

# Chapter 8

## Transplantation



2016

ANZDATA Registry

39th Annual Report

*Data to 31-Dec-2015*

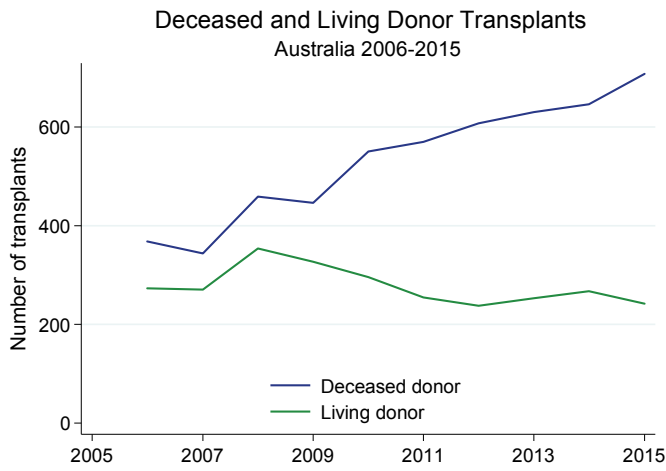
## New Transplants

Table 8.1 shows the number of transplants performed in each country over the last 20 years. The 949 transplants performed in Australia in 2015 represent the highest number ever performed. This is predominantly driven by large growth in deceased donor numbers (figure 8.1); after a peak in 2008 living donor numbers have returned to pre-2008 levels. In New Zealand total transplant activity has increased in the last two years and deceased donors.

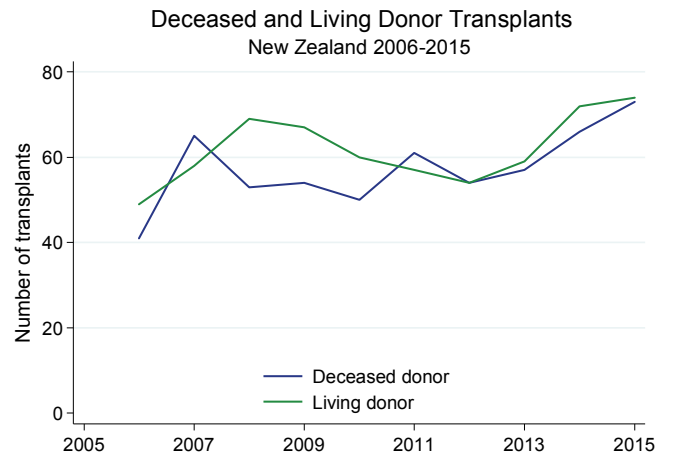
Table 8.1. Number of Grafts Performed by Country 1996-2015														
Year	Australia							New Zealand						
	Graft					Total	Living	Graft					Total	Living
1	2	3	4	5	1			2	3	4	5			
1996	416	50	9	0	0	475	115	88	7	1	0	0	96	26
1997	447	51	6	1	0	505	147	101	10	1	0	0	112	31
1998	443	62	11	2	0	518	161	95	10	1	0	0	106	31
1999	403	43	9	0	0	455	169	97	11	4	0	0	112	42
2000	476	47	7	1	0	531	181	91	13	2	0	0	106	31
2001	488	45	6	2	0	541	213	101	9	0	0	0	110	43
2002	537	60	5	2	0	604	230	103	12	2	0	0	117	48
2003	472	60	10	1	0	543	218	94	13	4	0	0	111	44
2004	583	53	11	3	0	650	244	98	7	0	0	0	105	48
2005	539	67	15	2	0	623	246	87	5	0	1	0	93	46
2006	549	70	17	5	0	641	273	80	8	2	0	0	90	49
2007	527	75	11	0	2	615	271	112	9	2	0	0	123	58
2008	708	84	16	5	0	813	354	111	10	1	0	0	122	69
2009	674	88	11	0	0	773	327	109	12	0	0	0	121	67
2010	744	83	18	1	0	846	296	104	5	1	0	0	110	60
2011	744	68	10	3	0	825	255	110	7	1	0	0	118	57
2012	747	80	15	1	2	845	238	99	9	0	0	0	108	54
2013	789	85	7	2	0	883	253	111	5	0	0	0	116	59
2014	805	100	5	3	0	913	267	126	12	0	0	0	138	72
2015	842	93	12	2	0	949	242	133	10	3	1	0	147	74

The transplant rate of dialysed patients is presented in figure 8.2 (for all dialysis patients) and figure 8.3 (for patients aged 15-64). Note that the denominator for these rates is dialysis-years, enabling a more accurate calculation of rates than that used in previous reports. Differences in rates between states and countries depend on a number of factors including the casemix of the dialysis patients and the local deceased donor rate. These rates are presented by age in figure 8.4, and by ethnicity in patients aged 15-64 in figure 8.5. In both countries the transplant rate of indigenous patients is lower than in other ethnic groups; see also chapter 12.

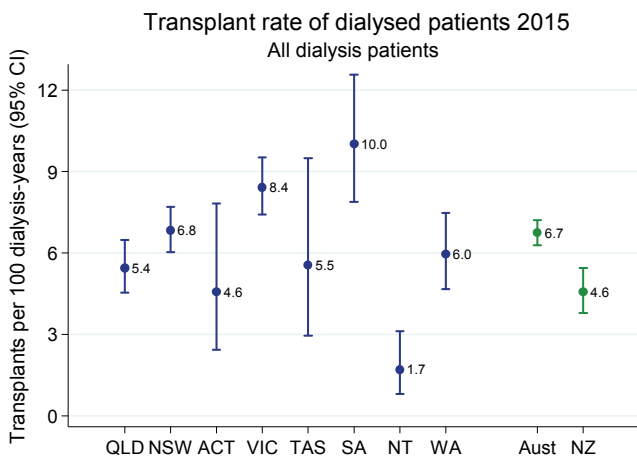
**Figure 8.1.1**



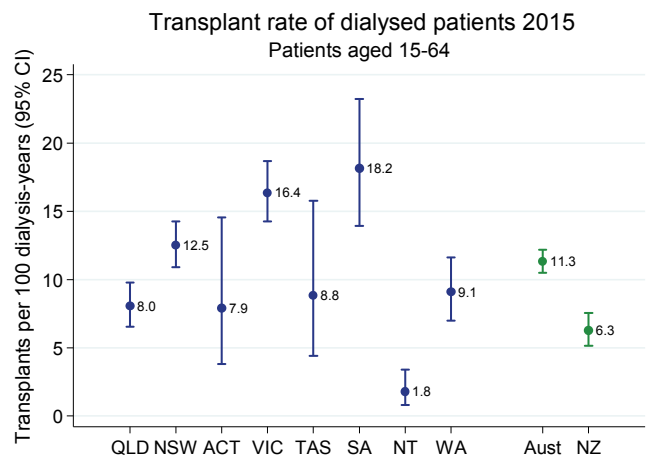
**Figure 8.1.2**



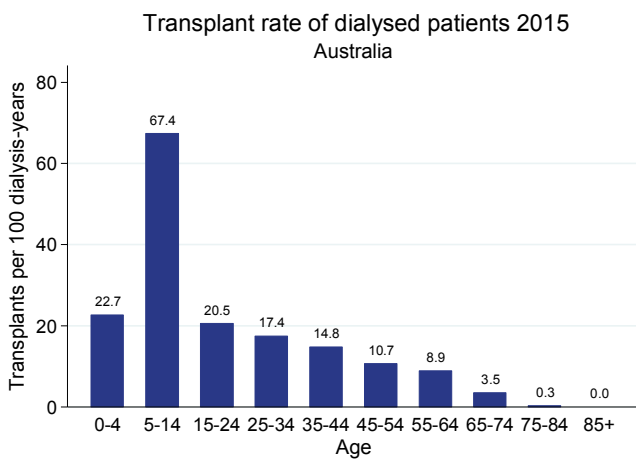
**Figure 8.2**



**Figure 8.3**



**Figure 8.4.1**



**Figure 8.4.2**

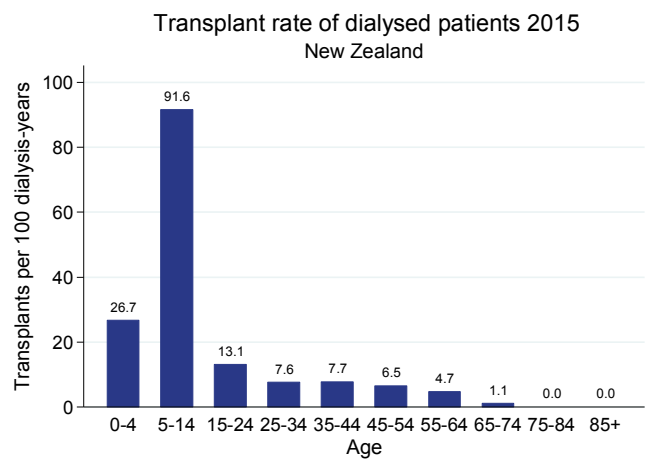


Figure 8.5.1

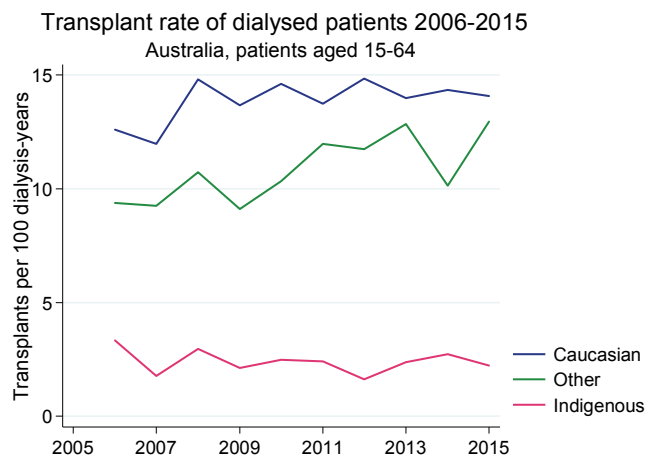


Figure 8.5.2

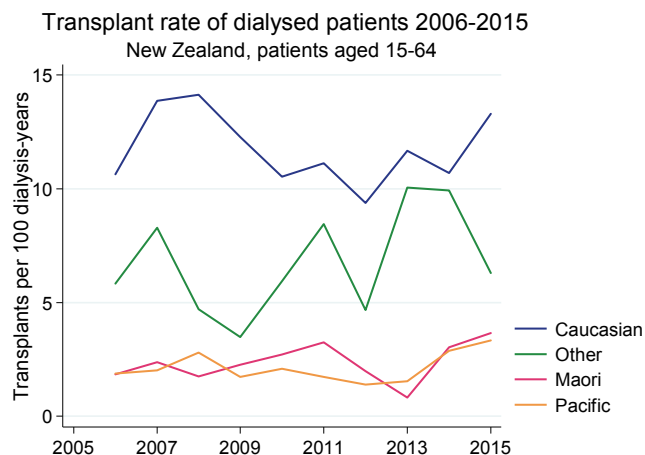
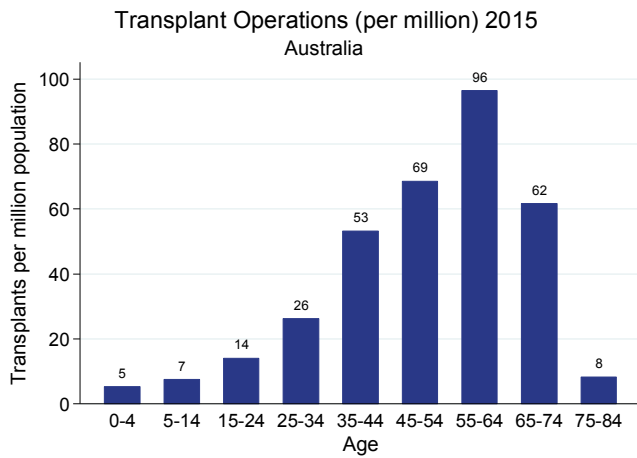


Table 8.2 shows the number of grafts performed according to graft number and recipient age in 2015. Transplant rates by age, per million population, are presented in figure 8.6.

Table 8.2. Age of Recipients Transplanted in 2015

Country	Donor Type	Graft	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84
AUS	Deceased	1	2	5	22	54	108	142	198	90	9
		2	0	0	3	8	14	20	15	6	0
		3	0	0	0	2	5	2	0	0	0
		4	0	0	0	0	1	0	1	0	0
	Living	1	6	16	17	20	38	40	47	28	0
		2	0	1	2	7	5	9	3	0	0
		3	0	0	0	1	1	1	0	0	0
		4	0	0	0	0	0	0	0	0	0
NZ	Deceased	1	0	1	2	7	10	18	23	4	0
		2	0	0	0	2	2	0	2	0	0
		3	0	0	0	0	0	1	1	0	0
		4	0	0	0	0	0	0	0	0	0
	Living	1	1	5	2	9	13	19	17	2	0
		2	0	0	0	2	0	1	0	1	0
		3	0	0	0	0	1	0	0	0	0
		4	0	0	0	0	0	1	0	0	0

**Figure 8.6.1**



**Figure 8.6.2**

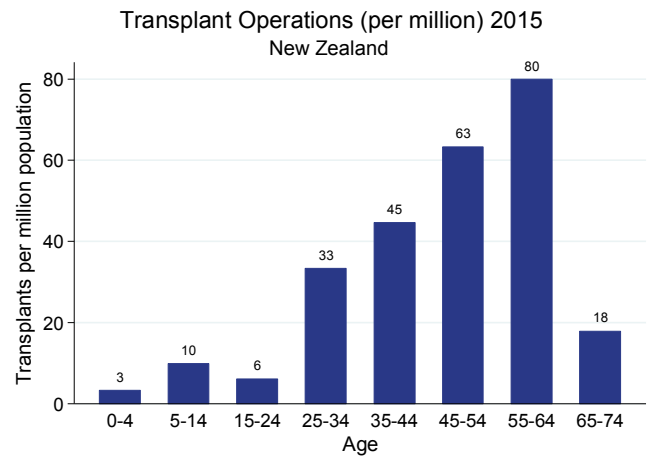


Table 8.3 shows the number of transplants performed by ethnicity over 2011-2015. In both countries the majority of recipients were Caucasian.

**Table 8.3. Ethnicity of Recipients Transplanted 2010-2014**

Country	Ethnicity	2011	2012	2013	2014	2015
Australia	<b>Total</b>	825 (100.0%)	845 (100.0%)	883 (100.0%)	913 (100.0%)	949 (100.0%)
	<b>Caucasian</b>	657 (79.6%)	674 (79.8%)	682 (77.2%)	696 (76.2%)	686 (72.3%)
	<b>Aboriginal/TSI</b>	28 (3.4%)	20 (2.4%)	31 (3.5%)	41 (4.5%)	36 (3.8%)
	<b>Asian</b>	97 (11.8%)	89 (10.5%)	109 (12.3%)	95 (10.4%)	126 (13.3%)
	<b>Māori</b>	11 (1.3%)	11 (1.3%)	8 (0.9%)	7 (0.8%)	8 (0.8%)
	<b>Pacific</b>	18 (2.2%)	15 (1.8%)	26 (2.9%)	27 (3.0%)	22 (2.3%)
	<b>Other</b>	14 (1.7%)	27 (3.2%)	22 (2.5%)	31 (3.4%)	38 (4.0%)
	<b>Not reported</b>	-	9 (1.1%)	5 (0.6%)	16 (1.8%)	33 (3.5%)
New Zealand	<b>Total</b>	118 (100.0%)	108 (100.0%)	116 (100.0%)	138 (100.0%)	147 (100.0%)
	<b>Caucasian</b>	77 (65.3%)	75 (69.4%)	81 (69.8%)	81 (58.7%)	84 (57.1%)
	<b>Asian</b>	11 (9.3%)	11 (10.2%)	16 (13.8%)	16 (11.6%)	12 (8.2%)
	<b>Māori</b>	20 (16.9%)	15 (13.9%)	9 (7.8%)	22 (15.9%)	28 (19.0%)
	<b>Pacific</b>	9 (7.6%)	7 (6.5%)	8 (6.9%)	16 (11.6%)	21 (14.3%)
	<b>Other</b>	1 (0.8%)	-	1 (0.9%)	3 (2.2%)	2 (1.4%)
<b>Not reported</b>	-	-	1 (0.9%)	-	-	

Table 8.4 shows the number of transplants (per million population) performed by transplanting region over 2011-2015. Transplants performed for people resident in Tasmania and the Northern Territory patients are included in figures for Victoria and South Australia regions respectively. These regions share common waiting lists and allocation protocols.

State	2011	2012	2013	2014	2015
<b>NSW/ACT</b>	232 (31)	247 (32)	288 (37)	300 (38)	331 (41)
<b>VIC/TAS</b>	278 (46)	268 (44)	267 (43)	306 (48)	303 (47)
<b>QLD</b>	155 (35)	159 (35)	149 (32)	145 (31)	139 (29)
<b>SA/NT</b>	74 (40)	88 (47)	81 (42)	85 (44)	89 (46)
<b>WA</b>	86 (37)	83 (34)	98 (39)	77 (30)	87 (34)
<b>AUSTRALIA</b>	825 (37)	845 (37)	883 (38)	913 (39)	949 (40)

Each year a small number of Australian and New Zealand dialysis patients travel overseas to receive a kidney transplant. The numbers of such procedures over 2006 - 2015 are presented in table 8.5. It is possible that these numbers are an underestimate of the true number, since some patients may not return to Australia/New Zealand and hence be reported to ANZDATA as lost to follow-up.

Year	Australia	New Zealand
<b>2006</b>	5	2
<b>2007</b>	11	1
<b>2008</b>	4	0
<b>2009</b>	8	1
<b>2010</b>	4	1
<b>2011</b>	7	2
<b>2012</b>	4	1
<b>2013</b>	3	1
<b>2014</b>	3	0
<b>2015</b>	6	0

## Prevalent Transplant Patients

This section presents the number of prevalent (functioning) transplants according to various categories.

Table 8.6 presents the total number of transplants performed (in Australia and New Zealand, categorised by country of transplant) and functioning at the end of 2015 (categorised by country of residence). The patients with transplants of “unknown” source were transplanted outside Australia/New Zealand.

Table 8.6. Total Number of Transplants Performed and Functioning at End of 2015				
Country	Donor type	Graft number	Performed	Functioning
<b>Australia</b>	<b>Living</b>	1	5135	3400
		2	491	303
		3	66	47
		4	10	7
		5	1	0
	<b>Deceased</b>	1	15149	5964
		2	2193	691
		3	343	101
		4	55	17
		5	6	2
<b>Unknown</b>	1	0	17	
	2	0	2	
<b>New Zealand</b>	<b>Living</b>	1	1190	740
		2	93	51
		3	7	4
	<b>Deceased</b>	4	1	1
		1	2460	799
		2	416	80
		3	78	16
		4	7	0
		<b>Unknown</b>	1	0

Table 8.7 presents the number of functioning transplants at the end of 2006-15 by transplant region. In Australia SA/NT has the highest prevalence of transplant patients per million population (571 pmp) and WA the lowest (385 pmp). These data are shown graphically in figures 8.7 and 8.8.

Table 8.7. Functioning Transplants (pmp) by Transplanting Region 2006-2015							
Year	NSW/ACT	VIC/TAS	QLD	SA/NT	WA	AUSTRALIA	NEW ZEALAND
2006	2224 (314)	1872 (337)	1377 (344)	823 (467)	685 (334)	6981 (341)	1258 (301)
2007	2279 (318)	1969 (349)	1425 (347)	868 (486)	710 (337)	7251 (348)	1303 (308)
2008	2386 (327)	2103 (365)	1507 (357)	911 (504)	750 (345)	7657 (360)	1353 (318)
2009	2488 (336)	2260 (385)	1577 (364)	935 (510)	788 (352)	8048 (371)	1405 (327)
2010	2636 (351)	2425 (406)	1651 (375)	974 (524)	819 (358)	8505 (386)	1443 (332)
2011	2713 (358)	2584 (427)	1721 (384)	988 (528)	859 (365)	8865 (397)	1483 (338)
2012	2821 (367)	2723 (443)	1800 (394)	1031 (545)	888 (364)	9263 (408)	1522 (345)
2013	2930 (376)	2870 (459)	1866 (401)	1052 (550)	938 (373)	9656 (418)	1571 (354)
2014	3076 (389)	3054 (481)	1923 (407)	1072 (556)	958 (374)	10083 (430)	1619 (359)
2015	3255 (406)	3212 (498)	1977 (414)	1109 (571)	998 (385)	10551 (444)	1694 (369)

Figure 8.7

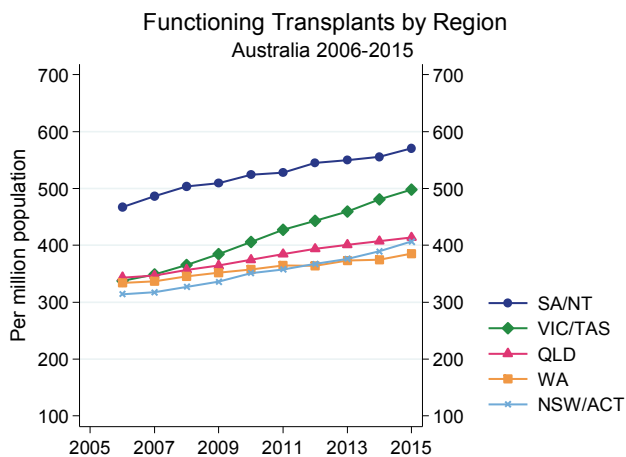
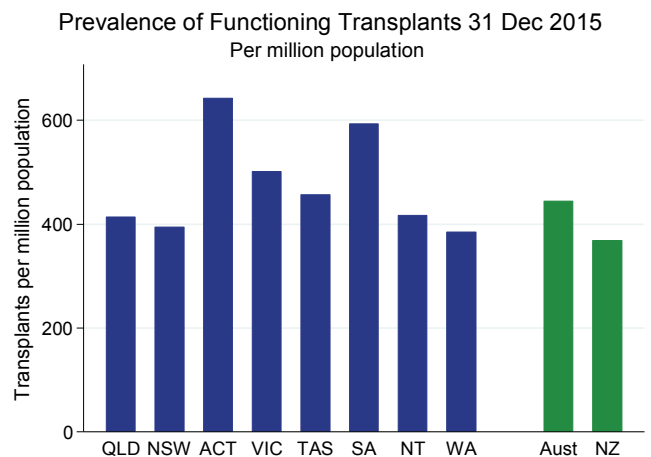


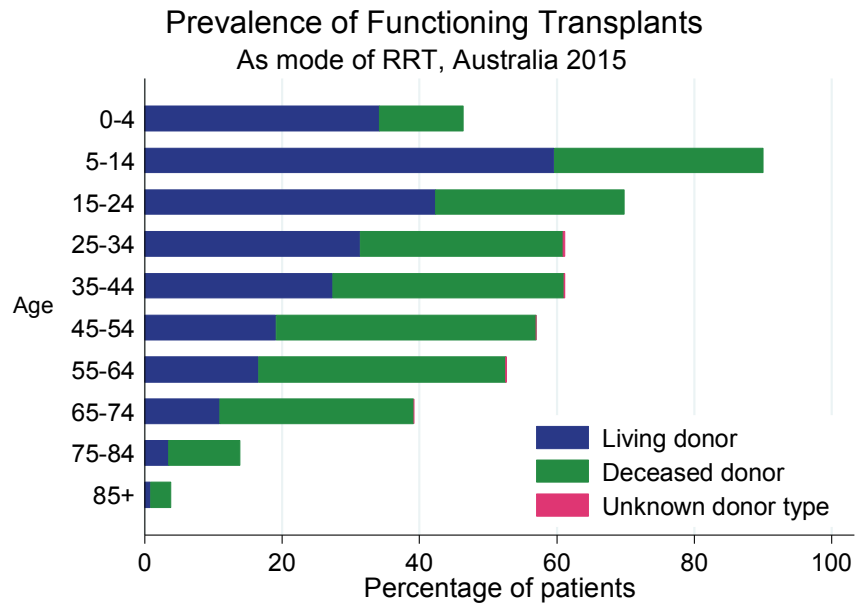
Figure 8.8



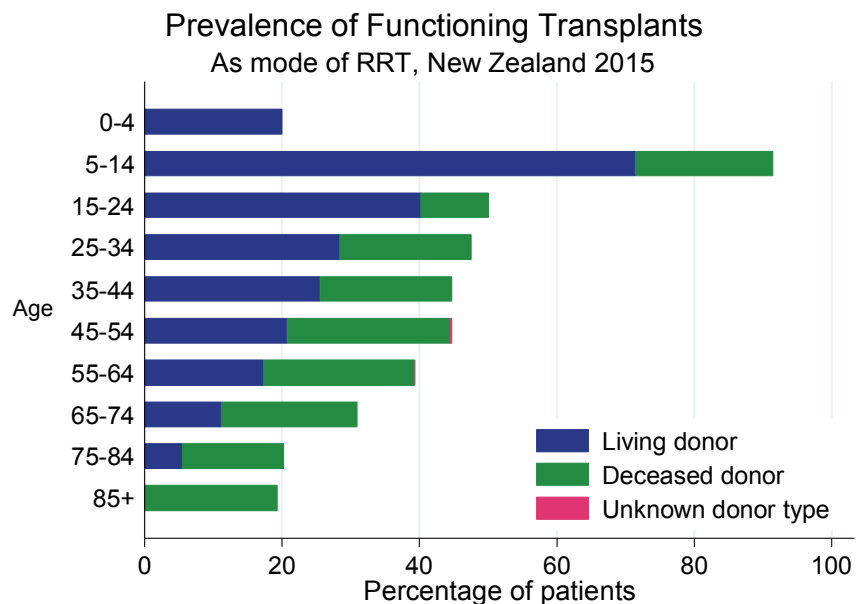


The age distribution of prevalent transplant patients as a proportion of patients on renal replacement therapy is shown in figure 8.9. The proportion depending on living donor grafts is greater in the younger age groups. The number of prevalent transplant patients by age and donor source is shown in table 8.8. Finally, the age distribution, and distribution per million population, are shown in figures 8.10 and 8.11 for Australia and New Zealand respectively.

**Figure 8.9.1**



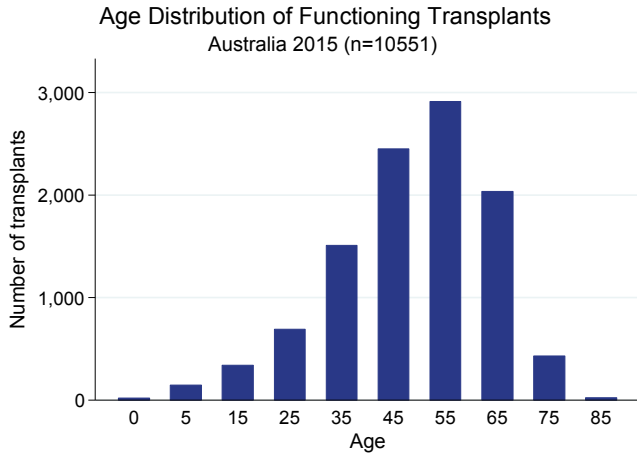
**Figure 8.9.2**



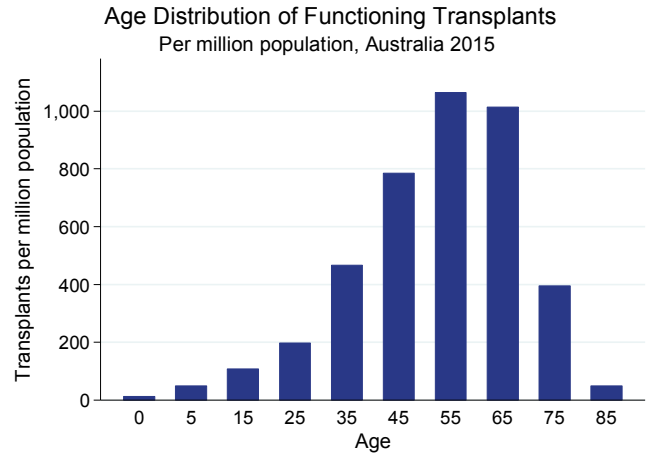
**Table 8.8. Age Distribution of Functioning Transplant Patients - 31 Dec 2015**

Country	Donor Source	Graft Number	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85+	Total	
AUS	All	All	19	145	338	690	1508	2449	2913	2037	429	23	10551	
	Unknown	1	-	-	-	3	4	2	5	3	-	-	-	17
		2	-	-	-	1	-	1	-	-	-	-	-	2
		All	-	-	-	4	4	3	5	3	-	-	-	19
	Deceased	1	5	46	115	286	703	1374	1762	1352	306	15	-	5964
		2	-	3	16	37	102	204	202	108	16	3	-	691
		3	-	-	2	8	22	40	21	8	-	-	-	101
		4	-	-	-	1	3	7	6	-	-	-	-	17
		5	-	-	-	-	-	1	1	-	-	-	-	2
		All	5	49	133	332	830	1626	1992	1468	322	18	-	6775
	Living	1	14	96	185	322	602	723	821	530	103	4	-	3400
		2	-	-	18	30	61	80	80	29	4	1	-	303
		3	-	-	2	2	10	14	13	6	-	-	-	47
		4	-	-	-	-	1	3	2	1	-	-	-	7
		All	14	96	205	354	674	820	916	566	107	5	-	3757
NZ	All	All	1	32	51	139	203	422	471	299	70	6	1694	
	Unknown	1	-	-	-	-	-	2	1	-	-	-	-	3
		All	-	-	-	-	-	2	1	-	-	-	-	3
	Deceased	1	-	7	10	52	76	179	241	178	50	6	-	799
		2	-	-	-	4	8	40	16	11	1	-	-	80
		3	-	-	-	-	3	5	6	2	-	-	-	16
		All	-	7	10	56	87	224	263	191	51	6	-	895
	Living	1	1	25	40	78	104	174	193	106	19	-	-	740
		2	-	-	1	5	11	20	12	2	-	-	-	51
		3	-	-	-	-	1	1	2	-	-	-	-	4
4		-	-	-	-	-	1	-	-	-	-	-	1	
	All	1	25	41	83	116	196	207	108	19	-	-	796	

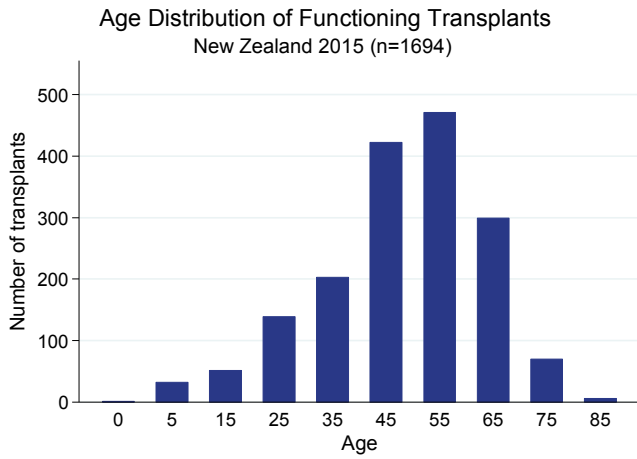
**Figure 8.10.1**



**Figure 8.10.2**



**Figure 8.11.1**



**Figure 8.11.2**

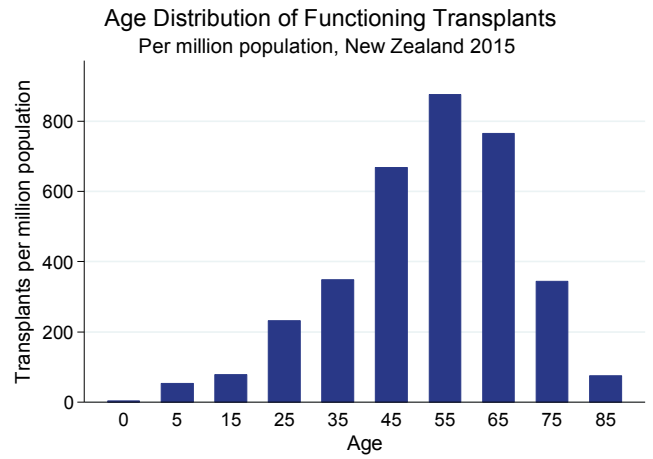
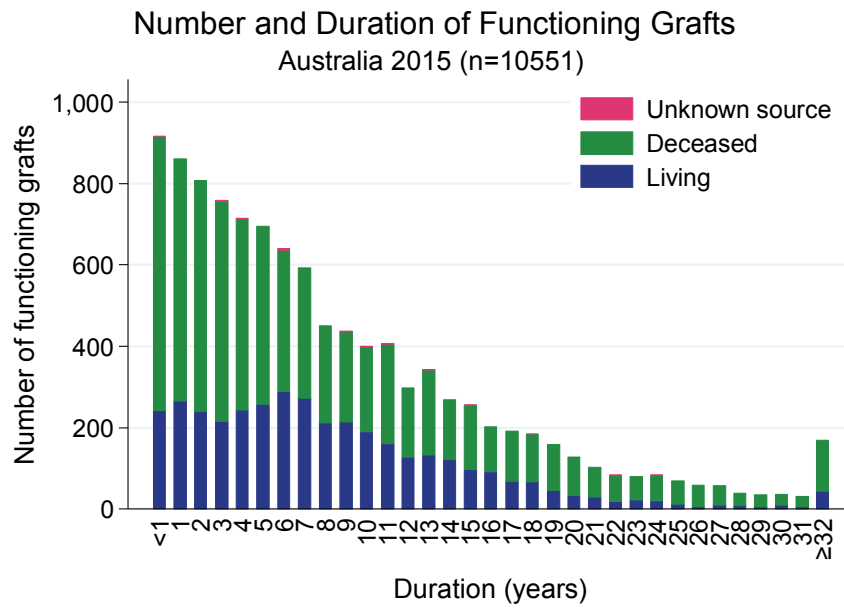


Table 8.9 presents the number of prevalent patients by sex, ethnicity and age; the great majority of prevalent transplant patients in both countries are Caucasian.

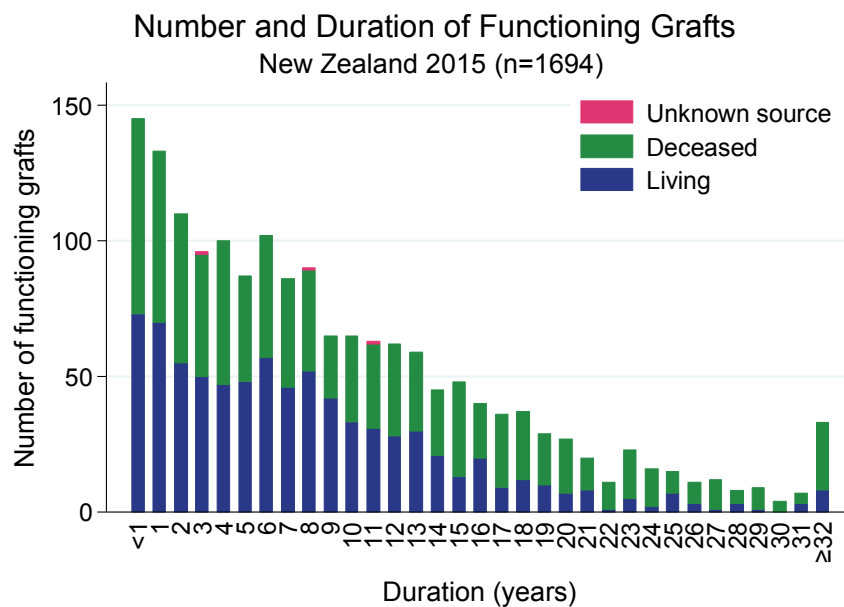
Table 8.9. Functioning Transplant Patients Related to Ethnicity and Age Group - 31 Dec 2015													
Country	Gender	Ethnicity	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85+	Total
AUS	All	Total	19	145	338	690	1508	2449	2913	2037	429	23	10551
	Female	Caucasian	5	43	101	225	479	734	891	637	170	14	3299
		Aboriginal/ Torres Strait Islander	-	1	7	8	22	37	22	7	-	-	104
		Asian	-	3	13	25	81	122	179	69	11	1	504
		Other	1	10	7	24	25	29	31	13	4	-	144
		Not reported	-	-	3	5	5	3	7	4	-	-	27
		Total	6	57	131	287	612	925	1130	730	185	15	4078
	Male	Caucasian	10	69	164	334	718	1293	1465	1142	221	7	5423
		Aboriginal/ Torres Strait Islander	-	3	2	11	22	33	49	16	1	-	137
		Asian	-	8	22	33	97	137	192	117	16	1	623
		Other	2	8	14	23	50	47	66	31	6	-	247
Not reported		1	-	5	2	9	14	11	1	-	-	43	
	Total	13	88	207	403	896	1524	1783	1307	244	8	6473	
NZ	All	Total	1	32	51	139	203	422	471	299	70	6	1694
	Female	Caucasian	-	6	20	32	64	116	128	103	21	4	494
		Asian	-	1	5	2	6	13	15	8	1	-	51
		Māori	1	5	3	8	10	13	15	6	4	-	65
		Pacific	-	1	1	6	11	16	10	1	2	-	48
		Other	-	1	-	-	-	-	-	-	-	-	1
		Total	1	14	29	48	91	158	168	118	28	4	659
	Male	Caucasian	-	16	16	62	83	208	203	133	32	2	755
		Asian	-	-	-	11	12	15	33	17	3	-	91
		Māori	-	2	3	11	6	24	38	16	5	-	105
		Pacific	-	-	3	6	10	13	25	11	2	-	70
Other		-	-	-	1	1	3	3	4	-	-	12	
	Not reported	-	-	-	-	-	1	1	-	-	-	2	
	Total	-	18	22	91	112	264	303	181	42	2	1035	

Figure 8.12 shows the duration of function of prevalent transplants at the end of 2015. In Australia there were 3,682 grafts that had functioned for  $\geq 10$  years, 975  $\geq 20$  years and 236  $\geq 30$  years. In New Zealand there were 680 grafts that had functioned for  $\geq 10$  years, 196  $\geq 20$  years and 44  $\geq 30$  years.

**Figure 8.12.1**



**Figure 8.12.2**



## Graft Loss

Table 8.10 presents the overall graft loss rate in 2006-15 by country, stratified into graft failure and death with a functioning graft. These rates are expressed as graft losses per 100 graft-years. In general around half of grafts are lost due to graft failure and half due to patient death.

Country	Outcome	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
AUS	Graft failure	2.9	2.9	3.5	3.2	2.8	2.9	3.2	2.7	2.8	3.1
	Death with function	2.3	2.5	2.6	2.1	2.4	2.9	2.2	2.8	2.5	2.4
	All losses	5.2	5.5	6.0	5.3	5.2	5.7	5.3	5.5	5.4	5.4
NZ	Graft failure	4.0	3.5	2.4	2.9	2.4	2.3	2.7	2.4	3.0	2.1
	Death with function	2.9	3.7	2.2	2.7	2.5	3.1	2.2	2.2	3.0	2.8
	All losses	6.9	7.2	4.6	5.5	4.9	5.4	4.9	4.6	6.0	4.9

The causes of graft loss over 2006-15 are presented in table 8.11. Chronic allograft nephropathy dominates the causes of graft failure, whilst graft failure due to acute rejection is an uncommon event. These data are further categorised by timing post-transplant (first year versus later years) for 2011-15 in table 8.12. Cancer and cardiovascular disease are the most common causes of death with a functioning graft in both Australia and New Zealand.

Country	Cause of Graft Loss	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
AUS	Death with function	146	165	175	149	178	222	173	232	214	208	1862
	Acute rejection	7	11	10	16	8	10	10	13	11	16	112
	Chronic allograft nephropathy	108	132	174	152	148	155	175	154	165	183	1546
	Hyperacute rejection	1	-	2	-	-	-	-	-	1	-	4
	Vascular	14	8	14	17	11	6	10	9	7	11	107
	Technical	5	2	4	3	4	5	2	-	6	4	35
	Glomerulonephritis	23	15	10	15	16	15	18	16	12	17	157
	Non-compliance	3	7	6	14	6	6	8	9	14	3	76
	Other	19	17	16	15	17	27	30	22	27	33	223
	<b>Total</b>		326	357	411	381	388	446	426	455	457	475
NZ	Death with function	34	44	26	34	33	41	30	30	43	41	356
	Acute rejection	2	1	1	1	-	3	1	2	3	1	15
	Chronic allograft nephropathy	31	20	20	29	17	15	26	21	28	23	230
	Hyperacute rejection	-	-	-	-	-	-	-	-	-	-	0
	Vascular	-	3	1	2	3	2	1	2	1	-	15
	Technical	3	1	-	-	-	-	-	-	1	1	6
	Glomerulonephritis	6	5	5	-	4	4	5	1	2	2	34
	Non-compliance	1	6	1	1	5	3	-	4	6	-	27
	Other	3	5	1	3	2	4	3	4	2	4	31
	<b>Total</b>		80	85	55	70	64	72	66	64	86	72

**Table 8.12 Graft Losses 2011-2015**

Country	Outcome	Cause	First year	Beyond first year	Total
	<b>Death with function</b>	Cardiovascular	33 (39%)	235 (24%)	268 (26%)
		Withdrawal	2 (2%)	66 (7%)	68 (6%)
		Cancer	3 (4%)	306 (32%)	309 (29%)
		Infection	30 (36%)	133 (14%)	163 (16%)
		Other	16 (19%)	225 (23%)	241 (23%)
		<b>Total</b>	<b>84 (100%)</b>	<b>965 (100%)</b>	<b>1049 (100%)</b>
<b>AUS</b>	<b>Graft Failure</b>	Acute rejection	26 (22%)	34 (3%)	60 (5%)
		Chronic allograft nephropathy	6 (5%)	826 (76%)	832 (69%)
		Hyper-acute rejection	1 (1%)	-	1 (<1%)
		Vascular	30 (25%)	13 (1%)	43 (4%)
		Technical	16 (13%)	1 (<1%)	17 (1%)
		Glomerulonephritis	5 (4%)	73 (7%)	78 (6%)
		Non-compliance	-	40 (4%)	40 (3%)
		Other	35 (29%)	104 (10%)	139 (11%)
<b>Total</b>	<b>119 (100%)</b>	<b>1091 (100%)</b>	<b>1210 (100%)</b>		
	<b>Death with function</b>	Cardiovascular	5 (63%)	54 (31%)	59 (32%)
		Withdrawal	-	6 (3%)	6 (3%)
		Cancer	-	59 (33%)	59 (32%)
		Infection	-	27 (15%)	27 (15%)
		Other	3 (38%)	31 (18%)	34 (18%)
		<b>Total</b>	<b>8 (100%)</b>	<b>177 (100%)</b>	<b>185 (100%)</b>
<b>NZ</b>	<b>Graft Failure</b>	Acute rejection	2 (14%)	8 (5%)	10 (6%)
		Chronic allograft nephropathy	-	113 (70%)	113 (65%)
		Vascular	3 (21%)	3 (2%)	6 (3%)
		Technical	2 (14%)	-	2 (1%)
		Glomerulonephritis	2 (14%)	12 (7%)	14 (8%)
		Non-compliance	-	13 (8%)	13 (7%)
		Other	5 (36%)	12 (7%)	17 (10%)
<b>Total</b>	<b>14 (100%)</b>	<b>161 (100%)</b>	<b>175 (100%)</b>		

## Immunosuppression

The use of antibodies for induction immunosuppression is shown in table 8.13. The drop in the number of patients receiving antibody therapy in 2012-15 may represent underreporting rather than a change in practice; caution is advised when interpreting these data.

**Table 8.13 Antibody Use for Induction Immunosuppression 2010-2015**  
**Number of Kidney Transplant Recipients Receiving Each Agent by Year (% Total New Transplants)**

Country	Type of agent	2011	2012	2013	2014	2015
<b>AUS</b>	Intravenous immunoglobulin	42 (5.1%)	28 (3.3%)	43 (4.9%)	27 (3.0%)	14 (1.5%)
	Anti-CD25	775 (93.9%)	724 (85.7%)	792 (89.7%)	783 (85.8%)	727 (76.6%)
	Rituximab	10 (1.2%)	7 (0.8%)	2 (0.2%)	2 (0.2%)	6 (0.6%)
	T cell depleting polyclonal Ab	34 (4.1%)	33 (3.9%)	35 (4.0%)	42 (4.6%)	56 (5.9%)
	Other	-	7 (0.8%)	3 (0.3%)	8 (0.9%)	1 (0.1%)
	<b>Total new transplants</b>		<b>825</b>	<b>845</b>	<b>883</b>	<b>913</b>
<b>NZ</b>	Intravenous immunoglobulin	-	1 (0.9%)	-	-	1 (0.7%)
	Anti-CD25	114 (96.6%)	101 (93.5%)	115 (99.1%)	133 (96.4%)	138 (93.9%)
	Rituximab	3 (2.5%)	4 (3.7%)	6 (5.2%)	9 (6.5%)	9 (6.1%)
	T cell depleting polyclonal Ab	1 (0.8%)	-	2 (1.7%)	2 (1.4%)	-
	Other	-	-	-	-	1 (0.7%)
	<b>Total new transplants</b>		<b>118</b>	<b>108</b>	<b>116</b>	<b>138</b>



Immunosuppressive therapy at baseline, 1 and 2 years post-transplant for primary deceased donor grafts over 2008-15 is presented in table 8.14. Tacrolimus is the most commonly prescribed calcineurin inhibitor in Australia, whereas in New Zealand cyclosporin predominates. As with antibody therapy, caution is advised when interpreting these data for 2012-15.

**Table 8.14.1 Immunosuppressive Therapy - Primary Deceased Donor Grafts Australia 2008-2015**

Country	Time	Year Trans-planted	AZA	CYC	TAC	MMF	MPA	SIR	EVE	PRE	Number of Grafts
Initial Treatment	2008	2 (1%)	137 (35%)	240 (61%)	364 (93%)	22 (6%)	-	-	389 (99%)	391	
	2009	4 (1%)	62 (16%)	310 (82%)	356 (95%)	13 (3%)	-	3 (1%)	375 (100%)	376	
	2010	-	66 (14%)	409 (86%)	426 (89%)	37 (8%)	1 (<1%)	3 (1%)	477 (100%)	478	
	2011	1 (<1%)	56 (11%)	447 (87%)	299 (59%)	208 (41%)	-	-	508 (99%)	511	
	2012	1 (<1%)	27 (5%)	479 (90%)	293 (55%)	226 (42%)	2 (<1%)	-	518 (97%)	533	
	2013	4 (1%)	11 (2%)	537 (95%)	345 (61%)	206 (36%)	-	-	553 (98%)	565	
	2014	2 (<1%)	11 (1%)	530 (93%)	364 (64%)	172 (30%)	1 (<1%)	11 (2%)	544 (96%)	568	
	2015	3 (<1%)	5 (<1%)	546 (87%)	353 (56%)	189 (30%)	2 (<1%)	9 (1%)	552 (88%)	630	
AUS	Treatment at 1 Year	2008	17 (5%)	84 (23%)	251 (70%)	288 (80%)	37 (10%)	12 (3%)	9 (2%)	345 (96%)	361
		2009	18 (5%)	40 (11%)	283 (80%)	281 (79%)	40 (11%)	18 (5%)	9 (3%)	341 (96%)	354
		2010	24 (5%)	53 (12%)	371 (82%)	322 (71%)	85 (19%)	16 (4%)	11 (2%)	442 (97%)	455
		2011	26 (5%)	34 (7%)	421 (87%)	225 (47%)	210 (44%)	8 (2%)	13 (3%)	470 (98%)	482
		2012	21 (4%)	25 (5%)	437 (87%)	215 (43%)	231 (46%)	12 (2%)	16 (3%)	478 (95%)	502
		2013	18 (3%)	22 (4%)	471 (88%)	269 (50%)	194 (36%)	11 (2%)	3 (1%)	498 (93%)	535
		2014	22 (4%)	8 (1%)	465 (88%)	266 (50%)	156 (29%)	4 (1%)	21 (4%)	479 (90%)	531
Treatment at 2 Years	2008	20 (6%)	80 (23%)	238 (68%)	275 (79%)	39 (11%)	12 (3%)	9 (3%)	324 (93%)	350	
	2009	24 (7%)	40 (12%)	272 (79%)	252 (73%)	55 (16%)	20 (6%)	11 (3%)	329 (96%)	344	
	2010	25 (6%)	46 (11%)	344 (79%)	305 (70%)	79 (18%)	21 (5%)	14 (3%)	411 (94%)	435	
	2011	31 (7%)	33 (7%)	396 (84%)	199 (42%)	208 (44%)	8 (2%)	20 (4%)	443 (94%)	470	
	2012	26 (5%)	22 (4%)	411 (84%)	203 (41%)	215 (44%)	11 (2%)	19 (4%)	450 (92%)	491	
	2013	19 (4%)	19 (4%)	420 (81%)	248 (48%)	175 (34%)	12 (2%)	7 (1%)	453 (87%)	518	

**Table 8.14.2 Immunosuppressive Therapy - Primary Deceased Donor Grafts New Zealand 2008-2015**

Country	Time	Years Transplanted	AZA	CYC	TAC	MMF	MPA	SIR	EVE	PRE	Number of Grafts
	<b>Initial Treatment</b>	<b>2008</b>	-	30 (67%)	15 (33%)	42 (93%)	3 (7%)	-	-	45 (100%)	45
		<b>2009</b>	-	39 (78%)	10 (20%)	49 (98%)	-	-	-	49 (98%)	50
		<b>2010</b>	-	32 (71%)	13 (29%)	45 (100%)	-	-	-	45 (100%)	45
		<b>2011</b>	-	41 (71%)	17 (29%)	58 (100%)	-	-	-	58 (100%)	58
		<b>2012</b>	-	36 (72%)	13 (26%)	49 (98%)	-	-	-	49 (98%)	50
		<b>2013</b>	-	45 (83%)	9 (17%)	53 (98%)	-	-	-	53 (98%)	54
		<b>2014</b>	-	44 (75%)	13 (22%)	58 (98%)	-	-	-	58 (98%)	59
		<b>2015</b>	-	51 (77%)	17 (26%)	61 (94%)	-	-	-	64 (98%)	65
<b>NZ</b>	<b>Treatment at 1 Year</b>	<b>2008</b>	2 (5%)	21 (48%)	23 (52%)	39 (89%)	1 (2%)	-	-	41 (93%)	44
		<b>2009</b>	-	24 (50%)	23 (48%)	48 (100%)	-	1 (2%)	-	45 (94%)	48
		<b>2010</b>	2 (5%)	16 (37%)	27 (63%)	41 (95%)	-	-	-	42 (98%)	43
		<b>2011</b>	2 (4%)	25 (46%)	29 (54%)	50 (93%)	-	-	-	52 (96%)	54
		<b>2012</b>	2 (4%)	27 (56%)	21 (44%)	45 (94%)	-	-	-	47 (98%)	48
		<b>2013</b>	2 (4%)	34 (65%)	18 (35%)	50 (96%)	-	-	-	52 (100%)	52
		<b>2014</b>	2 (4%)	32 (56%)	26 (46%)	55 (96%)	-	-	-	56 (98%)	57
		<b>2015</b>	2 (5%)	20 (48%)	22 (52%)	37 (88%)	-	1 (2%)	-	40 (95%)	42
	<b>Treatment at 2 Years</b>	<b>2008</b>	-	21 (46%)	24 (52%)	45 (98%)	-	1 (2%)	-	42 (91%)	46
		<b>2009</b>	2 (5%)	17 (40%)	25 (60%)	39 (93%)	-	-	-	39 (93%)	42
		<b>2010</b>	4 (7%)	25 (46%)	29 (54%)	45 (83%)	-	-	-	51 (94%)	54
		<b>2011</b>	1 (2%)	24 (52%)	20 (43%)	42 (91%)	-	1 (2%)	-	43 (93%)	46
		<b>2012</b>	2 (4%)	34 (65%)	17 (33%)	47 (90%)	-	-	-	51 (98%)	52
		<b>2013</b>	2 (4%)	34 (65%)	17 (33%)	47 (90%)	-	-	-	51 (98%)	52

## Rejection

The proportion of patients experiencing any rejection episode by 6 months post-transplant, stratified by donor type and graft number, is presented in table 8.15. Antibody-mediated rejection rates are presented in table 8.16; rates are notably higher in re-grafts.

**Table 8.15 Rejection Rates at Six Months Post Transplant 2005 - 2014**

Donor Type	Graft Number	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Living Donor	First	19.6%	19.6%	21.1%	17.0%	16.8%	17.8%	17.5%	14.1%	19.2%	22.4%
	Second and Subsequent	18.5%	33.3%	34.3%	30.0%	24.3%	12.9%	18.5%	10.3%	16.1%	28.6%
Deceased Donor	First	18.6%	16.3%	17.7%	22.0%	21.1%	18.9%	20.0%	16.8%	18.4%	19.8%
	Second and Subsequent	31.7%	36.4%	32.8%	32.9%	37.8%	28.6%	19.4%	24.4%	25.0%	25.9%

**Table 8.16 Antibody-Mediated Rejection Rates at Six Months Post Transplant 2005 - 2014**

Donor Type	Graft Number	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Living Donor	First	1.1%	1.4%	3.4%	3.1%	4.5%	3.7%	4.9%	2.3%	5.0%	4.6%
	Second and Sub-	3.7%	5.6%	20.0%	12.5%	13.5%	3.2%	11.1%	6.9%	3.2%	5.7%
Deceased Donor	First	3.0%	2.9%	5.8%	4.8%	5.6%	5.2%	5.6%	3.9%	5.0%	5.1%
	Second and Sub-	4.8%	15.2%	10.9%	15.8%	24.3%	13.0%	11.3%	10.3%	10.3%	12.9%

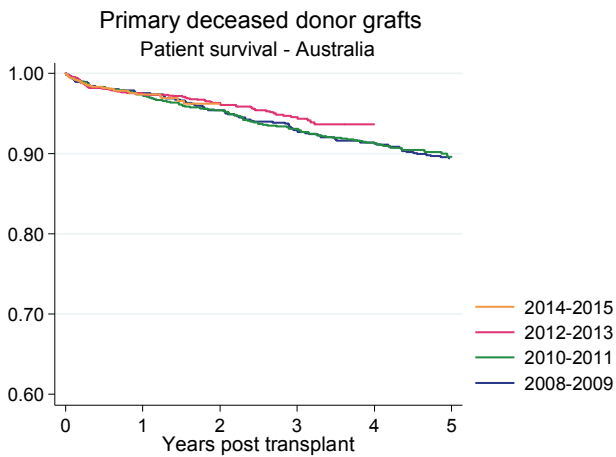
Table 8.17 shows the number of people who received antibody agents for treating acute rejection by calendar year. The number is also reported as a proportion of new transplant recipients in each calendar year, but readers should be aware that although the large majority of people experiencing acute rejection do so within the first six months of transplantation, some experience rejection after this time (when they would not necessarily be counted as a new transplant). For this reason the total number of transplant recipients treated during the year is also reported.

<b>Table 8.17 Antibody Therapy for Acute Rejection 2011 - 2015</b>						
<b>Country</b>	<b>Type of Agent</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
<b>Australia</b>	Intravenous immunoglobulin	106 (12.8%)	69 (8.2%)	104 (11.8%)	95 (10.4%)	161 (17.0%)
	Anti-CD25	-	-	1 (0.1%)	1 (0.1%)	2 (0.2%)
	Rituximab	11 (1.3%)	8 (0.9%)	11 (1.2%)	12 (1.3%)	12 (1.3%)
	T cell depleting polyclonal Ab	45 (5.5%)	39 (4.6%)	51 (5.8%)	37 (4.1%)	27 (2.8%)
	Not specified	3 (0.4%)	11 (1.3%)	14 (1.6%)	28 (3.1%)	24 (2.5%)
	<b>Total new transplants</b>	<b>825</b>	<b>845</b>	<b>883</b>	<b>913</b>	<b>949</b>
	<b>Total transplants at risk</b>	<b>9330</b>	<b>9710</b>	<b>10146</b>	<b>10569</b>	<b>11032</b>
<b>New Zealand</b>	Intravenous immunoglobulin	4 (3.4%)	3 (2.8%)	2 (1.7%)	8 (5.8%)	1 (0.7%)
	Anti-CD25	1 (0.8%)	-	1 (0.9%)	-	-
	Rituximab	-	1 (0.9%)	1 (0.9%)	7 (5.1%)	-
	T cell depleting polyclonal Ab	11 (9.3%)	4 (3.7%)	4 (3.4%)	7 (5.1%)	3 (2.0%)
	Not specified	-	1 (0.9%)	1 (0.9%)	3 (2.2%)	4 (2.7%)
	<b>Total new transplants</b>	<b>118</b>	<b>108</b>	<b>116</b>	<b>138</b>	<b>147</b>
	<b>Total transplants at risk</b>	<b>1561</b>	<b>1591</b>	<b>1638</b>	<b>1709</b>	<b>1766</b>

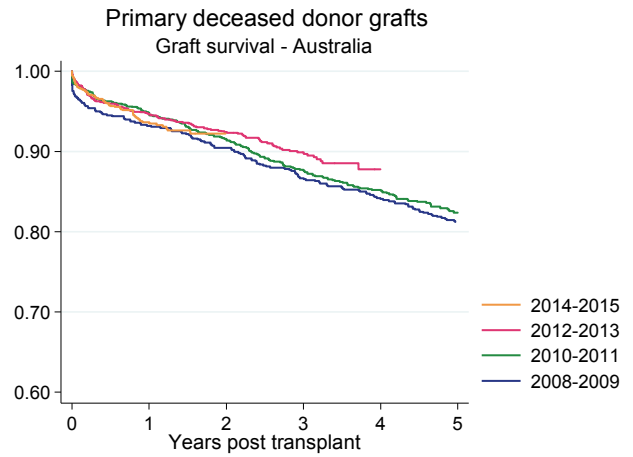
## Patient and Graft Survival

The remainder of the chapter presents patient and graft survival by transplant era and within a number of different categories combining country, graft number and donor type. Each page shows the patient and graft survival graphically, and in tabular form (with 95% confidence intervals) at selected time-points post-transplant. In each case the survivor function is calculated using the Kaplan-Meier method. Graft survival is not censored for death. All of these survival statistics are unadjusted. Note that in the survival graphs out to 5 years, the y axis ranges from 0.60 to 1.00 in order to show the differences between the eras more clearly, whereas in the long-term graphs (out to 30 years) the y axis starts at 0.

**Figure 8.13.1**



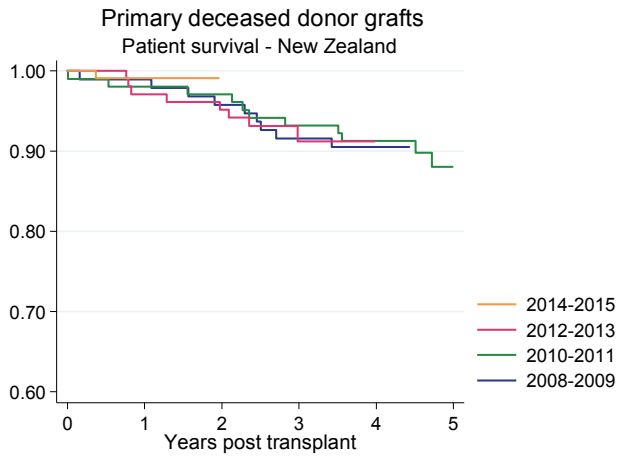
**Figure 8.14**



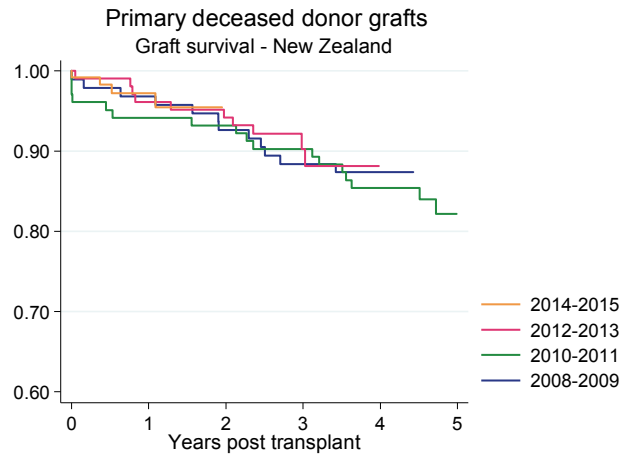
**Table 8.18. Primary Deceased Donor Grafts - Australia 2008-2015**

Outcome	Era	1 month	6 months	1 year	5 years
<b>Patient survival</b>	<b>2008-2009 (n=767)</b>	99 (99, 100)	98 (97, 99)	98 (96, 98)	89 (87, 91)
	<b>2010-2011 (n=989)</b>	99 (99, 100)	98 (97, 99)	97 (96, 98)	90 (87, 91)
	<b>2012-2013 (n=1098)</b>	100 (99, 100)	98 (97, 99)	97 (96, 98)	-
	<b>2014-2015 (n=1198)</b>	99 (99, 100)	98 (97, 99)	97 (96, 98)	-
<b>Graft survival</b>	<b>2008-2009 (n=767)</b>	97 (95, 98)	95 (93, 96)	93 (91, 95)	81 (78, 84)
	<b>2010-2011 (n=989)</b>	98 (97, 99)	96 (95, 97)	95 (93, 96)	82 (80, 85)
	<b>2012-2013 (n=1098)</b>	98 (97, 99)	96 (95, 97)	95 (93, 96)	-
	<b>2014-2015 (n=1198)</b>	98 (97, 99)	96 (94, 97)	94 (92, 95)	-

**Figure 8.15**



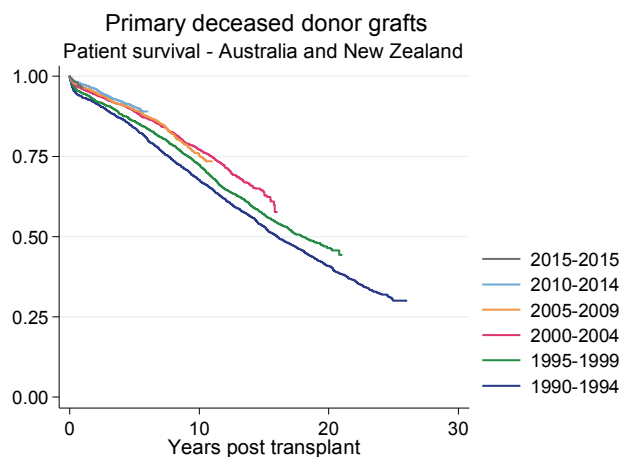
**Figure 8.16**



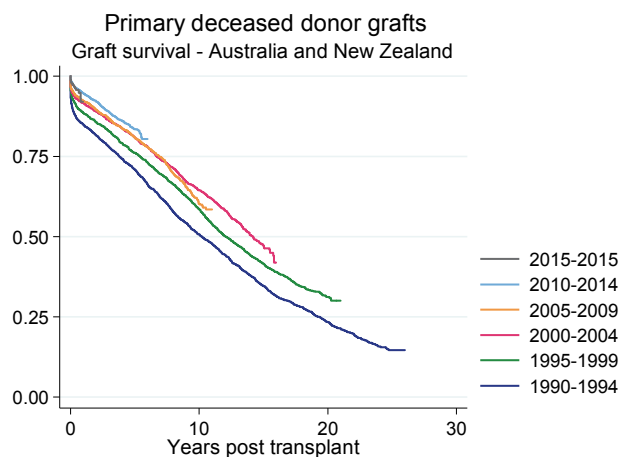
**Table 8.19 Primary Deceased Donor Grafts - New Zealand 2008 - 2015**

Outcome	Era	1 month	6 months	1 year	5 years
<b>Patient survival</b>	2008-2009 (n=95)	100	99 (93, 100)	99 (93, 100)	91 (83, 95)
	2010-2011 (n=103)	99 (93, 100)	99 (93, 100)	98 (92, 100)	88 (79, 93)
	2012-2013 (n=104)	100	100	97 (91, 99)	-
	2014-2015 (n=124)	100	99 (94, 100)	99 (94, 100)	-
<b>Graft survival</b>	2008-2009 (n=95)	99 (93, 100)	98 (92, 99)	97 (91, 99)	87 (79, 93)
	2010-2011 (n=103)	96 (90, 99)	95 (89, 98)	94 (87, 97)	82 (73, 89)
	2012-2013 (n=104)	99 (93, 100)	99 (93, 100)	96 (90, 99)	-
	2014-2015 (n=124)	99 (94, 100)	98 (93, 100)	97 (92, 99)	-

**Figure 8.17**



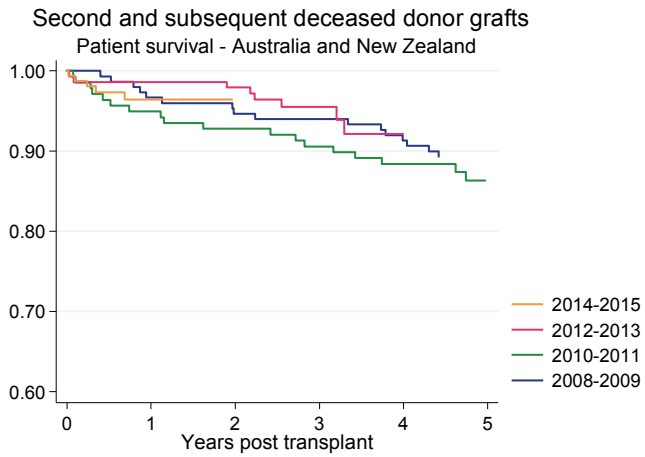
**Figure 8.18**



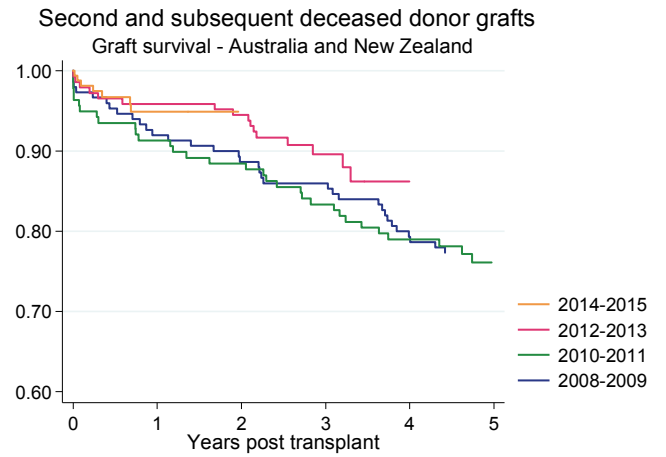
**Table 8.20 Primary Deceased Donor Grafts - Australia and New Zealand 1990-2015**

Outcome	Era	1 year	5 years	10 years	15 years	20 years
Patient survival	1990-1994 (n=1906)	93 (92, 94)	84 (82, 85)	68 (66, 70)	53 (51, 55)	41 (39, 43)
	1995-1999 (n=1779)	95 (94, 96)	86 (84, 88)	72 (70, 74)	57 (55, 59)	47 (44, 49)
	2000-2004 (n=1850)	96 (95, 97)	89 (88, 90)	77 (75, 79)	64 (61, 66)	-
	2005-2009 (n=1911)	97 (96, 97)	90 (88, 91)	75 (72, 78)	-	-
	2010-2014 (n=2921)	98 (97, 98)	90 (89, 92)	-	-	-
	2015-2015 (n=695)	-	-	-	-	-
Graft survival	1990-1994 (n=1906)	85 (83, 87)	71 (69, 73)	51 (48, 53)	35 (33, 37)	23 (22, 25)
	1995-1999 (n=1779)	89 (87, 90)	76 (74, 78)	59 (56, 61)	42 (39, 44)	31 (29, 34)
	2000-2004 (n=1850)	92 (90, 93)	81 (79, 83)	65 (62, 67)	47 (45, 50)	-
	2005-2009 (n=1911)	92 (91, 93)	81 (79, 83)	60 (57, 63)	-	-
	2010-2014 (n=2921)	95 (94, 96)	83 (82, 85)	-	-	-
	2015-2015 (n=695)	-	-	-	-	-

**Figure 8.19**



**Figure 8.20**

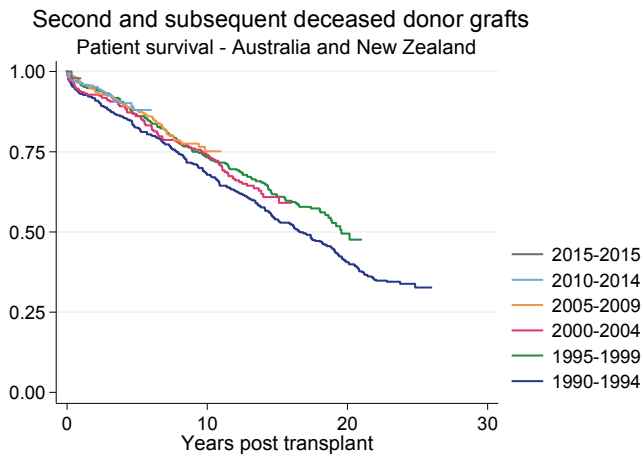


**Table 8.21 Second and Subsequent Deceased Donor Grafts - Australia and New Zealand 2008 - 2015**

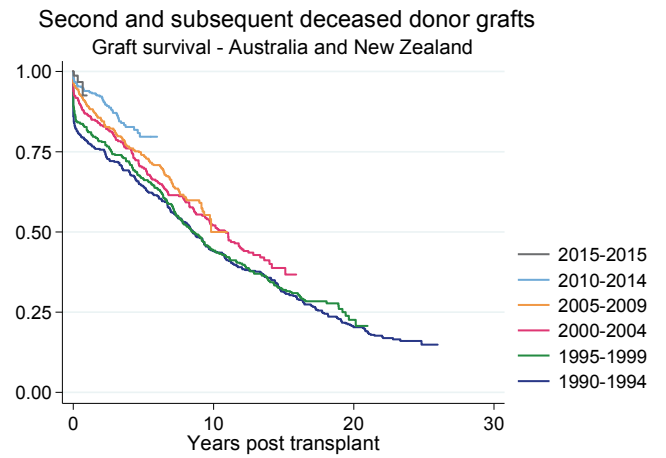
Outcome	Era	1 month	6 months	1 year	5 years
<b>Patient survival</b>	<b>2008-2009 (n=150)</b>	100	99 (95, 100)	97 (92, 99)	89 (83, 93)
	<b>2010-2011 (n=139)</b>	99 (95, 100)	96 (92, 98)	95 (90, 98)	86 (79, 91)
	<b>2012-2013 (n=146)</b>	99 (95, 100)	99 (95, 100)	99 (95, 100)	-
	<b>2014-2015 (n=170)</b>	99 (96, 100)	97 (93, 99)	96 (92, 99)	-
<b>Graft survival</b>	<b>2008-2009 (n=150)</b>	97 (93, 99)	95 (90, 98)	92 (86, 95)	77 (70, 83)
	<b>2010-2011 (n=139)</b>	95 (90, 98)	94 (88, 97)	91 (85, 95)	76 (68, 83)
	<b>2012-2013 (n=146)</b>	98 (94, 99)	97 (92, 99)	96 (91, 98)	-
	<b>2014-2015 (n=170)</b>	99 (95, 100)	97 (92, 99)	95 (89, 98)	-



**Figure 8.21**



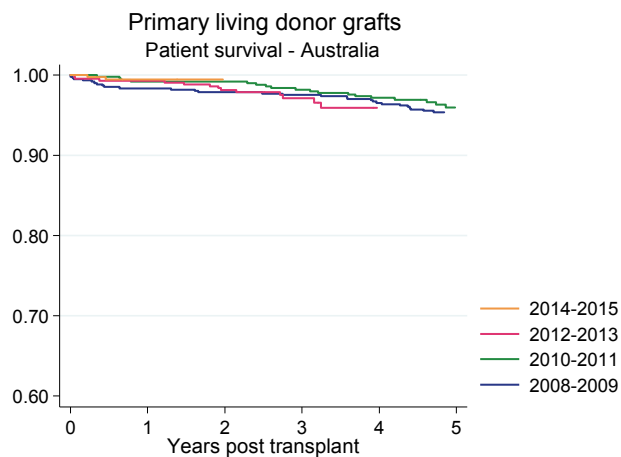
**Figure 8.22**



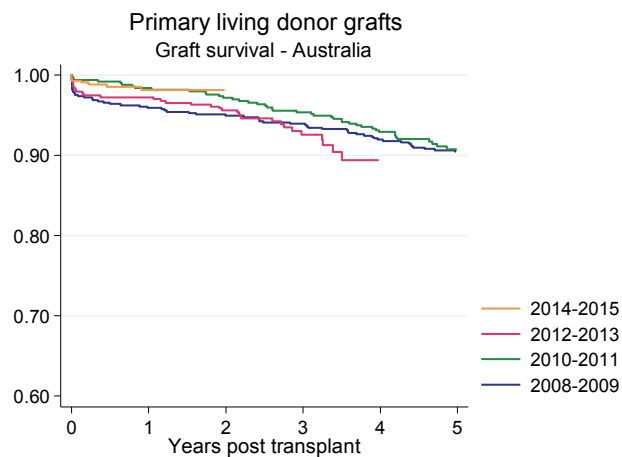
**Table 8.22 Second and Subsequent Deceased Donor Grafts - Australia and New Zealand 1990-2015**

Outcome	Era	1 year	5 years	10 years	15 years	20 years
Patient survival	1990-1994 (n=374)	93 (90, 95)	83 (78, 86)	68 (63, 72)	54 (49, 59)	41 (36, 45)
	1995-1999 (n=296)	96 (93, 98)	86 (82, 90)	73 (68, 78)	61 (55, 66)	50 (42, 56)
	2000-2004 (n=268)	94 (90, 96)	86 (81, 90)	74 (68, 79)	61 (54, 67)	-
	2005-2009 (n=343)	96 (94, 98)	88 (84, 91)	75 (69, 80)	-	-
	2010-2014 (n=370)	96 (94, 98)	88 (83, 92)	-	-	-
	2015-2015 (n=85)	-	-	-	-	-
Graft survival	1990-1994 (n=374)	78 (74, 82)	64 (59, 69)	44 (39, 49)	31 (27, 36)	20 (17, 25)
	1995-1999 (n=296)	82 (77, 86)	67 (61, 72)	44 (39, 50)	32 (27, 37)	23 (17, 29)
	2000-2004 (n=268)	87 (82, 90)	70 (64, 75)	52 (46, 58)	39 (32, 46)	-
	2005-2009 (n=343)	90 (86, 92)	74 (69, 78)	50 (42, 57)	-	-
	2010-2014 (n=370)	94 (91, 96)	80 (73, 85)	-	-	-
	2015-2015 (n=85)	-	-	-	-	-

**Figure 8.23**



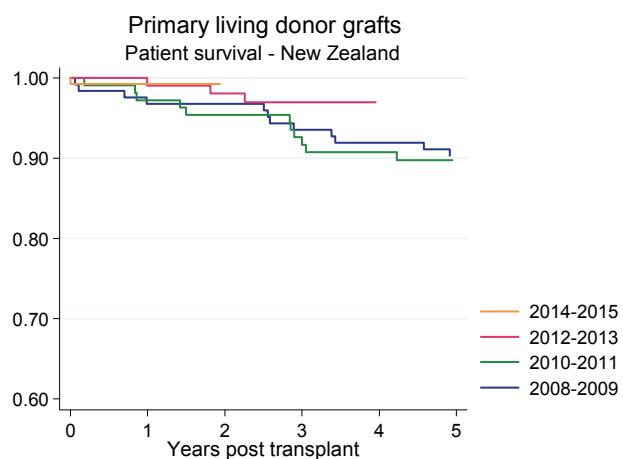
**Figure 8.24**



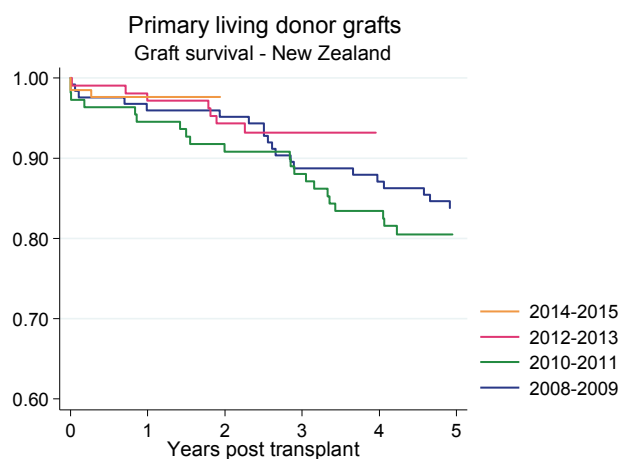
**Table 8.23 Primary Living Donor Grafts - Australia 2008 - 2015**

Outcome	Era	1 month	6 months	1 year	5 years
Patient survival	2008-2009 (n=615)	100 (98, 100)	99 (97, 99)	98 (97, 99)	95 (93, 97)
	2010-2011 (n=499)	100	100 (99, 100)	99 (98, 100)	96 (94, 97)
	2012-2013 (n=438)	100 (98, 100)	99 (98, 100)	99 (98, 100)	-
	2014-2015 (n=449)	100	99 (98, 100)	99 (98, 100)	-
Graft survival	2008-2009 (n=615)	98 (96, 99)	96 (95, 98)	96 (94, 97)	90 (88, 93)
	2010-2011 (n=499)	99 (98, 100)	99 (98, 100)	98 (97, 99)	91 (88, 93)
	2012-2013 (n=438)	98 (96, 99)	97 (95, 98)	97 (95, 98)	-
	2014-2015 (n=449)	99 (98, 100)	99 (97, 99)	98 (96, 99)	-

**Figure 8.25**



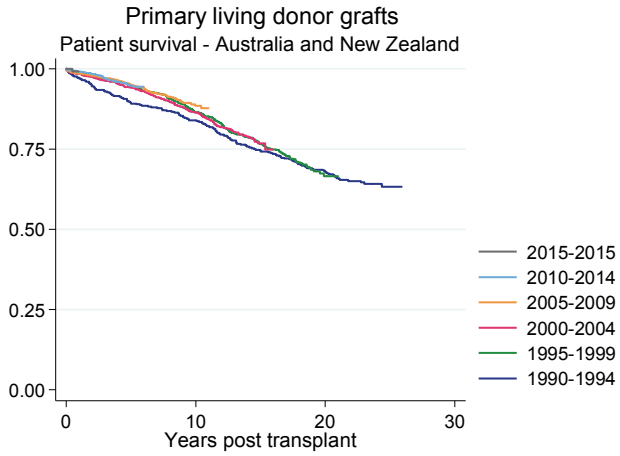
**Figure 8.26**



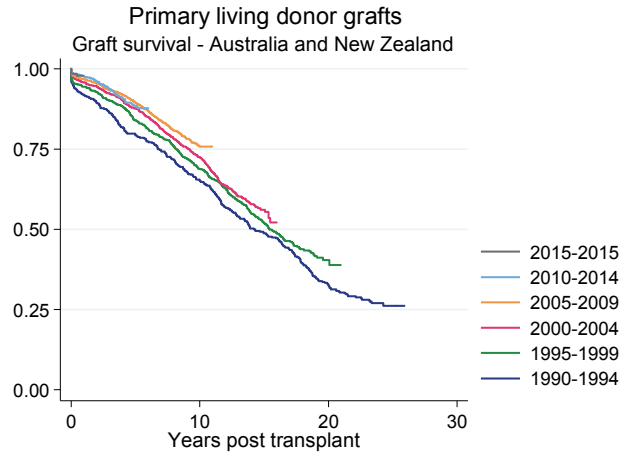
**Table 8.24 Primary Living Donor Grafts - New Zealand 2008 - 2015**

Outcome	Era	1 month	6 months	1 year	5 years
Patient Survival	2008-2009 (n=125)	99 (94, 100)	98 (94, 100)	97 (92, 99)	90 (84, 94)
	2010-2011 (n=111)	100	99 (94, 100)	97 (92, 99)	90 (82, 94)
	2012-2013 (n=106)	100	100	99 (93, 100)	-
	2014-2015 (n=135)	99 (95, 100)	99 (95, 100)	99 (95, 100)	-
Graft Survival	2008-2009 (n=125)	98 (94, 100)	98 (93, 99)	96 (91, 98)	84 (76, 89)
	2010-2011 (n=111)	97 (92, 99)	96 (91, 99)	95 (88, 98)	81 (72, 87)
	2012-2013 (n=106)	99 (93, 100)	99 (93, 100)	97 (91, 99)	-
	2014-2015 (n=135)	99 (94, 100)	98 (93, 99)	98 (93, 99)	-

**Figure 8.27**



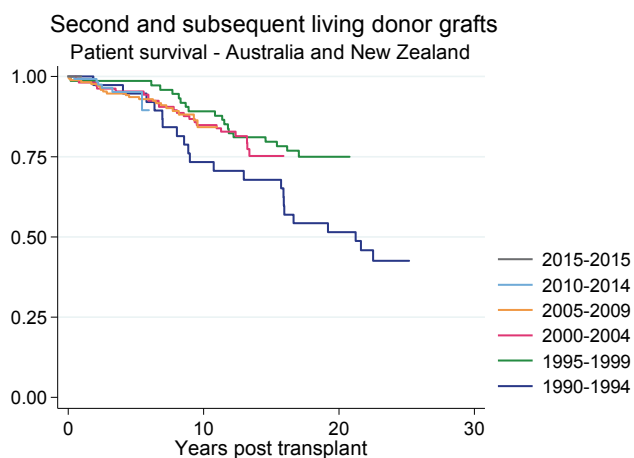
**Figure 8.28**



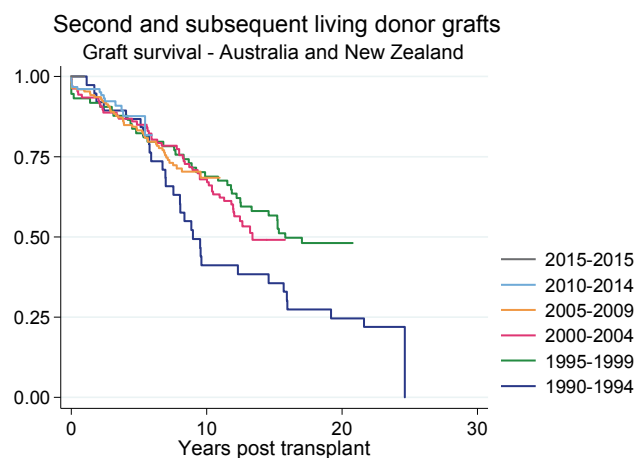
**Table 8.25 Primary Living Donor Grafts - Australia and New Zealand 1990-2015**

Outcome	Era	1 year	5 years	10 years	15 years	20 years
Patient Survival	1990-1994 (n=431)	97 (95, 98)	89 (86, 92)	84 (80, 87)	75 (70, 78)	68 (63, 72)
	1995-1999 (n=766)	99 (97, 99)	95 (93, 96)	87 (84, 89)	77 (73, 80)	67 (62, 71)
	2000-2004 (n=1193)	98 (98, 99)	94 (93, 95)	86 (84, 88)	77 (74, 80)	-
	2005-2009 (n=1585)	99 (98, 99)	95 (94, 96)	89 (86, 90)	-	-
	2010-2014 (n=1458)	99 (98, 99)	95 (93, 96)	-	-	-
	2015-2015 (n=280)	-	-	-	-	-
Graft Survival	1990-1994 (n=431)	92 (89, 94)	80 (75, 83)	65 (61, 70)	49 (44, 54)	33 (28, 37)
	1995-1999 (n=766)	95 (93, 96)	84 (81, 86)	69 (65, 72)	52 (48, 56)	40 (36, 45)
	2000-2004 (n=1193)	96 (95, 97)	88 (86, 89)	72 (70, 75)	56 (53, 59)	-
	2005-2009 (n=1585)	97 (96, 97)	90 (88, 91)	76 (73, 78)	-	-
	2010-2014 (n=1458)	98 (97, 98)	89 (86, 91)	-	-	-
	2015-2015 (n=280)	-	-	-	-	-

**Figure 8.29**



**Figure 8.30**



**Table 8.26 Second and Subsequent Living Donor Grafts - Australia and New Zealand 1990-2015**

Outcome	Era	1 year	5 years	10 years	15 years	20 years
<b>Patient Survival</b>	<b>1990-1994 (n=38)</b>	100	95 (81, 99)	73 (56, 85)	68 (50, 80)	52 (35, 66)
	<b>1995-1999 (n=74)</b>	99 (91, 100)	99 (91, 100)	89 (80, 94)	80 (69, 87)	75 (63, 84)
	<b>2000-2004 (n=107)</b>	98 (93, 100)	95 (89, 98)	85 (76, 90)	75 (64, 84)	-
	<b>2005-2009 (n=175)</b>	98 (95, 99)	94 (89, 96)	84 (75, 90)	-	-
	<b>2010-2014 (n=153)</b>	99 (95, 100)	95 (89, 98)	-	-	-
	<b>2015-2015 (n=36)</b>	-	-	-	-	-
<b>Graft Survival</b>	<b>1990-1994 (n=38)</b>	100	87 (71, 94)	41 (25, 56)	36 (21, 51)	25 (12, 39)
	<b>1995-1999 (n=74)</b>	93 (85, 97)	82 (72, 89)	69 (57, 78)	57 (45, 67)	48 (36, 59)
	<b>2000-2004 (n=107)</b>	93 (87, 97)	85 (77, 91)	68 (58, 76)	49 (38, 59)	-
	<b>2005-2009 (n=175)</b>	95 (91, 98)	83 (77, 88)	68 (60, 76)	-	-
	<b>2010-2014 (n=153)</b>	96 (91, 98)	88 (79, 93)	-	-	-
	<b>2015-2015 (n=36)</b>	-	-	-	-	-

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