismatch group, cold ischaemic time*, recipient ethnicity
1 year patient survival	Donor age, recipient age, waiting time to transplant, primary renal disease, HLA mismatch group, cold ischaemic time*
5 year graft survival	Graft year, donor age, donor type, donor cause of death, recipient age, waiting time to transplant, primary renal disease, HLA mismatch group, recipient ethnicity
5 year patient survival	Graft year, donor age, recipient age, waiting time to transplant, primary renal disease

Transplants from live donors

1 year graft survival	Donor age, recipient age, primary renal disease, number of HLA mismatches
1 year patient survival	Recipient age
5 year graft survival	Graft year, donor age, recipient age, primary renal disease, number of HLA mismatches
5 year patient survival	Recipient age, primary renal disease

Paediatric patient transplants

First transplants from deceased donors

1 year graft survival	Donor age, recipient age, HLA mismatch group, cold ischaemic time*
1 year patient survival	Recipient age
5 year graft survival	Donor age, recipient age, HLA mismatch group
5 year patient survival	Recipient age

Transplants from live donors

1 year graft survival	Donor age, recipient age
1 year patient survival	Recipient age
5 year graft survival	Donor age, recipient age
5 year patient survival	Recipient age

*Time between retrieval of kidney from the donor and time of transplant in the patient.

A3 Factors used in risk-adjusted models for patient survival from listing

Adult patient registrations

First registrations for deceased donor transplant

1, 5 and 10 year patient survival from listing age, gender, ethnicity, blood group, BMI, cRF*>85%, primary disease, dialysis status

* Calculated reaction frequency

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