

KIDNEY TRANSPLANTATION ANNUAL RENAL UNIT REPORT

**REPORT FOR 2018/19
(1 APRIL 2010 – 31 MARCH 2019)**

March 2021

PRODUCED IN COLLABORATION WITH THE UK RENAL REGISTRY



Contents

Contents

Introduction	4
1 Adult kidney transplant list.....	6
1.1 Kidney only transplant list, 30 April 2018 – 31 March 2019.....	7
1.2 Post-registration outcomes, 1 April 2013 – 31 March 2016.....	9
1.3 Demographic characteristics, 1 April 2016 – 31 March 2019	10
1.4 Waiting times for patients on the list, as at 31 March 2019	12
1.5 Pre-emptive listing rates, 1 April 2014 - 31 March 2017.....	13
2 Adult kidney transplants	14
2.1 Kidney only transplants, 1 April 2016 – 31 March 2019	15
2.2 Demographic characteristics of recipients, 1 April 2016 - 31 March 2019...	17
2.3 Pre-emptive transplant rates, 1 April 2016 - 31 March 2019	19
3 Adult kidney outcomes – post transplant survival	21
3.1 Deceased donor graft and patient survival.....	23
3.2 Living donor graft and patient survival.....	28
4 Adult kidney outcomes – risk adjusted eGFR.....	33
4.1 Risk adjusted eGFR	34
Appendix.....	39
A1 Glossary of terms	40
A2 Methods	44
A3 Risk adjustment factors	45

Introduction

This report presents data on activity and outcomes of kidney transplant candidates and recipients between 1 April 2010 and 31 March 2019, for all 71 renal centres in the UK. Data were obtained from the UK Transplant Registry, at NHS Blood and Transplant, which holds information relating to donors, recipients and outcomes for all kidney transplants performed in the UK. Renal unit information was supplied by the UK Renal Registry.

[Graft](#) and [patient survival](#) estimates are reported at 1- and 5- year post-transplant for the periods 1 April 2014 to 31 March 2018 and 1 April 2010 to 31 March 2014, respectively. Adjusted mean [eGFR](#) post-transplant is reported at 3- and 12- months post-transplant for the period 1 April 2014 to 31 March 2018. Results are described separately according to the type of donor (deceased and [living](#)).

The unit specific results for survival estimates are adjusted for differences in [risk factors](#) between the units. The risk models used are described in in [Appendix A3](#).

Patients requiring [multi-organ transplants](#) are excluded from all analyses and all results are described for adult (aged ≥ 18 years) patients.

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

Annual Report on Kidney Transplantation 2018/2019 by Renal Unit, NHS Blood and Transplant.

Adult kidney transplant list

1.1 Kidney only transplant list, 30 April 2018 – 31 March 2019

Figure 1.1 shows the mean number of adult patients on the active kidney only [transplant list](#) per million population (pmp) at the end of each month by renal unit for the period 30 April 2018 to 31 March 2019. West London Renal and Transplant Centre (WLRTC) had the highest mean rate of adult patients on the waiting list per million population. **Figure 1.2** shows similar information for adult patients on the suspended kidney only [transplant list](#), Guy's had the highest mean rate of suspended adult patients.

Figure 1.1 Adult patients on the active kidney only transplant list (pmp) end of month average, 30 April 2018 - 31 March 2019, by renal unit

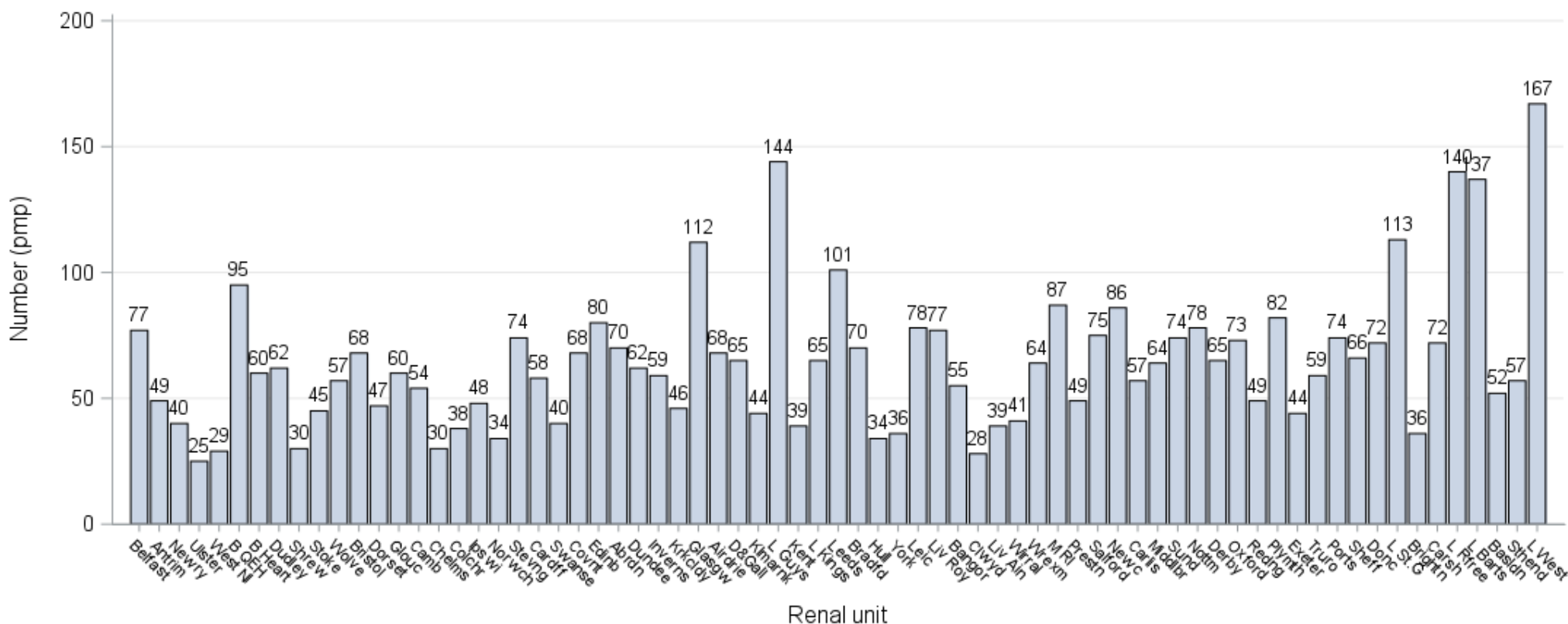
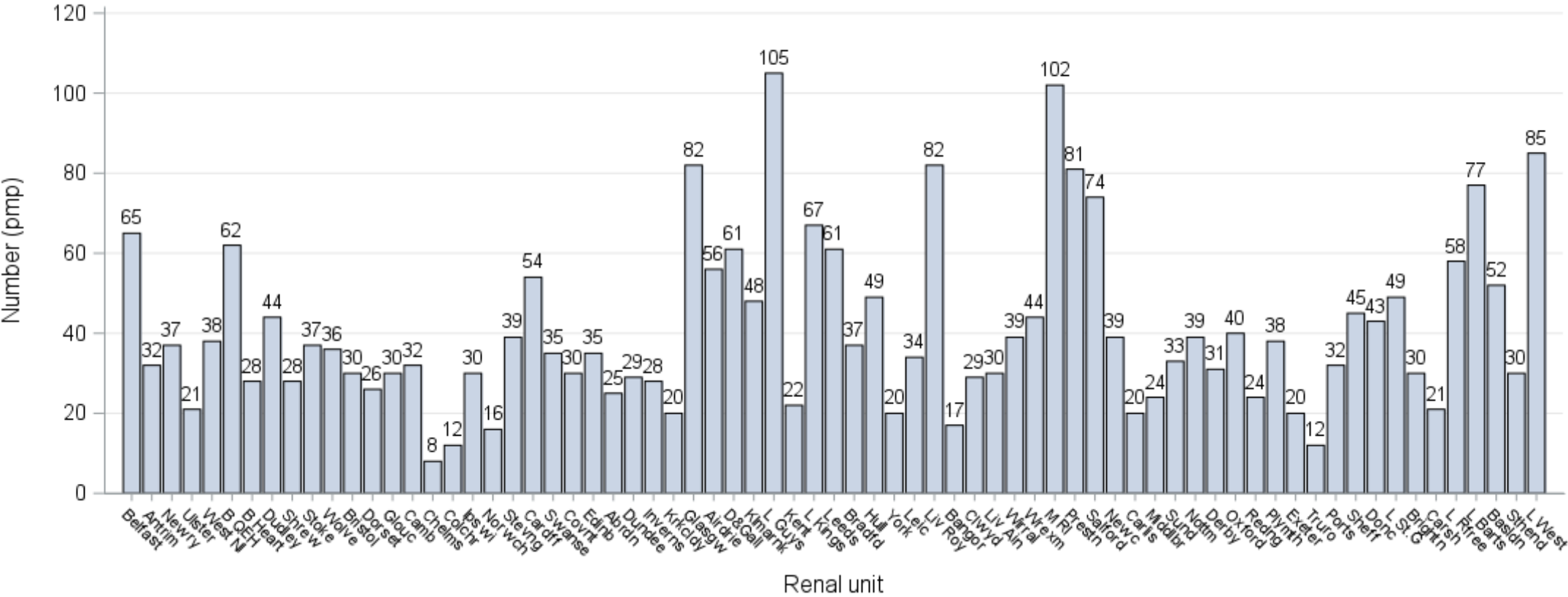


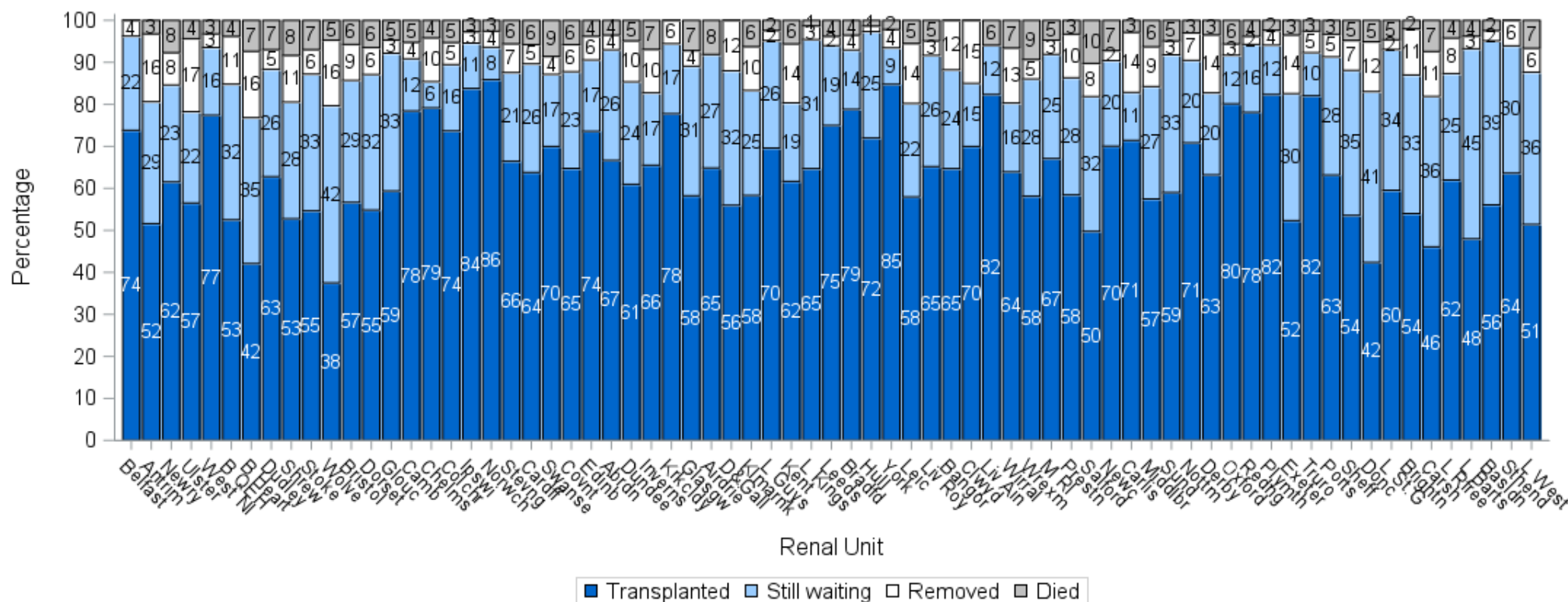
Figure 1.2 Adult patients on the suspended kidney only transplant list (pmp) end of month average, 30 April 2018 - 31 March 2019, by renal unit



1.2 Post-registration outcomes, 1 April 2013 – 31 March 2016

Figure 1.3 shows the registration outcomes of patients registered between 1 April 2013 and 31 March 2016 by renal unit at three years post-registration. The proportion of patients transplanted three years after listing at each unit ranges from 38% at Wolverhampton to 86% at Norwich. A small proportion of patients across centres were removed or died on the list.

Figure 1.3 Three-year post-registration outcome for 9135 new adult kidney only registrations made in the UK, 1 April 2013 - 31 March 2016, by renal unit



1.3 Demographic characteristics, 1 April 2016 – 31 March 2019

The ethnicity and age group of patients registered onto the transplant list between 1 April 2016 and 31 March 2019 are shown by renal unit in **Figures 1.4** and **1.5**, respectively. Note that all percentages quoted are based only on data where relevant information was available.

Figure 1.4 Ethnicity of patients registered onto the active kidney only transplant list between 1 April 2016 and 31 March 2019, by renal unit

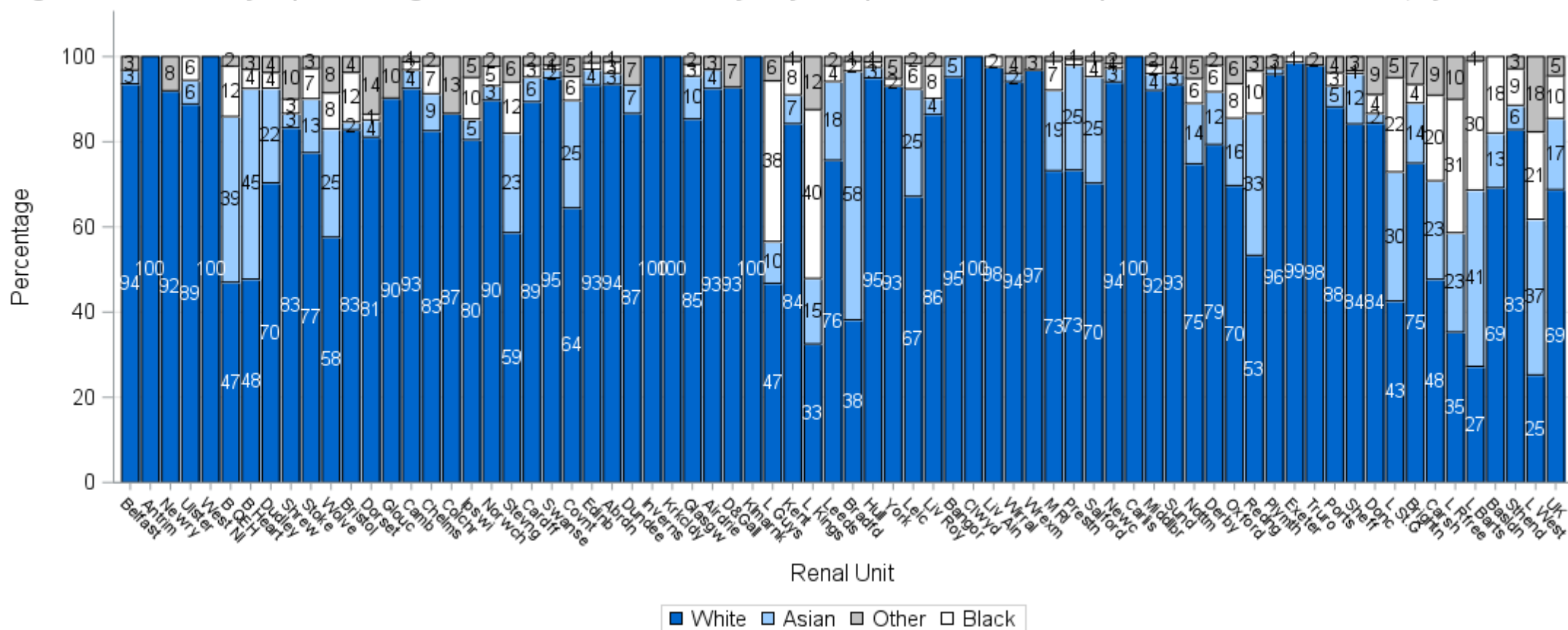
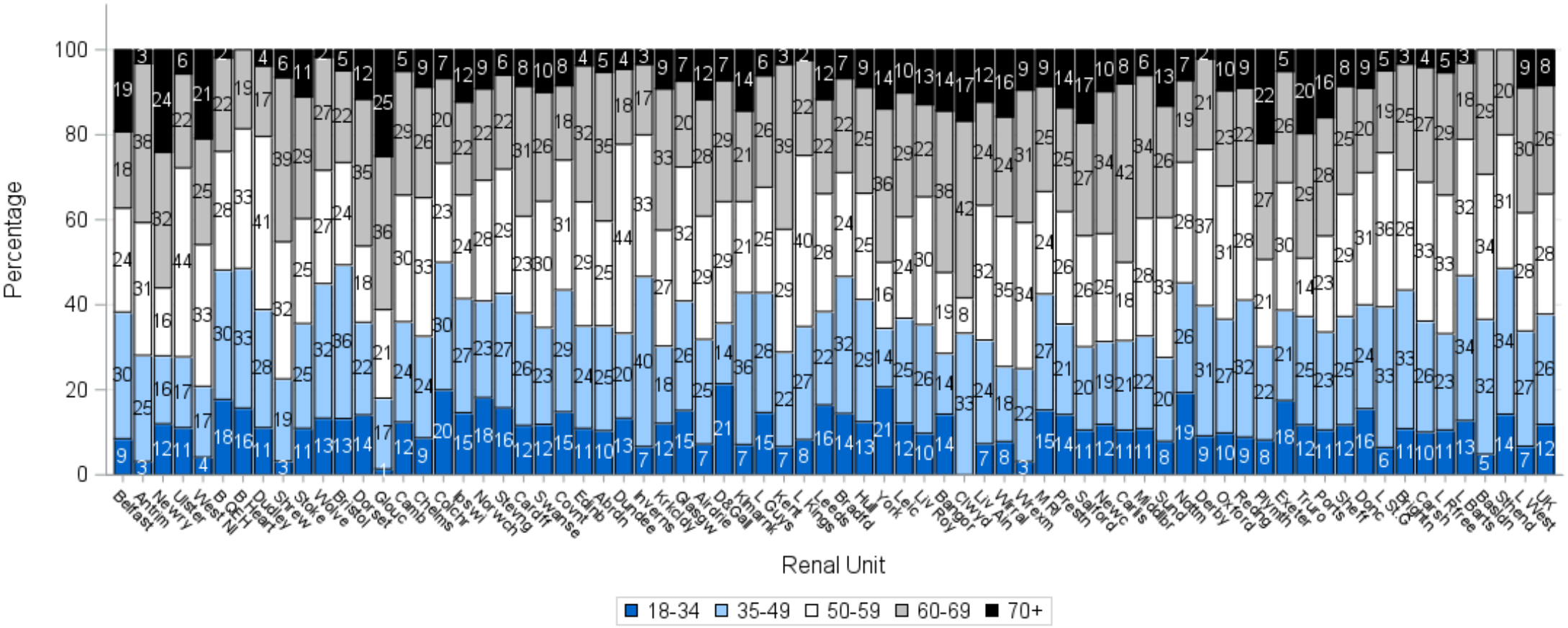


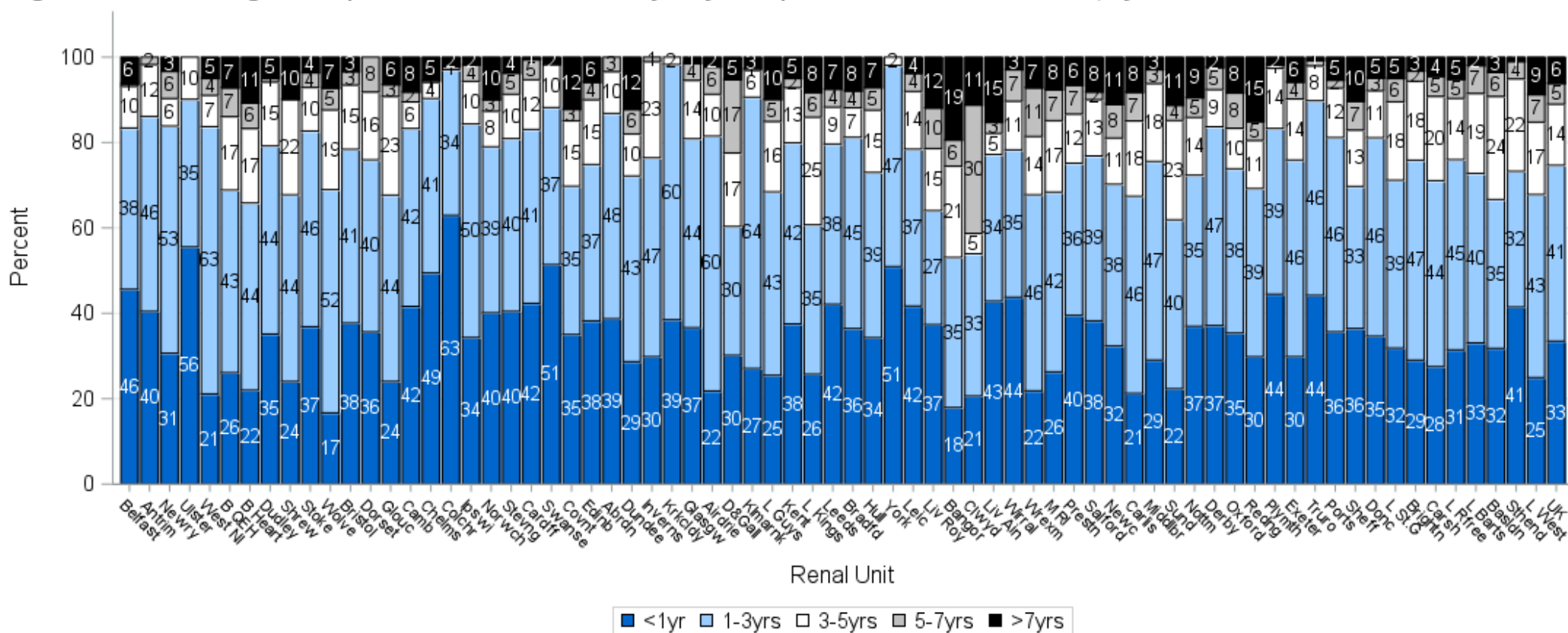
Figure 1.5 Age of patients registered onto the active kidney only transplant list between 1 April 2016 and 31 March 2019, by renal unit



1.4 Waiting times for patients on the list, as at 31 March 2019

Figure 1.6 shows the length of time patients have been waiting on the kidney only [transplant list](#) by renal unit for those active on the list as at 31 March 2019. A small proportion of patients (6%) have been waiting for a transplant for more than seven years. 98% of these long waiters are highly sensitised with a calculated reaction frequency (cRF) of 85% or higher, with 85% having a cRF of 100% which makes these patients very difficult to match.

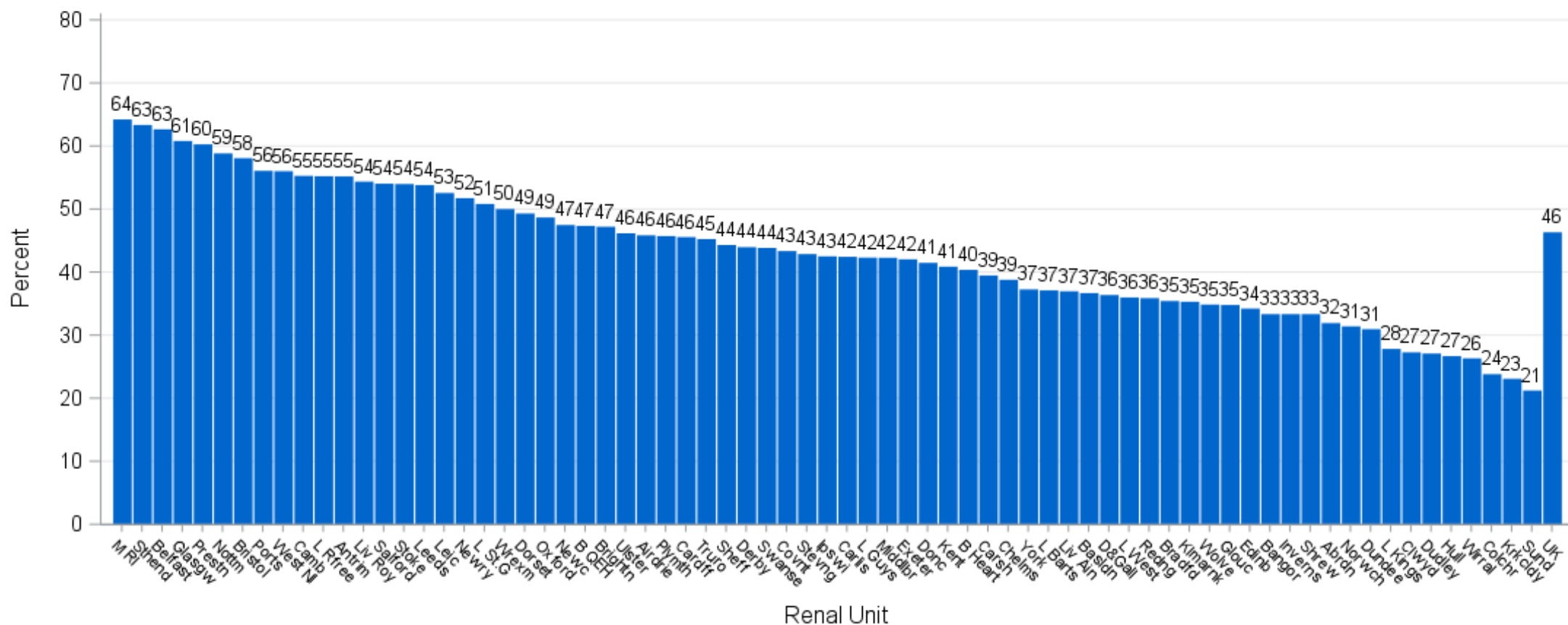
Figure 1.6 Waiting time of patients on the active kidney only transplant list as at 31 March 2019, by renal unit



1.5 Pre-emptive listing rates, 1 April 2014 - 31 March 2017

Rates of [pre-emptive](#) kidney only listings are shown in **Figure 1.7** for adult patients joining the list between 1 April 2015 and 31 March 2018. Patients listed on the deceased donor [transplant list](#) prior to receiving a living donor transplant are excluded. [Pre-emptive](#) listing accounted for 46% of all adult registrations across the UK ranging from 64% at Manchester Royal Infirmary to 21% at Sunderland.

Figure 1.7 Adult pre-emptive listing rates by centre, registrations between 1 April 2015 and 31 March 2018



Adult kidney transplants

2.1 Kidney only transplants, 1 April 2016 – 31 March 2019

Figure 2.1 shows the mean number of adult kidney only transplants performed per million population (pmp) between 1 April 2016 and 31 March 2019, by renal unit and type of donor. Belfast and Guy's had the highest overall mean rate of adult kidney only transplants per million population at 105 pmp, Belfast also had the highest living donor rate (67 pmp) and Guy's had the highest deceased donor rate (66 pmp). **Figure 2.2** shows the proportion of [DBD](#), [DCD](#) and [living donor](#) transplants performed for each unit.

Figure 2.1 Adult kidney only transplants (pmp) annual average, 1 April 2016 - 31 March 2019, by donor type and renal unit

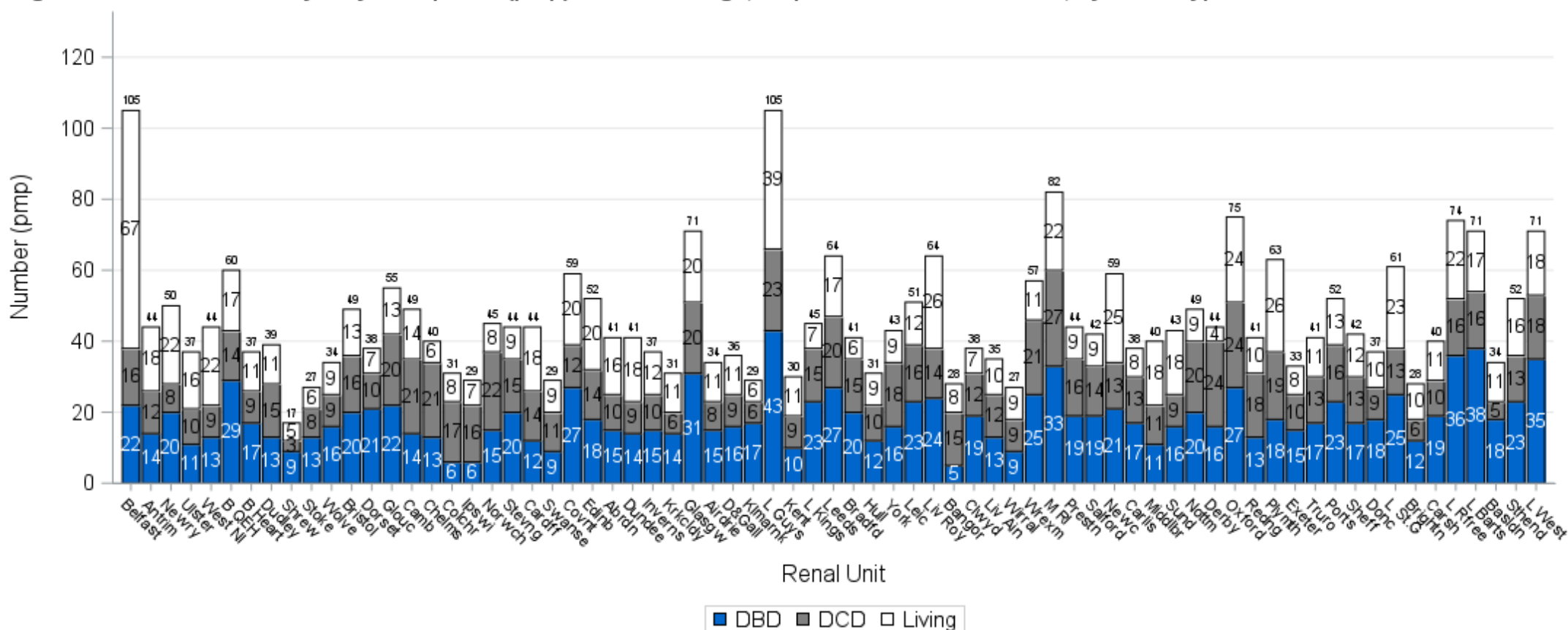
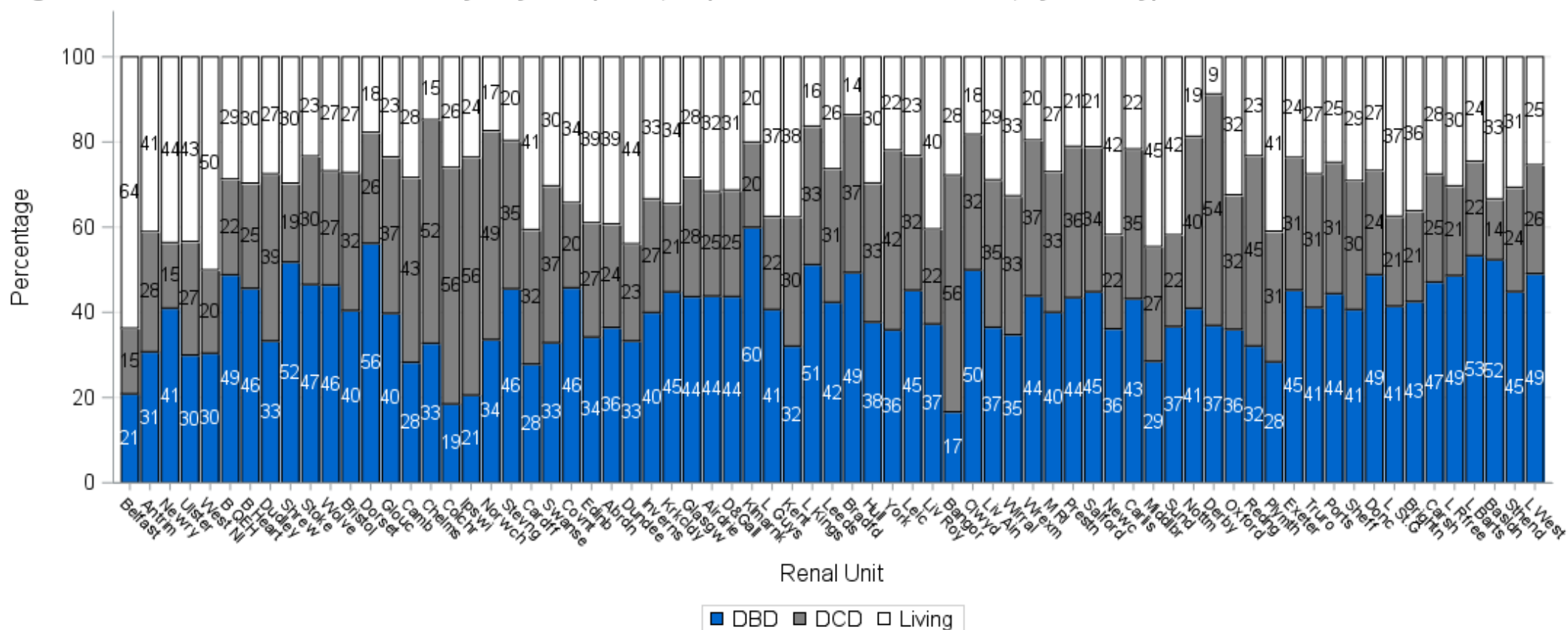


Figure 2.2 Distribution of adult kidney only transplants, 1 April 2016 and 31 March 2019, by donor type and renal unit



2.2 Demographic characteristics of recipients, 1 April 2016 - 31 March 2019

The ethnicity and age group of patients who received a kidney only transplant between 1 April 2016 and 31 March 2019 are shown by renal unit in **Figures 2.3** and **2.4**, respectively. Note that all percentages quoted are based only on data where relevant information was available.

Figure 2.3 Ethnicity of kidney only transplant recipients, 1 April 2016 and 31 March 2019, by renal unit

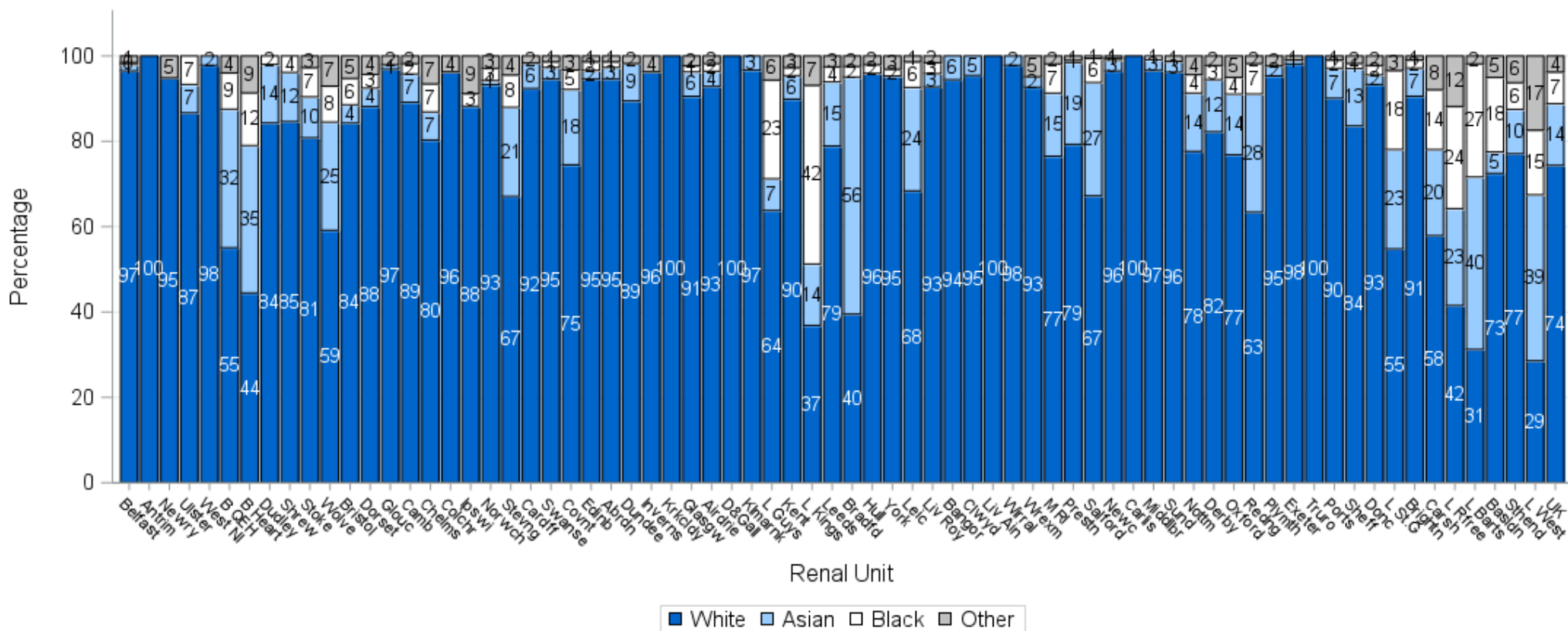
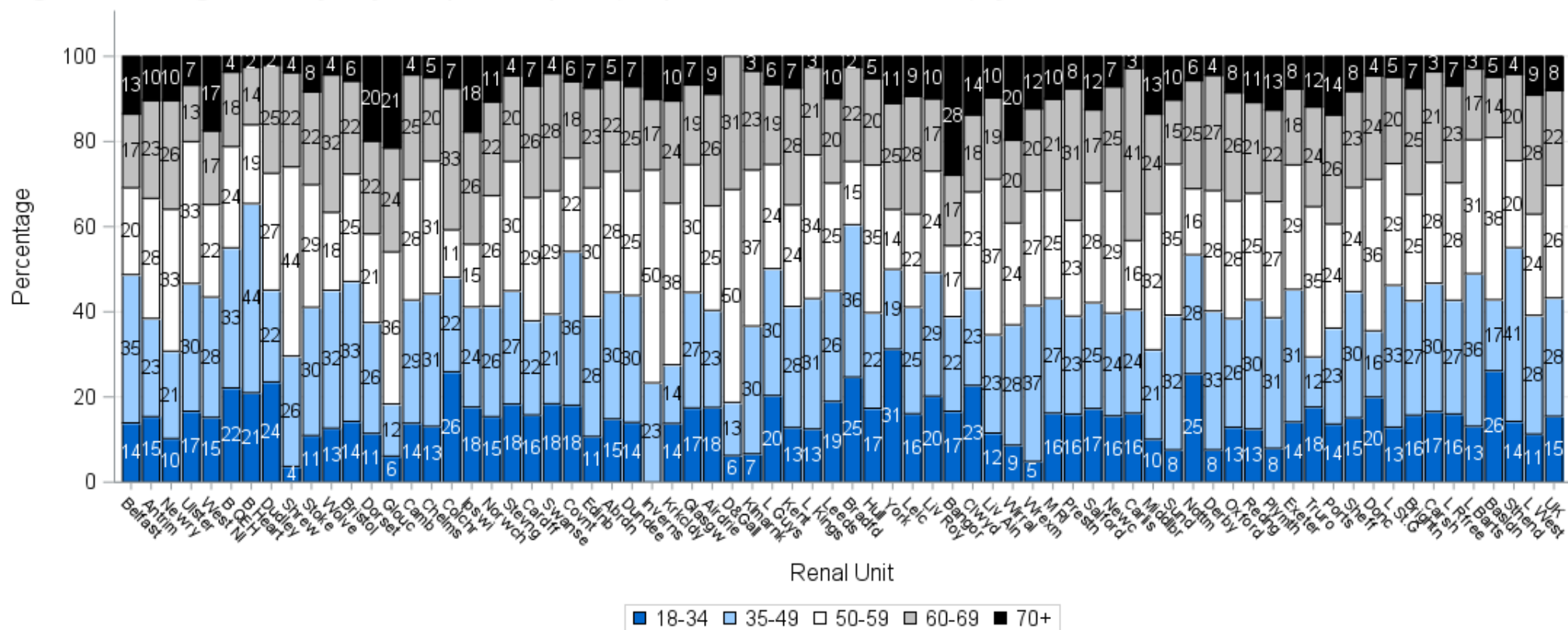


Figure 2.4 Age of kidney only transplant recipients, 1 April 2016 and 31 March 2019, by renal unit



2.3 Pre-emptive transplant rates, 1 April 2016 - 31 March 2019

Rates of [pre-emptive](#) kidney only transplantation for transplants performed between 1 April 2016 and 31 March 2019 are shown in **Figure 2.5** for deceased donor transplants and **Figure 2.6** for [living donor](#) transplants. Living donor transplants are more likely to be carried out before the need for dialysis than deceased donor transplants: 38% and 16% respectively. This is because a living donor transplant can often be carried out more quickly than a deceased donor kidney transplant. Adult deceased donor [pre-emptive](#) transplant rates ranged from 37% at Belfast to 0% at several units. Adult living donor [pre-emptive](#) transplant rates ranged from 73% at Belfast and St George's to 0% at several units.

Figure 2.5 Adult deceased donor pre-emptive transplant rates by renal unit, 1 April 2016 - 31 March 2019

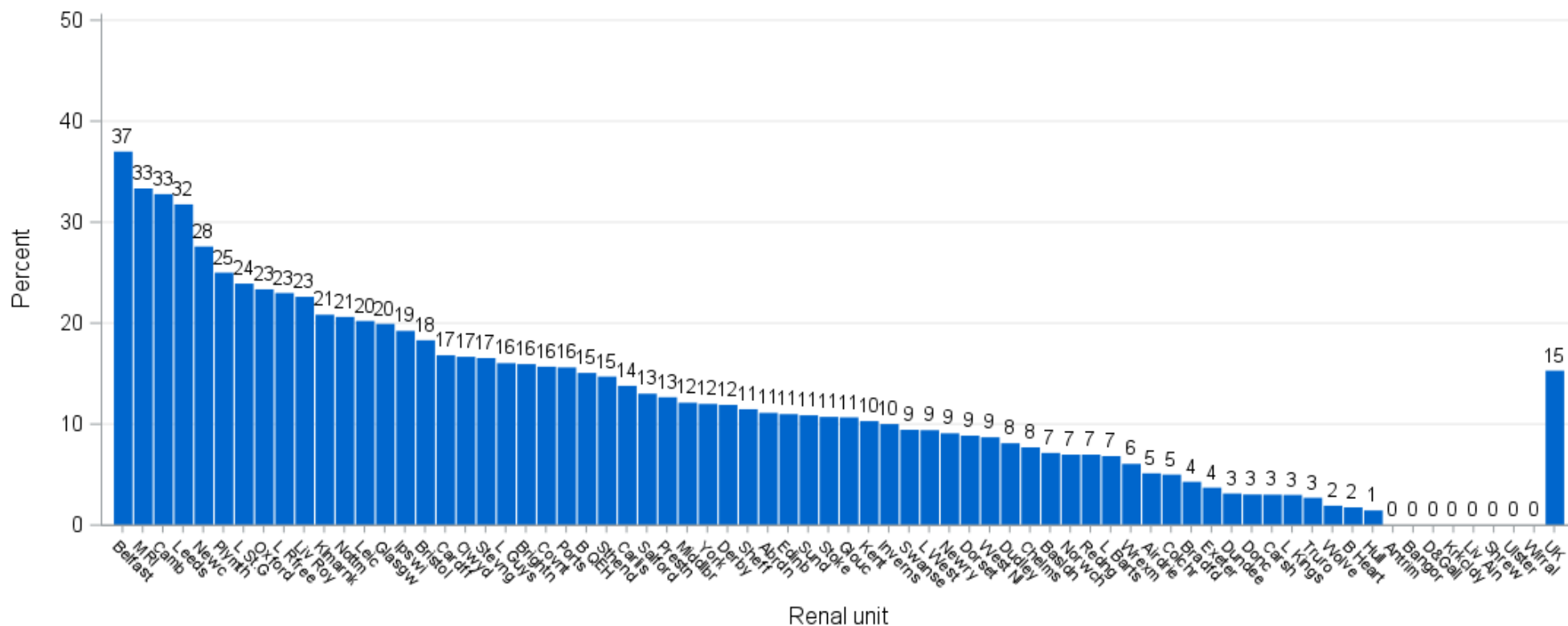
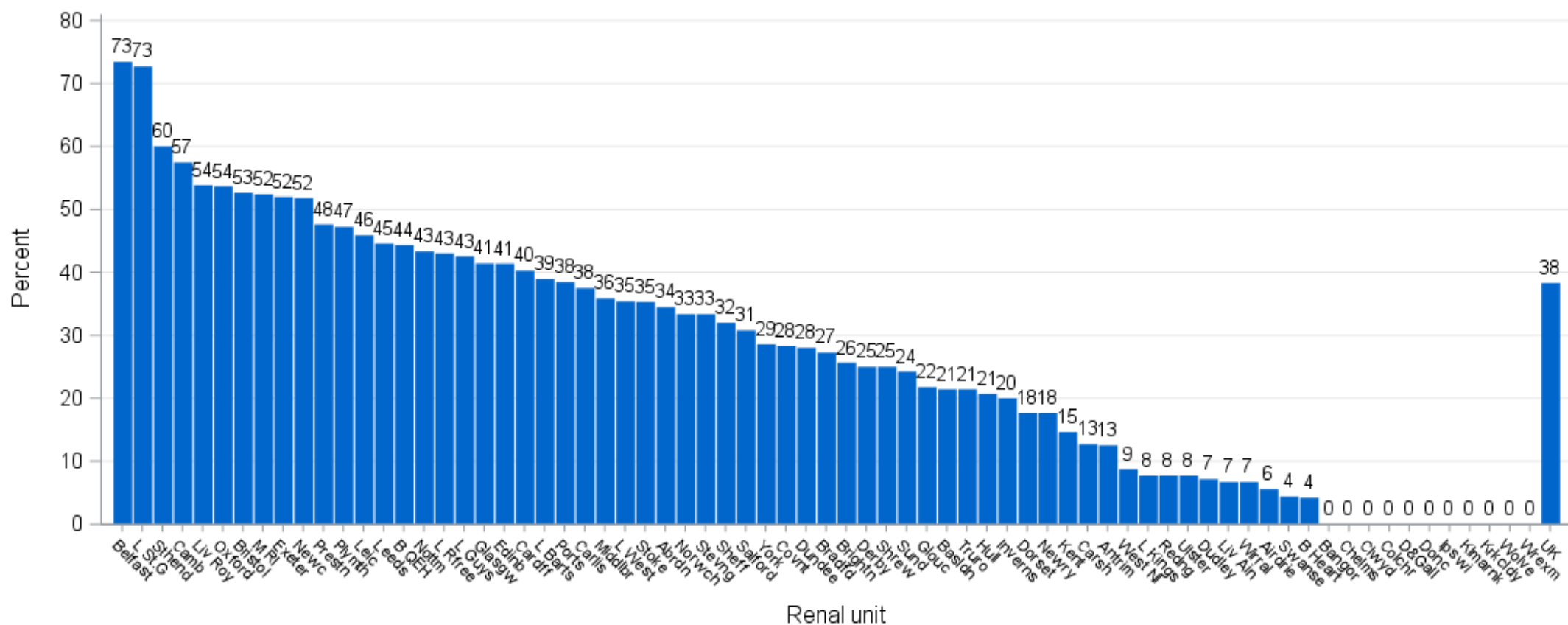


Figure 2.6 Adult living donor pre-emptive transplant rates by renal unit, 1 April 2016 - 31 March 2019



Adult kidney outcomes – post transplant survival

We present a visual comparison of survival rates among renal units 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 renal units are with the national rate. [Funnel plots](#) show the [risk-adjusted survival rate](#) plotted against the number of transplants for each unit, 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 units.

If a unit lies within all the limits, then that unit has a survival rate that is statistically consistent with the national rate. If a unit lies outside the 95% [confidence limits](#), this serves as an alert that the unit may have a rate that is significantly different from the national rate. If a unit lies outside the 99.8% limits, then further investigations may be carried out to determine the reasons for the possible difference. When a unit lies above the upper limits, this indicates a survival rate that is higher than the national rate, while a unit 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 unit 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 unit.

This section excludes [multi-organ transplants](#) and includes first time transplants only, with results presented separately for deceased and [living donor](#) transplants. One-year [patient](#) and [graft survival rates](#) are based on transplants performed in the period 1 April 2014 to 31 March 2018 while five-year [patient](#) and [graft survival rates](#) are based on transplants in the period 1 April 2010 to 31 March 2014. The [risk factors](#) used to produce the [risk-adjusted survival rates](#) are detailed in **Table A3.1** in [Appendix A3](#).

Note that although we report survival according to renal unit, many patients receive after care from their transplant centre before returning to their local renal units. We do not know at what point a patient is transferred back from the transplant centre to their renal unit, but we do know that this practice can differ widely across the country.

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.

3.1 Deceased donor graft and patient survival

Figures 3.1-3.4 and **Table 3.1** show the [risk-adjusted patient](#) and [graft survival rates](#) for each unit and nationally following deceased donor transplantation. At five years post-transplant, the national patient survival rate was 87% and the graft survival was also 87%.

The [funnel plots](#) show that, for the most part, the renal units lie within the [confidence limits](#). The [funnel plots](#) show some units lie outside the lower 95% [confidence limits](#) in the five-year estimates and one unit in the one-year estimates, indicating that these units have survival rates that are significantly lower than the national rate. All of the [funnel plots](#) show some units to be above the upper 99.8% [confidence limit](#). This suggests that these units may have survival rates that are considerably higher than the national rate. Units can be identified by the information shown in **Table 3.1**.

Figure 3.1 Risk-adjusted one year graft (death censored) survival rates for first deceased donor kidney transplants in adult patients, between 1 April 2014 and 31 March 2018

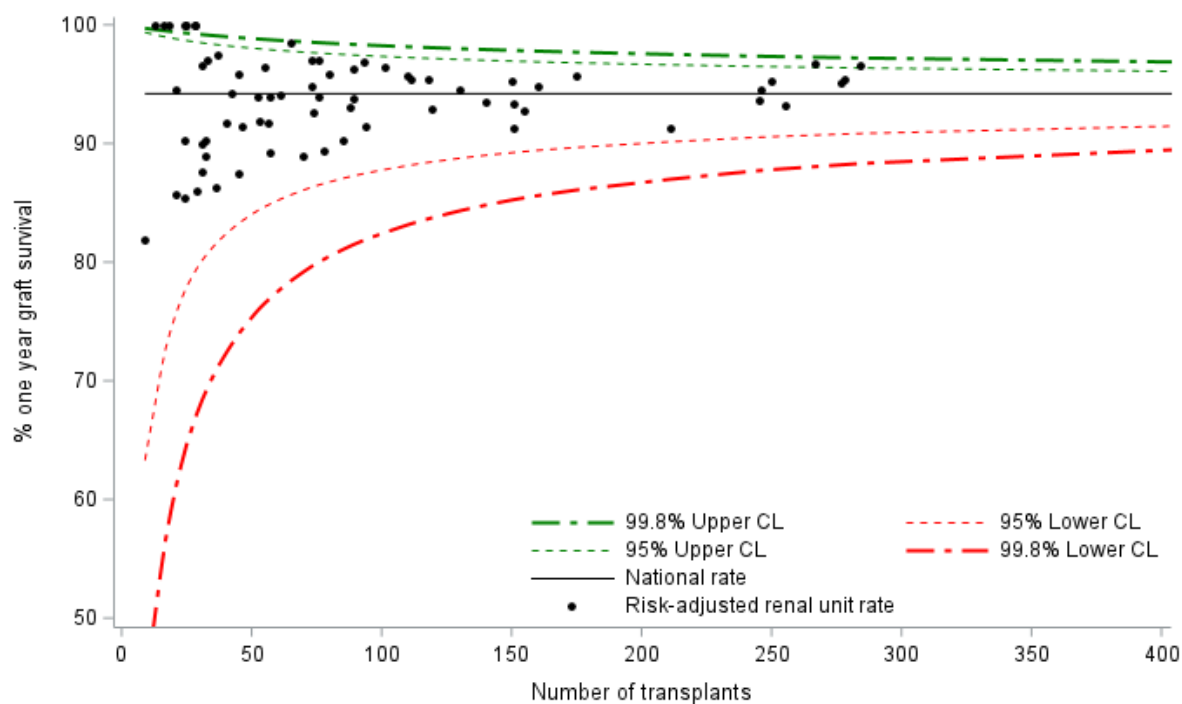


Figure 3.2 Risk-adjusted one year patient survival rates for first deceased donor kidney transplants in adult patients, between 1 April 2014 and 31 March 2018

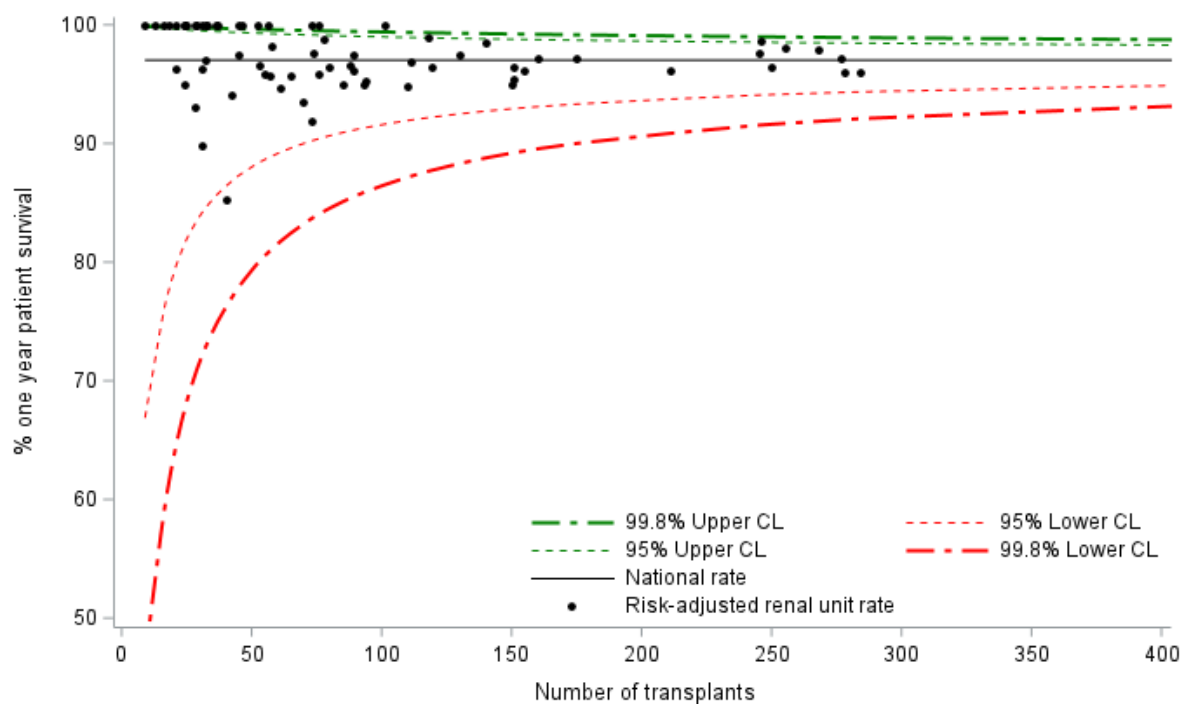


Figure 3.3 Risk-adjusted five year graft (death censored) survival rates for first deceased donor kidney transplants in adult patients, between 1 April 2010 and 31 March 2014

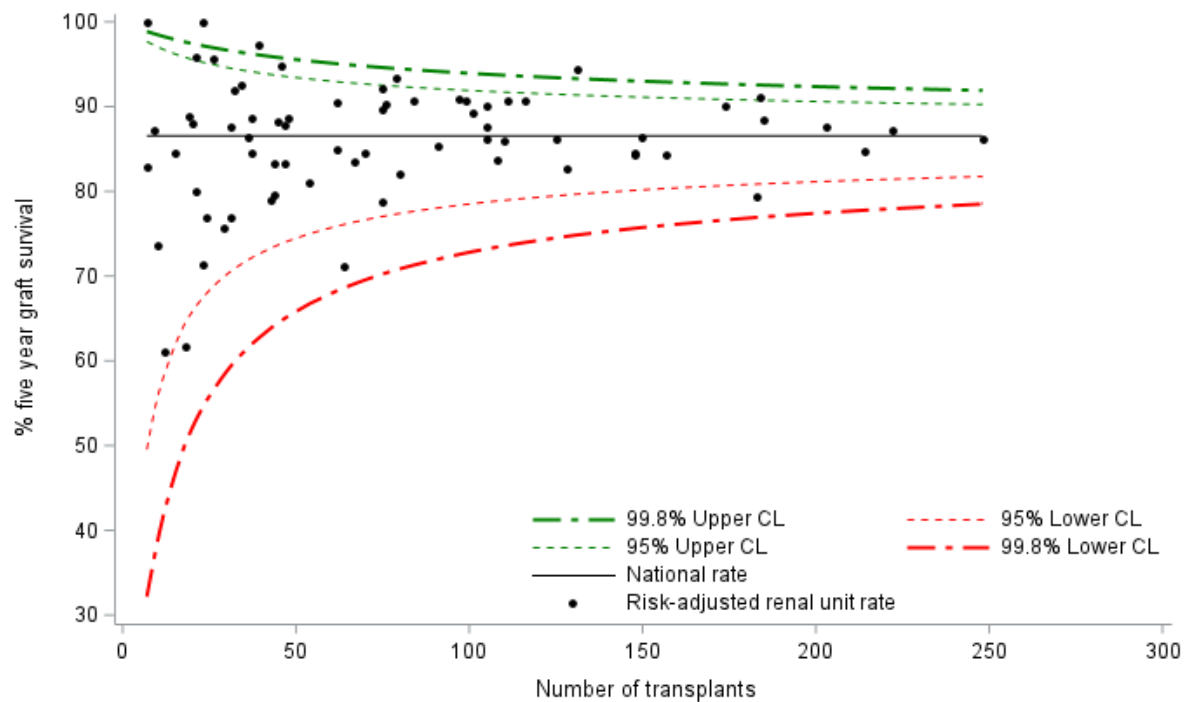


Figure 3.4 Risk-adjusted five year patient survival rates for first deceased donor kidney transplants in adult patients, between 1 April 2010 and 31 March 2014

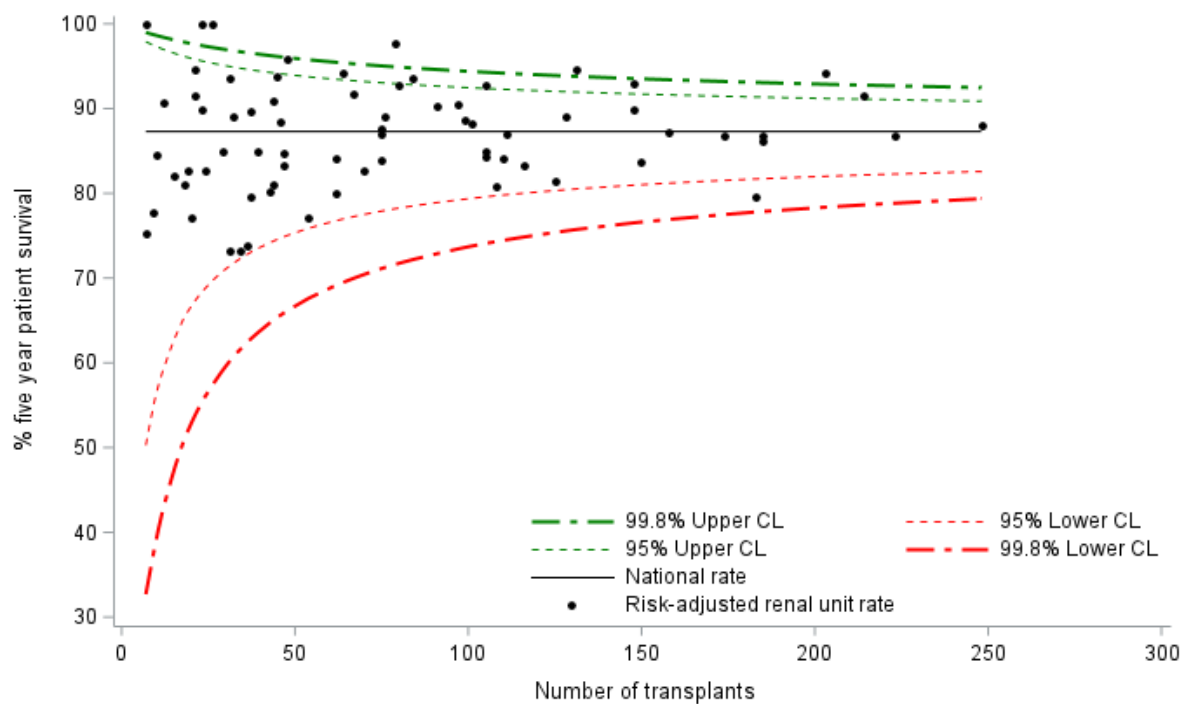


Table 3.1 One and five year first adult kidney-only graft and patient survival using kidneys from deceased donors

Unit	Kidney graft survival				Patient survival			
	One-year*		Five-year**		One-year*		Five-year**	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Belfast	89	(78 - 96)	92	(71 - 99)	99	(93 - 100)	89	(68 - 98)
Antrim	86	(58 - 97)	74	(4 - 97)	96	(80 - 100)	85	(44 - 98)
Newry	89	(68 - 98)	61	(0 - 89)	97	(84 - 100)	91	(49 - 100)
Ulster	100	N/A	100	N/A	100	N/A	100	N/A
West NI	100	N/A	93	(73 - 99)	100	N/A	73	(47 - 88)
B QEH	91	(86 - 95)	83	(74 - 89)	96	(92 - 98)	89	(80 - 95)
B Heart	89	(76 - 96)	84	(72 - 92)	96	(84 - 99)	83	(67 - 92)
Dudley	86	(68 - 96)	62	(17 - 86)	100	N/A	81	(45 - 96)
Shrew	86	(64 - 96)	80	(49 - 95)	100	N/A	92	(53 - 100)
Stoke	98	(91 - 100)	80	(61 - 91)	96	(87 - 99)	81	(59 - 93)
Wolve	91	(78 - 98)	85	(66 - 94)	100	N/A	90	(70 - 98)
Bristol	93	(87 - 97)	86	(77 - 92)	96	(92 - 99)	82	(71 - 89)
Dorset	95	(85 - 99)	95	(81 - 99)	92	(81 - 97)	89	(75 - 96)
Glouc	92	(79 - 98)	88	(69 - 97)	100	N/A	85	(67 - 94)
Camb	95	(89 - 99)	94	(88 - 98)	99	(94 - 100)	95	(89 - 98)
Chelms	96	(85 - 99)	83	(67 - 93)	97	(86 - 100)	83	(66 - 93)
Colchr	100	N/A	89	(60 - 99)	100	N/A	83	(55 - 95)
Ipswi	98	(86 - 100)	97	(84 - 100)	100	N/A	85	(65 - 95)
Norwch	97	(90 - 100)	90	(80 - 96)	100	N/A	89	(78 - 95)
Stevng	95	(90 - 98)	90	(82 - 95)	95	(89 - 98)	85	(76 - 91)
Cardff	96	(90 - 99)	91	(86 - 95)	95	(89 - 98)	87	(81 - 91)
Swanse	96	(87 - 100)	86	(77 - 92)	96	(85 - 100)	84	(76 - 90)
Covnt	94	(85 - 98)	85	(70 - 93)	96	(89 - 99)	84	(70 - 93)
Edinb	97	(89 - 100)	91	(80 - 97)	100	N/A	94	(83 - 98)
Abrdn	94	(82 - 99)	83	(64 - 94)	100	N/A	91	(73 - 98)
Dundee	97	(83 - 100)	71	(38 - 90)	100	N/A	100	N/A
Inverns	90	(65 - 99)	84	(44 - 98)	95	(72 - 100)	82	(48 - 96)
Krkcdy	95	(70 - 100)	96	(76 - 100)	100	N/A	100	N/A
Glasgw	95	(92 - 98)	88	(82 - 93)	97	(93 - 98)	86	(79 - 92)
Airdrie	92	(79 - 98)	81	(64 - 91)	97	(88 - 100)	77	(57 - 90)
D&Gall	82	(35 - 98)	87	(29 - 100)	100	N/A	78	(20 - 97)
Klmarnk	88	(68 - 97)	76	(47 - 91)	100	N/A	85	(62 - 96)
L Guys	96	(92 - 98)	84	(77 - 90)	97	(94 - 99)	93	(87 - 97)
Kent	93	(84 - 97)	85	(75 - 92)	98	(91 - 100)	90	(81 - 96)
L Kings	93	(85 - 97)	91	(82 - 96)	97	(88 - 100)	91	(78 - 97)
Leeds	94	(89 - 96)	87	(81 - 92)	98	(95 - 99)	87	(81 - 91)
Bradfd	90	(82 - 96)	90	(79 - 96)	95	(85 - 99)	88	(77 - 94)
Hull	94	(86 - 98)	82	(70 - 91)	96	(88 - 99)	93	(83 - 98)
York	94	(82 - 99)	89	(73 - 96)	98	(90 - 100)	96	(85 - 99)
Leic	95	(92 - 98)	88	(82 - 92)	96	(93 - 98)	94	(90 - 97)
Liv Roy	93	(86 - 97)	84	(73 - 91)	96	(91 - 99)	81	(69 - 89)
Bangor	100	N/A	100	N/A	100	N/A	90	(71 - 98)
Clwyd	100	N/A	83	(5 - 100)	100	N/A	75	(11 - 97)
Liv Ain	100	N/A	77	(50 - 92)	93	(75 - 99)	73	(47 - 88)
Wirral	90	(71 - 98)	89	(71 - 97)	96	(79 - 100)	80	(61 - 91)
Wrexm	100	N/A	88	(57 - 99)	100	N/A	77	(50 - 92)

Table 3.1 One and five year first adult kidney-only graft and patient survival using kidneys from deceased donors

Unit	Kidney graft survival				Patient survival			
	One-year*		Five-year**		One-year*		Five-year**	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
M RI	97	(94 - 98)	90	(84 - 94)	96	(93 - 98)	87	(80 - 92)
Prestn	93	(87 - 96)	91	(82 - 96)	96	(92 - 98)	89	(78 - 95)
Salford	95	(90 - 98)	91	(82 - 96)	97	(93 - 99)	87	(78 - 93)
Newc	95	(89 - 99)	88	(78 - 94)	97	(91 - 99)	84	(75 - 91)
Carlis	97	(81 - 100)	86	(65 - 96)	90	(70 - 98)	74	(48 - 89)
Middlbr	89	(78 - 95)	79	(64 - 88)	94	(85 - 98)	84	(72 - 92)
Sund	94	(79 - 99)	79	(59 - 91)	94	(79 - 99)	80	(62 - 91)
Nottm	95	(89 - 98)	85	(77 - 90)	97	(93 - 99)	90	(83 - 95)
Derby	97	(91 - 99)	92	(83 - 97)	95	(87 - 99)	87	(76 - 94)
Oxford	97	(94 - 99)	84	(77 - 90)	98	(95 - 99)	87	(80 - 92)
Redng	97	(91 - 99)	89	(80 - 95)	100	N/A	88	(80 - 94)
Plymth	94	(83 - 99)	71	(53 - 84)	95	(84 - 99)	94	(85 - 98)
Exeter	96	(88 - 99)	90	(78 - 97)	96	(90 - 99)	80	(64 - 90)
Truro	92	(76 - 98)	88	(72 - 96)	85	(57 - 97)	94	(84 - 98)
Ports	94	(91 - 97)	86	(79 - 92)	99	(96 - 100)	84	(76 - 89)
Sheff	94	(88 - 97)	91	(83 - 95)	99	(95 - 100)	83	(74 - 90)
Donc	88	(73 - 95)	88	(68 - 97)	100	N/A	94	(77 - 99)
L St.G	91	(81 - 97)	93	(85 - 98)	95	(86 - 99)	98	(92 - 100)
Brightn	96	(89 - 99)	83	(70 - 92)	97	(91 - 100)	92	(81 - 97)
Carsh	91	(85 - 96)	86	(77 - 92)	95	(90 - 98)	93	(85 - 97)
L Rfree	95	(92 - 97)	85	(79 - 89)	97	(95 - 99)	92	(87 - 95)
L Barts	93	(89 - 96)	79	(72 - 85)	98	(95 - 99)	80	(70 - 87)
Basldn	90	(71 - 98)	77	(50 - 92)	100	N/A	83	(55 - 95)
Sthend	85	(58 - 97)	96	(76 - 100)	100	N/A	95	(71 - 100)
L West	94	(91 - 96)	86	(81 - 90)	97	(96 - 99)	88	(83 - 92)
UK	94	(94 - 95)	87	(86 - 87)	97	(97 - 97)	87	(86 - 88)

Centre has reached the lower 99.8% confidence limit

Centre has reached the lower 95% confidence limit

Centre has reached the upper 95% confidence limit

Centre has reached the upper 99.8% confidence limit

* Includes transplants performed between 1 April 2014 - 31 March 2018

** Includes transplants performed between 1 April 2010 - 31 March 2014

3.2 Living donor graft and patient survival

Figures 3.5-3.8 and **Table 3.2** show the [risk-adjusted patient](#) and [graft survival rates](#) for each unit and nationally following [living donor](#) transplantation. At five years post-transplant, the national patient survival rate was 92% and the graft survival was 94%.

Many units appear above the upper 99.8% [confidence limit](#) in the [funnel plots](#). This suggests that these units may have survival rates that are considerably higher than the national rate. One unit appears outside the lower 95% confidence limit indicating that a survival rate significantly lower than the national rate. Units can be identified by the information shown in **Table 3.2**.

Figure 3.5 Risk-adjusted one year graft (death censored) survival rates for first live donor kidney transplants in adult patients, between 1 April 2014 and 31 March 2018

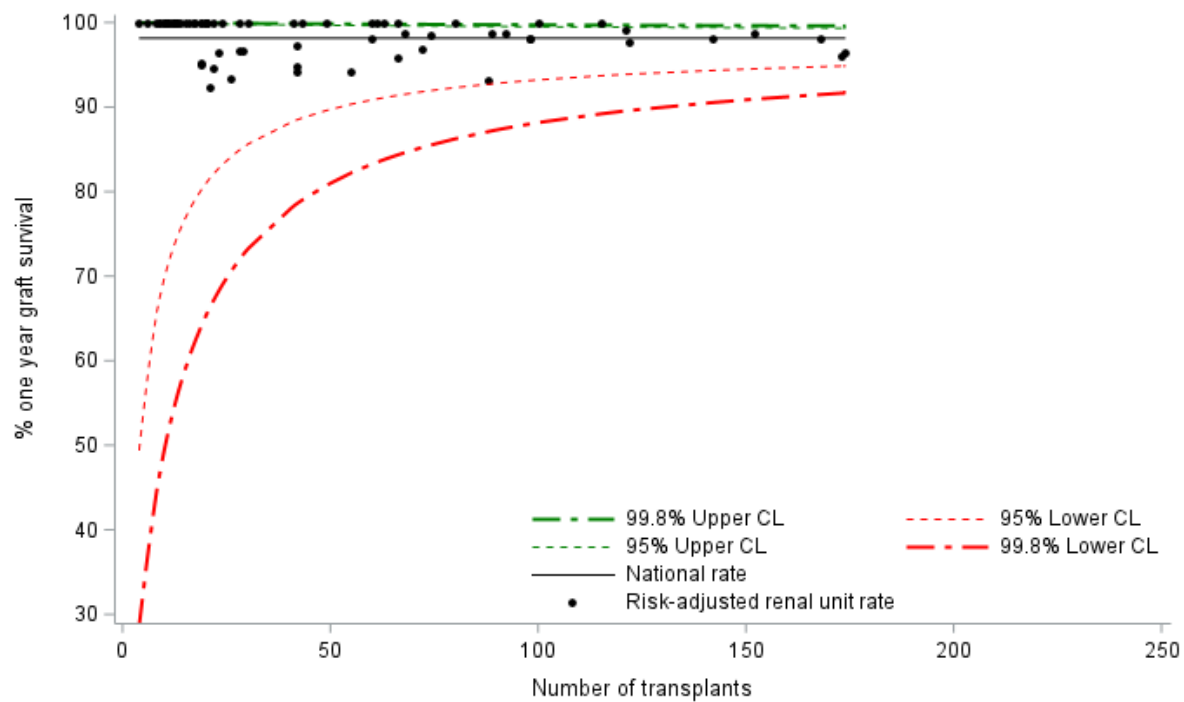


Figure 3.6 Risk-adjusted one year patient survival rates for first live donor kidney transplants in adult patients, between 1 April 2014 and 31 March 2018

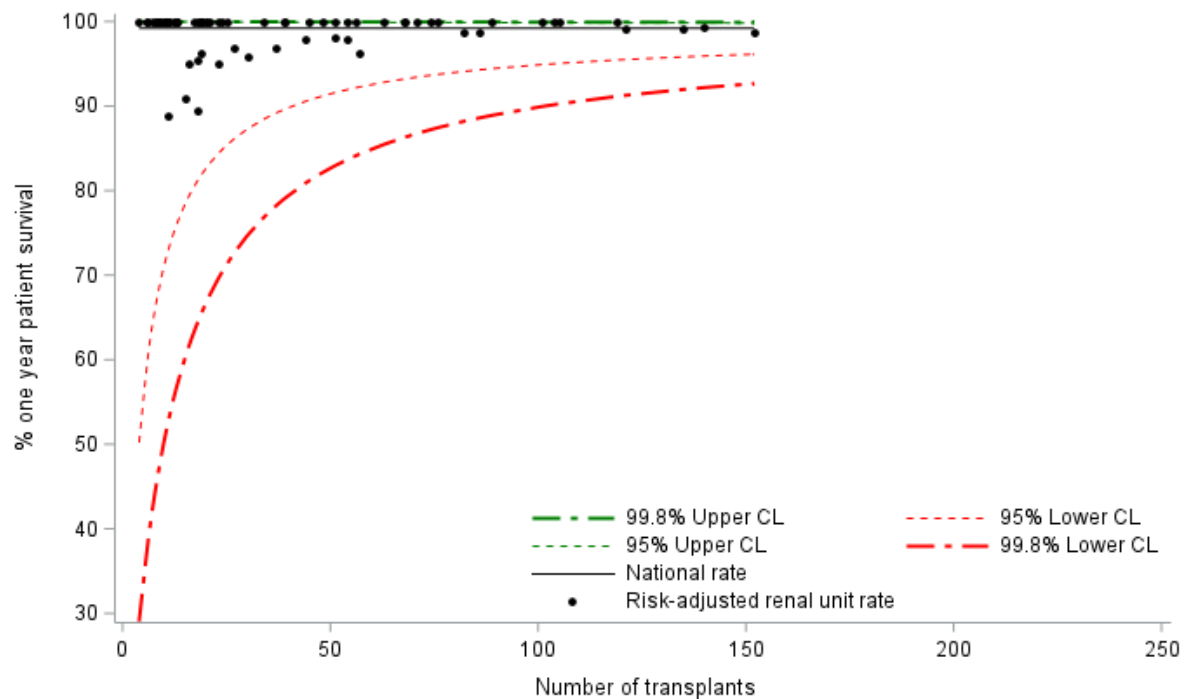


Figure 3.7 Risk-adjusted five year graft (death censored) survival rates for first live donor kidney transplants in adult patients, between 1 April 2010 and 31 March 2014

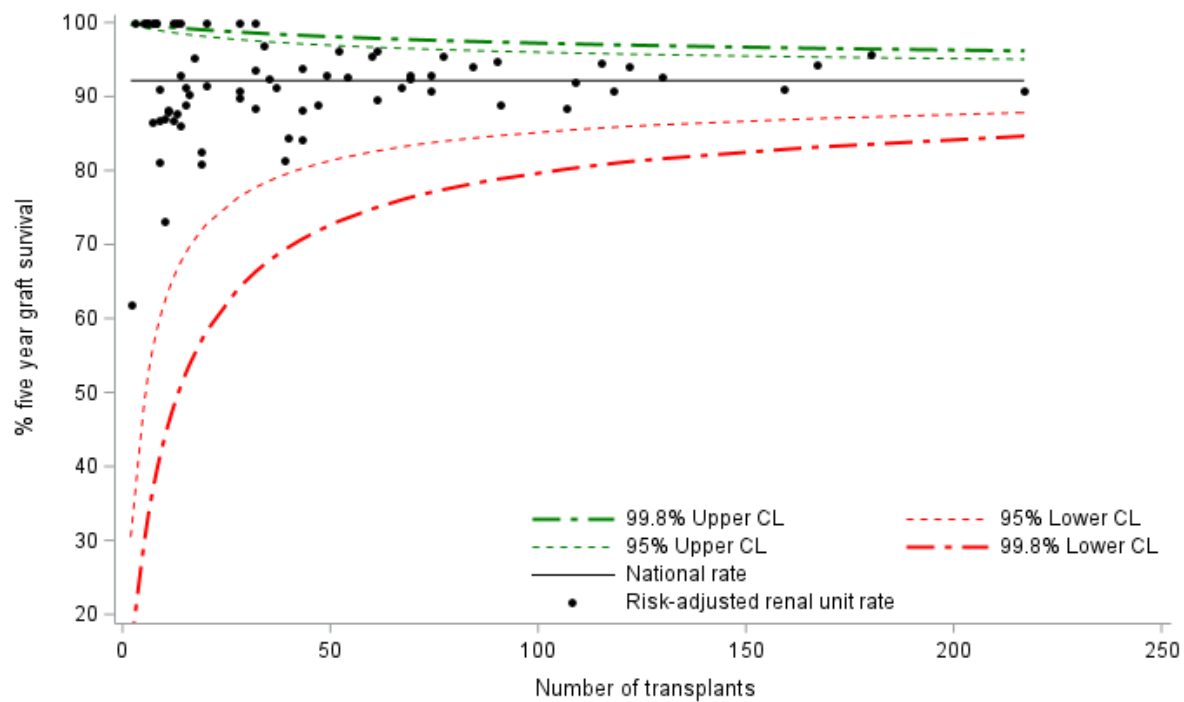


Figure 3.8 Risk-adjusted five year patient survival rates for first live donor kidney transplants in adult patients, between 1 April 2010 and 31 March 2014

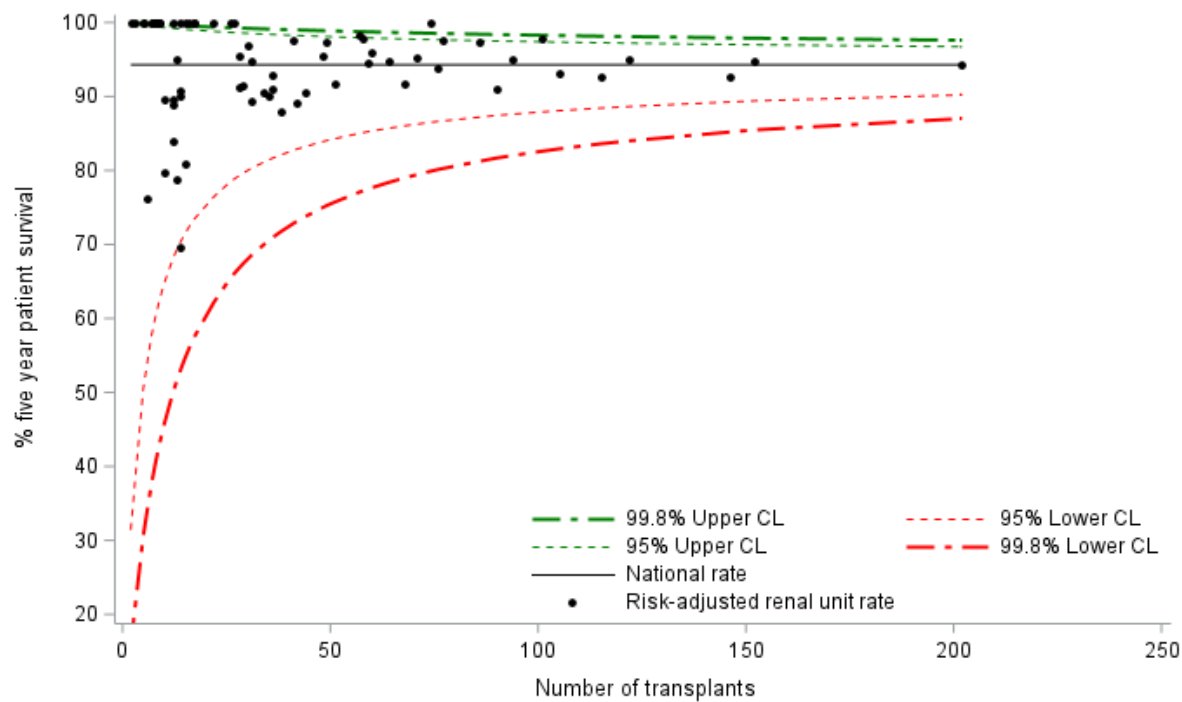


Table 3.2 One and five year first adult kidney-only graft and patient survival using kidneys from living donors

Unit	Kidney graft survival				Patient survival			
	One-year*		Five-year**		One-year*		Five-year**	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Belfast	98	(93 - 100)	94	(87 - 98)	100	N/A	97	(90 - 100)
Antrim	100	N/A	91	(51 - 100)	100	N/A	100	N/A
Newry	100	N/A	88	(35 - 100)	96	(79 - 100)	100	N/A
Ulster	100	N/A	73	(3 - 97)	91	(49 - 100)	90	(43 - 100)
West NI	95	(70 - 100)	100	N/A	100	N/A	91	(74 - 98)
B QEH	99	(96 - 100)	92	(85 - 96)	100	N/A	95	(87 - 99)
B Heart	93	(76 - 99)	91	(67 - 99)	95	(72 - 100)	100	N/A
Dudley	100	N/A	91	(50 - 100)	100	N/A	100	N/A
Shrew	100	N/A	93	(60 - 100)	100	N/A	100	N/A
Stoke	100	N/A	94	(82 - 99)	97	(82 - 100)	93	(75 - 99)
Wolve	95	(73 - 100)	95	(74 - 100)	100	N/A	70	(22 - 92)
Bristol	99	(92 - 100)	89	(79 - 95)	100	N/A	94	(84 - 98)
Dorset	92	(57 - 100)	83	(37 - 98)	100	N/A	81	(44 - 96)
Glouc	100	N/A	100	N/A	100	N/A	100	N/A
Camb	100	N/A	96	(86 - 100)	100	N/A	98	(91 - 100)
Chelms	100	N/A	88	(33 - 100)	100	N/A	80	(27 - 98)
Colchr	100	N/A	100	N/A	100	N/A	100	N/A
Ipswi	100	N/A	100	N/A	100	N/A	100	N/A
Norwch	96	(80 - 100)	86	(50 - 98)	96	(75 - 100)	90	(45 - 100)
Stevng	97	(85 - 100)	94	(77 - 99)	97	(82 - 100)	96	(75 - 100)
Cardff	96	(88 - 99)	91	(81 - 96)	98	(90 - 100)	92	(81 - 97)
Swanse	95	(74 - 100)	92	(78 - 98)	95	(73 - 100)	89	(69 - 98)
Covnt	100	N/A	91	(81 - 97)	100	N/A	96	(85 - 100)
Edinb	100	N/A	93	(80 - 99)	100	N/A	98	(87 - 100)
Abrdn	100	N/A	90	(70 - 98)	100	N/A	100	N/A
Dundee	100	N/A	91	(69 - 99)	100	N/A	100	N/A
Inverns	100	N/A	100	N/A	100	N/A	100	N/A
Krkldy	100	N/A	87	(27 - 100)	100	N/A	100	N/A
Glasgw	98	(93 - 100)	88	(80 - 94)	100	N/A	91	(81 - 97)
Airdrie	100	N/A	100	N/A	100	N/A	91	(49 - 100)
D&Gall	100	N/A	62	(0 - 99)	100	N/A	100	N/A
Klmarnk	100	N/A	100	N/A	100	N/A	76	(14 - 97)
L Guys	96	(91 - 99)	94	(89 - 97)	99	(95 - 100)	95	(89 - 98)
Kent	100	N/A	90	(77 - 96)	100	N/A	92	(81 - 97)
L Kings	100	N/A	89	(72 - 97)	89	(41 - 100)	89	(69 - 98)
Leeds	99	(93 - 100)	92	(82 - 98)	100	N/A	98	(89 - 100)
Bradfd	100	N/A	89	(38 - 100)	100	N/A	89	(60 - 99)
Hull	97	(81 - 100)	84	(65 - 94)	100	N/A	90	(71 - 98)
York	100	N/A	90	(65 - 99)	100	N/A	100	N/A
Leic	98	(93 - 100)	91	(85 - 95)	99	(93 - 100)	93	(86 - 96)
Liv Roy	93	(84 - 98)	93	(82 - 98)	100	N/A	95	(84 - 99)
Bangor	100	N/A	100	N/A	100	N/A	100	N/A
Clwyd	100	N/A	87	(25 - 100)	100	N/A	100	N/A

Table 3.2 One and five year first adult kidney-only graft and patient survival using kidneys from living donors

Unit	Kidney graft survival				Patient survival			
	One-year*		Five-year**		One-year*		Five-year**	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Liv Ain	100	N/A	81	(32 - 98)	100	N/A	100	N/A
Wirral	100	N/A	100	N/A	100	N/A	95	(73 - 100)
Wrexham	100	N/A	100	N/A	100	N/A	100	N/A
M RI	98	(94 - 100)	96	(91 - 98)	99	(96 - 100)	95	(90 - 98)
Preston	100	N/A	96	(86 - 100)	96	(86 - 100)	95	(84 - 99)
Salford	94	(83 - 99)	93	(81 - 98)	100	N/A	91	(76 - 97)
Newcastle	99	(93 - 100)	93	(83 - 98)	100	N/A	95	(86 - 99)
Carlisle	100	N/A	87	(27 - 100)	100	N/A	100	N/A
Middlebury	98	(90 - 100)	81	(62 - 93)	100	N/A	91	(73 - 98)
Sunderland	100	N/A	100	N/A	100	N/A	100	N/A
Nottingham	94	(83 - 99)	88	(74 - 96)	96	(77 - 100)	91	(74 - 98)
Derby	100	N/A	100	N/A	100	N/A	84	(42 - 98)
Oxford	99	(95 - 100)	93	(86 - 97)	99	(96 - 100)	93	(86 - 97)
Redding	97	(82 - 100)	88	(70 - 97)	100	N/A	97	(83 - 100)
Plymouth	95	(81 - 99)	84	(64 - 95)	100	N/A	88	(69 - 97)
Exeter	100	N/A	91	(74 - 98)	100	N/A	95	(81 - 99)
Truro	100	N/A	100	N/A	100	N/A	100	N/A
Portsmouth	100	N/A	95	(86 - 99)	99	(93 - 100)	98	(92 - 100)
Sheffield	99	(92 - 100)	95	(87 - 99)	98	(88 - 100)	97	(85 - 100)
Doncaster	100	N/A	88	(56 - 99)	100	N/A	79	(23 - 97)
L St.G	97	(89 - 100)	94	(85 - 98)	100	N/A	100	N/A
Brighton	100	N/A	97	(83 - 100)	98	(89 - 100)	92	(75 - 98)
Cardiff	100	N/A	96	(87 - 99)	100	N/A	95	(88 - 99)
L Rfree	100	N/A	95	(88 - 98)	100	N/A	98	(93 - 100)
L Barts	98	(94 - 100)	91	(84 - 95)	100	N/A	93	(84 - 98)
Birmingham	100	N/A	87	(52 - 98)	89	(38 - 100)	90	(43 - 100)
St Helens	100	N/A	81	(51 - 95)	100	N/A	100	N/A
L West	97	(93 - 99)	91	(86 - 95)	99	(95 - 100)	94	(90 - 97)
UK	98	(98 - 99)	92	(91 - 93)	99	(99 - 99)	94	(93 - 95)

Centre has reached the lower 99.8% confidence limit

Centre has reached the lower 95% confidence limit

Centre has reached the upper 95% confidence limit

Centre has reached the upper 99.8% confidence limit

* Includes transplants performed between 1 April 2014 - 31 March 2018

** Includes transplants performed between 1 April 2010 - 31 March 2014

Adult kidney outcomes – risk adjusted eGFR

4.1 Risk adjusted eGFR

[Funnel plots](#) were used to compare the adjusted mean 3 and 12 month [eGFR](#) at each renal unit to the national average. The plots show each unit's adjusted mean [eGFR](#) at 3- and 12-months post-transplant against the number of patients at each unit. The national adjusted mean [eGFRs](#) at 3- and 12-months post-transplant are shown by the black line and the 95% and 99.8% [confidence limits](#) around this national average are shown by the dotted lines. Units that fall within the upper and lower 95% [confidence limits](#) have an adjusted mean [eGFR](#) statistically consistent with the national average [eGFR](#). Those units that are above the 95% upper [confidence limit](#) have significantly higher adjusted mean [eGFR](#) than the national average and units that are below the 95% lower [confidence limit](#) have significantly lower adjusted mean [eGFR](#) than the national average.

This section excludes [multi-organ transplants](#) and includes first time transplants only, with results presented separately for deceased and [living donor](#) transplants. Estimates are based on transplants performed in the period 1 April 2014 to 31 March 2018. The [risk factors](#) used to produce the risk-adjusted [eGFR](#) values are detailed in **Table A3.2** in [Appendix A3](#).

Figures 4.1-4.4 and **Table 4.1** show the [risk-adjusted](#) mean [eGFR](#) for each unit and nationally. The [funnel plots](#) show a number of units outside the lower 95% and 99.8% [confidence limits](#) from both deceased and living donors, this may indicate adjusted mean [eGFR](#) values considerably lower than the national rate. Units can be identified by the information shown in **Table 4.1**. At 12 months post-transplant, the national mean [eGFR](#) rate was 49.1 mL/min/1.73m² and 56.2 mL/min/1.73m² for deceased and living donor transplants respectively.

Figure 4.1 Adjusted mean eGFR at 3 months by renal unit for first adult deceased donor kidney transplants in the UK, 1 April 2014 and 31 March 2018

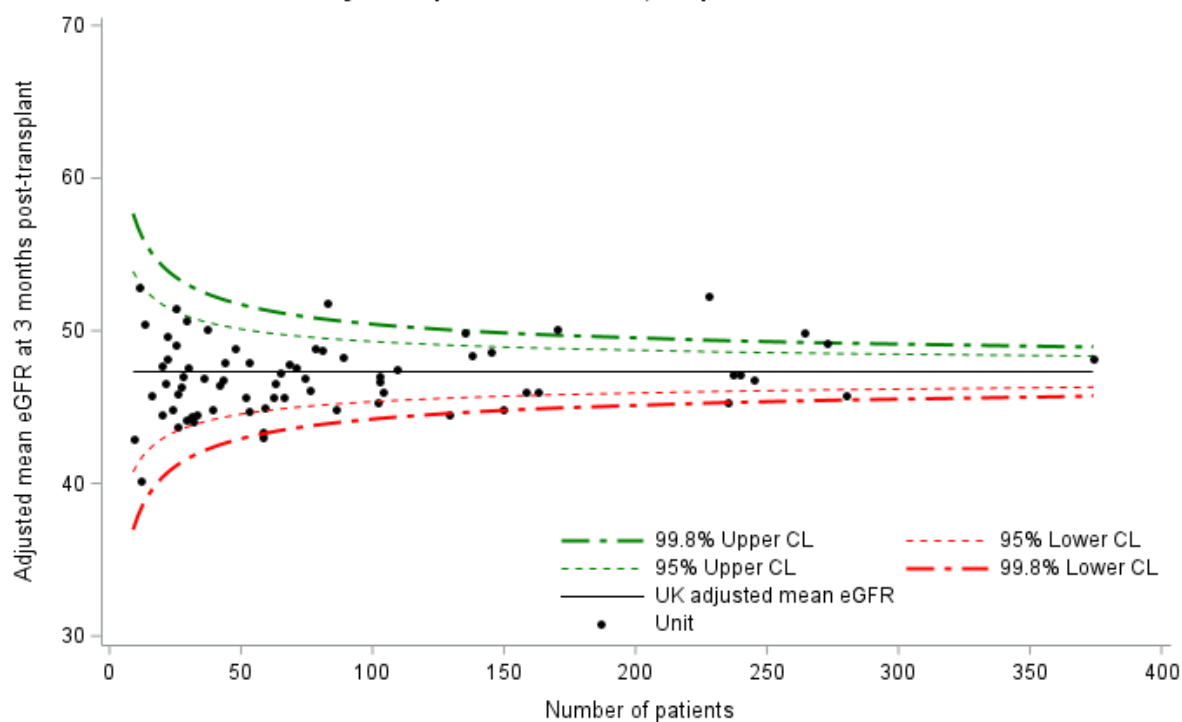


Figure 4.2 Adjusted mean eGFR at 12 months by renal unit for first adult deceased donor kidney transplants in the UK, 1 April 2014 and 31 March 2018

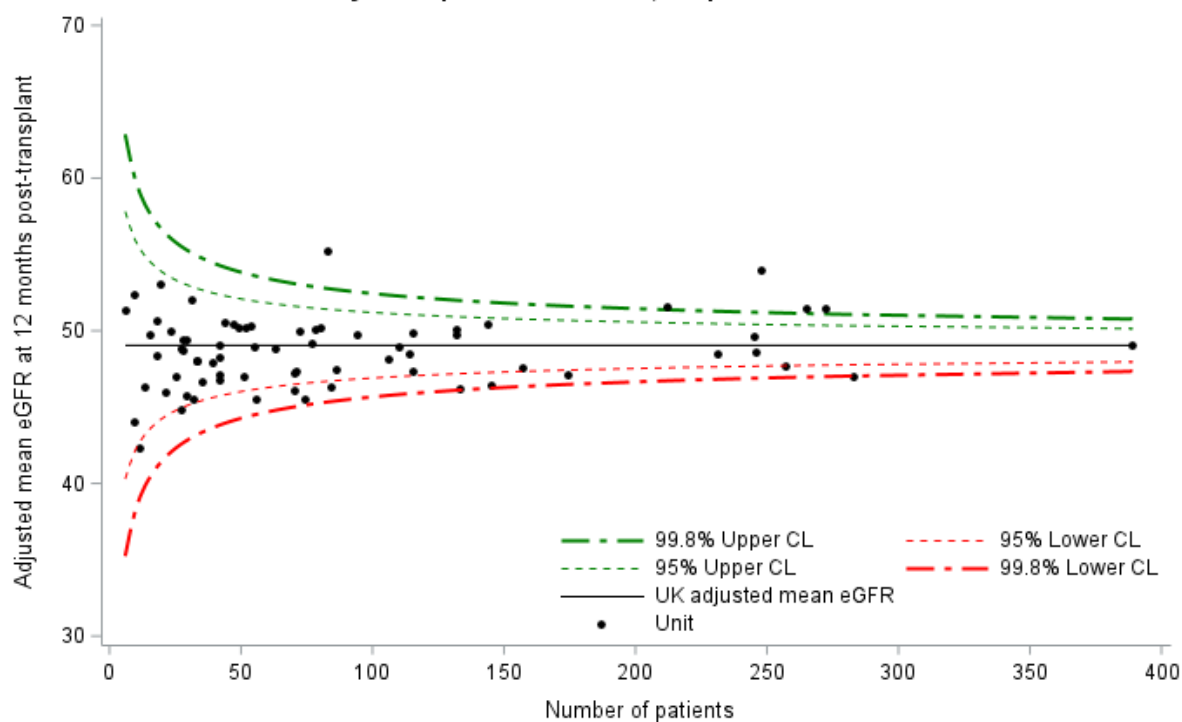


Figure 4.3 Adjusted mean eGFR at 3 months by renal unit for first adult living donor kidney transplants in the UK, 1 April 2014 and 31 March 2018

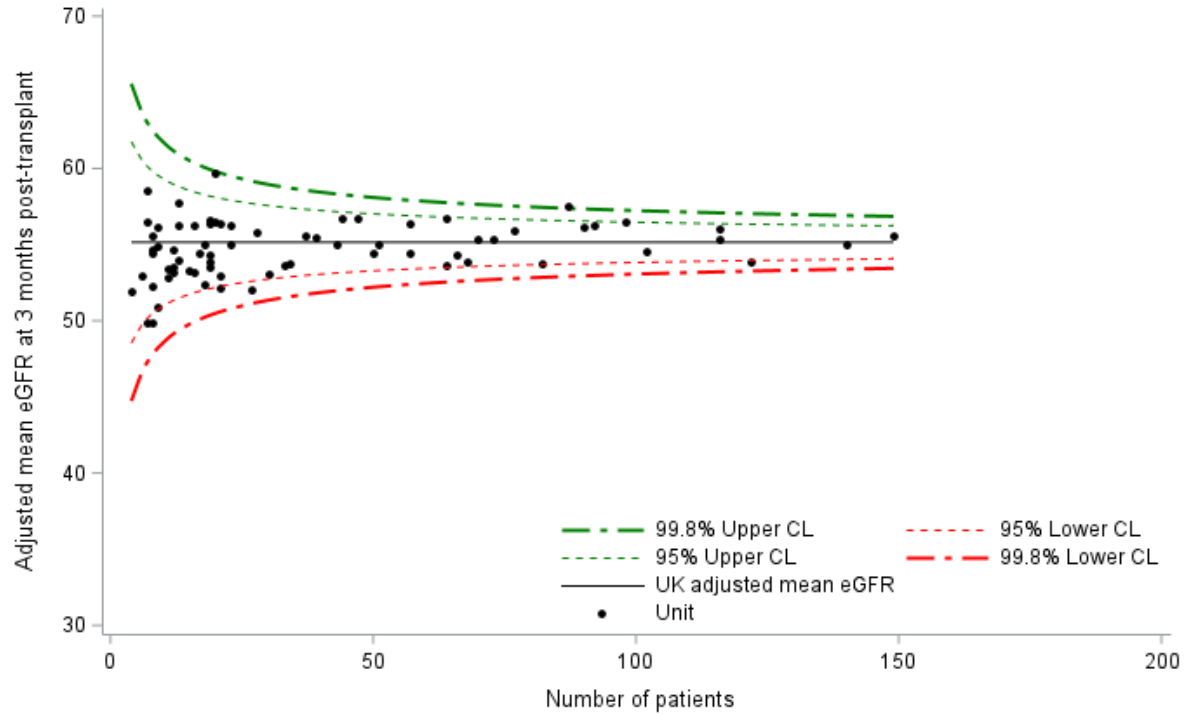


Figure 4.4 Adjusted mean eGFR at 12 months by renal unit for first adult living donor kidney transplants in the UK, 1 April 2014 and 31 March 2018

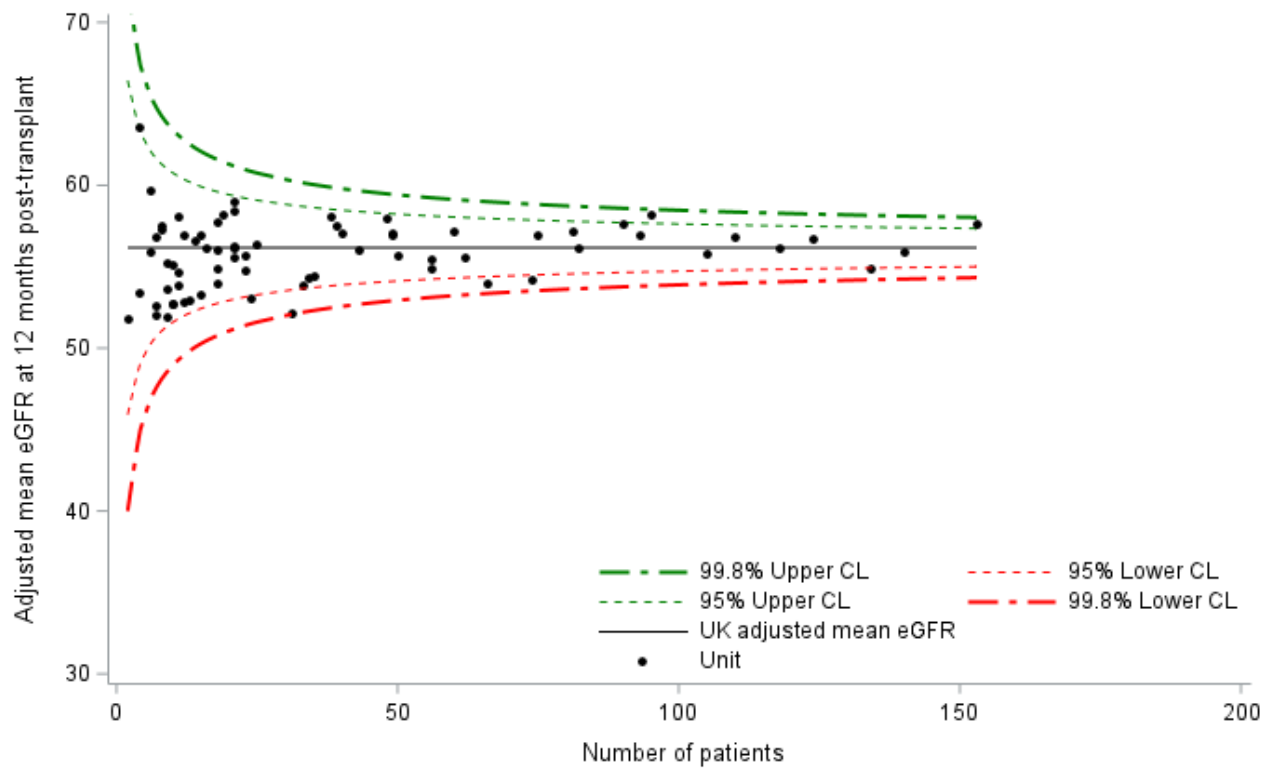


Table 4.1 Adjusted mean eGFR at 3 and 12 months, by donor type and renal unit

Unit	Deceased donor transplants				Living donor transplants			
	3 months post-transplant*		12 months post-transplant**		3 months post-transplant***		12 months post-transplant****	
	N	Mean	N	Mean	N	Mean	N	Mean
Belfast	74	47.0	77	49.2	116	55.3	118	56.2
Antrim	21	46.6	15	49.8	13	56.3	14	56.6
Newry	30	47.7	29	49.4	19	56.7	21	58.5
Ulster	11	52.9	6	51.3	16	53.2	9	51.9
West NI	25	51.5	19	53.1	19	53.5	18	54.0
B QEH	170	50.1	212	51.6	90	56.1	110	56.9
B Heart	48	48.8	54	50.4	21	53.0	23	55.7
Dudley	28	47.0	33	48.1	13	57.8	11	58.1
Shrew	22	49.6	27	48.8	9	54.9	11	54.7
Stoke	65	47.2	63	48.9	27	52.1	31	52.2
Wolve	37	50.1	44	50.6	19	53.9	23	54.7
Bristol	145	48.6	132	50.2	68	53.9	56	54.9
Dorset	33	44.5	39	48.0	13	54.0	12	56.9
Glouc	53	44.8	27	44.9	18	55.1	8	57.5
Camb	103	46.7	114	48.5	64	53.7	66	54.0
Chelms	42	46.4	42	48.3	12	53.2	11	53.9
Colchr	20	47.7	23	50.1	8	54.5	9	55.3
Ipswi	31	44.4	35	46.7	8	52.3	9	53.6
Norwch	62	45.7	71	47.4	21	52.2	24	53.1
Stevng	138	48.4	115	49.9	44	56.8	38	58.1
Cardff	104	46.0	106	48.2	66	54.3	62	55.6
Swanse	53	47.9	49	50.3	18	52.4	15	53.4
Covnt	78	48.9	80	50.2	47	56.8	48	58.0
Edinb	63	46.6	42	47.2	37	55.6	18	54.9
Abrdn	44	48.0	52	50.3	20	59.7	21	59.0
Dundee	26	45.9	33	48.0	12	54.7	18	56.0
Inverns	20	44.5	21	46.0	12	53.6	12	52.8
Krkldy	13	50.5	9	52.4	8	49.9	2	51.8
Glasgw	245	46.8	246	48.6	102	54.6	105	55.8
Airdrie	52	45.6	51	47.0	21	56.3	19	58.2
D&Gall	9	42.9	9	44.1	7	49.9	7	52.0
Klmarnk	32	44.0	32	45.5	9	50.9	10	52.8
L Guys	163	46.0	174	47.2	116	56.1	124	56.7
Kent	59	44.9	74	45.6	28	55.8	39	57.5
L Kings	81	48.7	72	50.0	17	54.5	15	56.9
Leeds	240	47.2	245	49.7	77	55.9	75	56.9
Bradfd	83	51.8	83	55.2	16	56.3	16	56.1
Hull	66	45.6	70	47.3	23	55.0	25	56.4
York	58	43.4	56	45.5	11	52.8	10	52.7
Leic	273	49.2	272	51.5	92	56.2	90	57.7
Liv Roy	102	45.3	115	47.4	70	55.3	81	57.2
Bangor	12	40.2	11	42.4	7	58.6	6	59.7
Clwyd	16	45.7	18	48.4	4	52.0	4	53.4
Liv Ain	25	49.1	28	49.5	19	56.4	18	57.8
Wirral	27	46.3	28	48.7	20	56.5	21	56.2
Wrexm	24	44.8	25	47.0	11	53.4	10	55.1
M RI	280	45.7	283	47.1	140	55.0	140	55.9
Prestn	150	44.8	145	46.4	57	54.4	56	55.5

Table 4.1 Adjusted mean eGFR at 3 and 12 months, by donor type and renal unit

Unit	Deceased donor transplants				Living donor transplants			
	3 months post-transplant*		12 months post-transplant**		3 months post-transplant***		12 months post-transplant****	
	N	Mean	N	Mean	N	Mean	N	Mean
Salford	158	46.0	157	47.6	51	55.0	49	56.9
Newc	103	47.0	110	49.0	73	55.3	82	56.2
Carlisle	26	43.7	29	45.7	8	54.7	6	56.0
Middleb	58	43.1	70	46.1	50	54.5	50	55.7
Sunder	39	44.9	42	46.7	33	53.6	34	54.4
Nottingham	129	44.5	133	46.2	34	53.7	35	54.5
Derby	86	44.9	84	46.3	6	53.0	7	52.6
Oxford	235	45.3	257	47.7	122	53.9	134	55.0
Reading	89	48.3	94	49.8	23	56.3	21	56.3
Plymouth	43	46.8	55	49.0	30	53.1	33	53.9
Exeter	71	47.6	78	50.1	19	54.4	21	55.6
Truro	29	44.2	13	46.3	7	56.5	4	63.6
Ports	237	47.2	231	48.6	82	53.7	74	54.2
Sheff	109	47.5	132	49.8	43	55.0	49	57.1
Donc	36	46.9	42	49.1	9	56.1	8	57.3
L St.G	68	47.9	47	50.5	57	56.4	43	56.1
Brighton	76	46.1	86	47.5	39	55.4	40	57.1
Carsh	135	49.9	144	50.5	64	56.8	60	57.3
L Rfree	264	49.8	265	51.5	98	56.5	93	57.0
L Barts	228	52.3	248	54.0	87	57.5	95	58.3
Basildon	29	50.6	31	52.0	15	53.3	13	53.0
St. Hend	22	48.1	18	50.7	8	55.6	7	56.9
L West	374	48.1	389	49.0	149	55.6	153	57.6
UK	6200	47.3	6361	49.1	2792	55.2	2800	56.2

* Adjusted for recipient ethnicity, donor type, donor hypertension, recipient sex, donor diabetes history, donor alcohol abuse history, donor ethnicity, recipient diabetic status, donor age, donor height and cold ischaemia time.

** Adjusted for recipient sex, recipient ethnicity, donor hypertension history, donor type, donor diabetes history, donor alcohol abuse history, donor age, donor height, cold ischaemia time, waiting time and recipient age

*** Adjusted for recipient ethnicity, relationship between donor and recipient, donor age, donor GFR, donor weight, cold ischaemia time and donor BMI.

**** Adjusted for recipient ethnicity, recipient sex, financial year of transplant, donor age, donor GFR, donor weight, donor height and cold ischaemia time.

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)

Donation after brainstem death means donation which takes place following the diagnosis of death using neurological criteria.

Donor after circulatory death (DCD)

Donation after circulatory death means donation which takes place following the diagnosis of death using circulatory criteria.

eGFR

Estimate of the glomerular filtration rate (GFR) – a recognised indication of renal function. Derived from serum creatinine, age and ethnicity, using the 4-variable Modification of Diet in Renal Disease (MDRD) formula.

Funnel plot

A graphical method that shows how consistent the survival rates of the different renal 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 units, 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 unit is the expected survival rate for that unit given the [case mix](#) of their patients. Adjusting for [case mix](#) in estimating unit-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 Methods

[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 **Table A3.1**.

A3 Risk adjustment factors

Table A3.1 Risk factors used in the adult kidney risk adjusted survival, by donor type and model

Donor Type	Model	Factors
Deceased	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
Living	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

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

Table A3.2 Risk factors used in the adult kidney risk adjusted eGFR, by donor type and model

Donor Type	Model	Factors
Deceased	3 month	recipient ethnicity, donor type, donor hypertension, recipient sex, donor diabetes history, donor alcohol abuse history, donor ethnicity, recipient diabetic status, donor age, donor height, cold ischaemic time*
	12 month	recipient sex, recipient ethnicity, donor hypertension history, donor type, donor diabetes history, donor alcohol abuse history, donor age, donor height, cold ischaemic time*, waiting time, recipient age
Living	3 month	recipient ethnicity, relationship between donor and recipient, donor age, donor GFR, donor weight, cold ischaemic time*, donor BMI
	12 month	recipient ethnicity, recipient sex, financial year of transplant, donor age, donor GFR, donor weight, donor height and cold ischaemic time*

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

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