



Australia &  
New Zealand Dialysis  
& Transplant Registry

# Chapter 8

## Transplantation

ANZDATA gratefully acknowledges the contributions of the Transplant Working Group convened by Dr Wai Lim

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## New Transplants

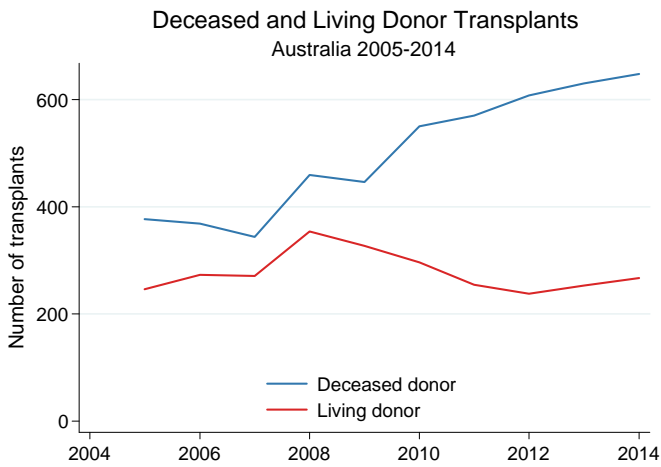
Table 8.1 shows the number of transplants performed in each country over the last 20 years. The 914 transplants performed in Australia in 2014 represent the highest number ever performed. This is predominantly driven by large growth in deceased donor numbers (figure 8.1); after a peak in 2008 living donor numbers have returned to pre-2008 levels. In New Zealand total transplant activity is relatively static, with approximately equal numbers of living and deceased donors.

**Table 8.1. Number of Grafts Performed by Country 1995-2014**

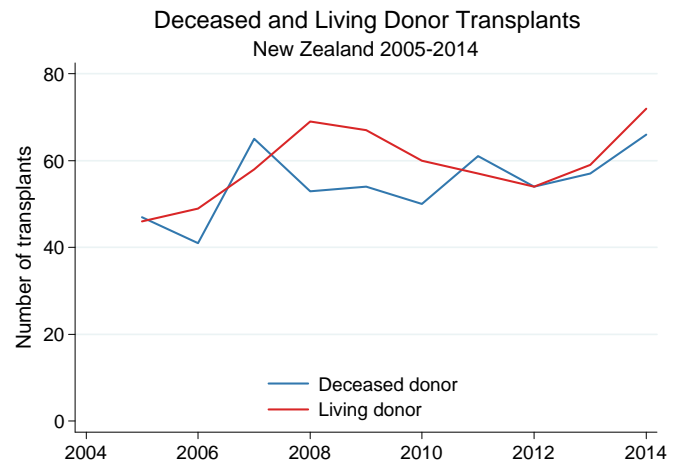
Year	Australia							New Zealand						
	Graft							Graft						
	1	2	3	4	5	Total	Living	1	2	3	4	Total	Living	
1995	371	60	11	0	0	442	94	84	7	3	0	94	24	
1996	416	50	9	0	0	475	115	88	7	1	0	96	26	
1997	447	51	6	1	0	505	147	101	10	1	0	112	31	
1998	443	62	11	2	0	518	161	95	10	1	0	106	31	
1999	403	43	9	0	0	455	169	97	11	4	0	112	42	
2000	475	47	7	1	0	530	181	91	13	2	0	106	31	
2001	488	45	6	2	0	541	213	101	9	0	0	110	43	
2002	537	60	5	2	0	604	230	103	12	2	0	117	48	
2003	472	60	10	1	0	543	218	94	13	4	0	111	44	
2004	583	53	11	3	0	650	244	98	7	0	0	105	48	
2005	539	67	15	2	0	623	246	87	5	0	1	93	46	
2006	549	70	17	5	0	641	273	80	8	2	0	90	49	
2007	527	75	11	0	2	615	271	112	9	2	0	123	58	
2008	708	84	16	5	0	813	354	111	10	1	0	122	69	
2009	674	88	11	0	0	773	327	109	12	0	0	121	67	
2010	744	83	18	1	0	846	296	104	5	1	0	110	60	
2011	744	68	10	3	0	825	255	110	7	1	0	118	57	
2012	747	80	15	1	2	845	238	99	9	0	0	108	54	
2013	789	85	7	2	0	883	253	111	5	0	0	116	59	
2014	806	100	5	3	0	914	267	126	12	0	0	138	72	

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 racial origin in patients aged 15-64 in figure 8.5. In both countries the transplant rate of indigenous patients is lower than in other racial groups; see also chapter 12.

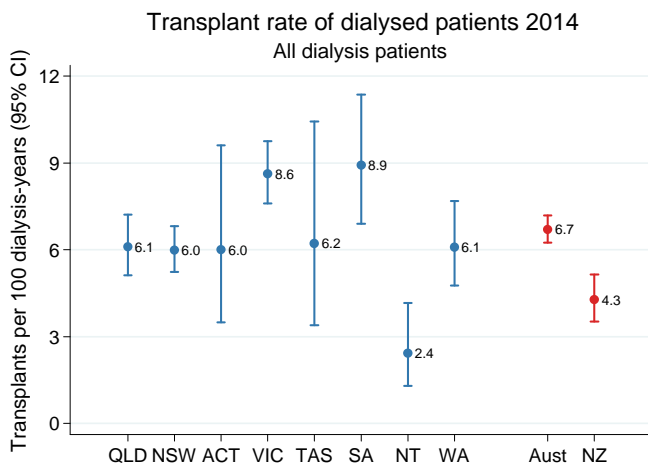
**Figure 8.1.1**



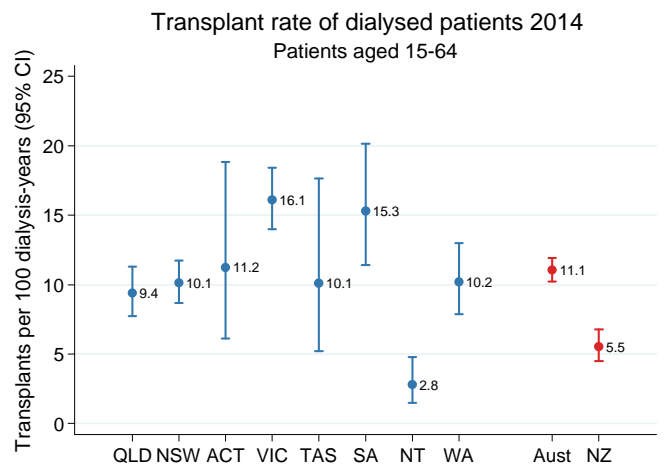
**Figure 8.1.2**



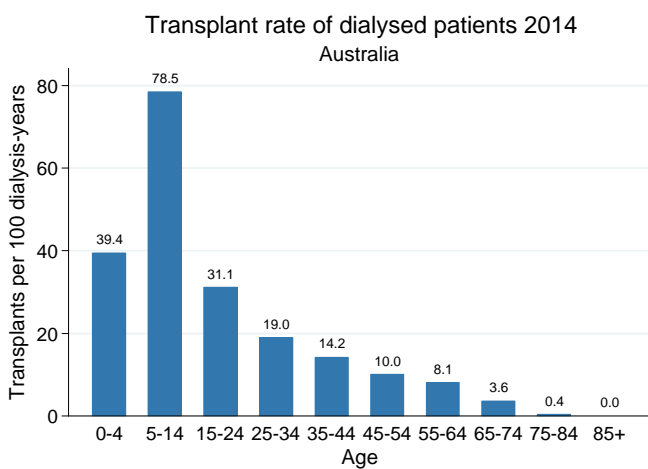
**Figure 8.2**



**Figure 8.3**



**Figure 8.4.1**



**Figure 8.4.2**

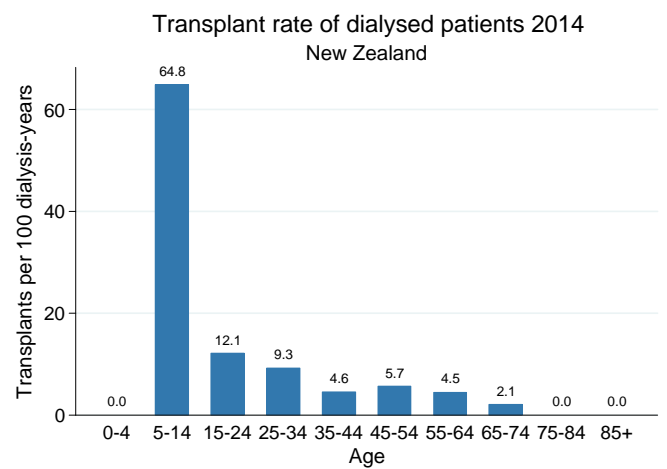


Figure 8.5.1

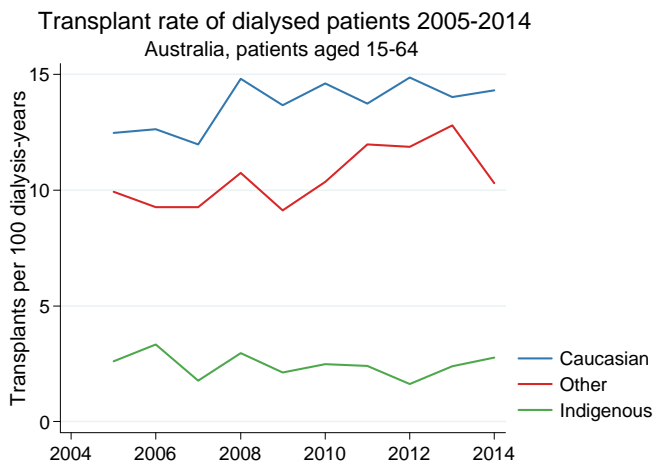


Figure 8.5.2

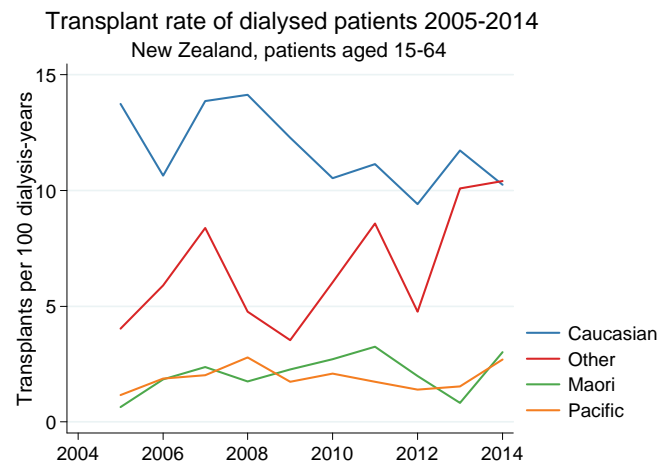


Table 8.2 shows the number of grafts performed according to graft number and recipient age in 2014. Transplant rates by age, per million population, are presented in figure 8.6.

Table 8.2. Age of Recipients Transplanted in 2014

Country	Donor Type	Graft	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84
Australia	Deceased	1	1	11	19	46	86	140	170	89	7
		2	0	0	6	8	21	15	15	6	0
		3	0	0	1	0	2	0	1	0	0
		4	0	0	0	0	1	1	1	0	0
	Living	1	8	11	22	37	40	42	45	28	4
		2	0	1	2	5	8	7	5	1	0
		3	0	0	0	0	1	0	0	0	0
New Zealand	Deceased	1	0	1	3	5	6	13	21	10	0
		2	0	0	0	2	0	3	2	0	0
	Living	1	0	2	7	9	8	17	19	5	0
		2	0	0	0	0	0	2	3	0	0

Figure 8.6.1

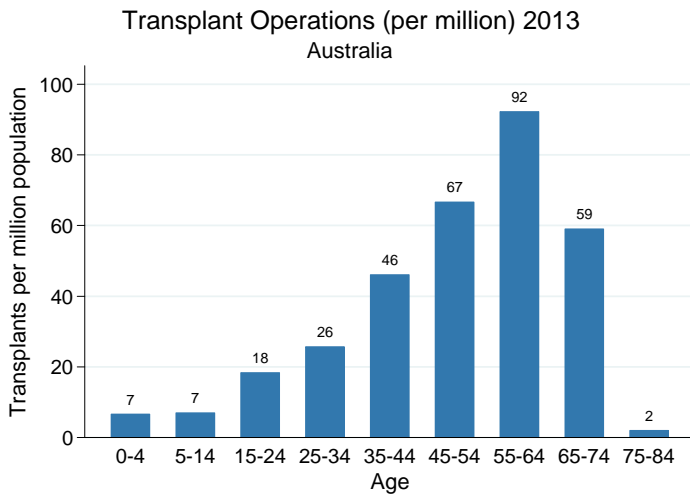


Figure 8.6.2

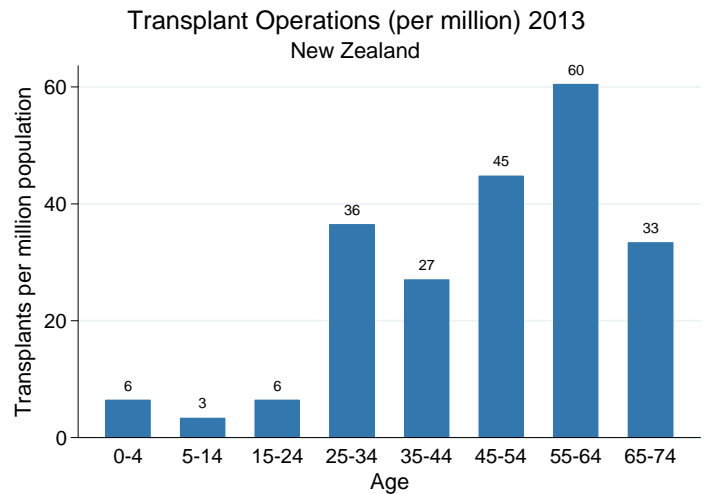


Table 8.3 shows the number of transplants performed by racial origin over 2010-2014. In both countries the majority of recipients are Caucasian.

Table 8.3. Ethnicity of Recipients Transplanted 2010-2014

Country	Race	2010	2011	2012	2013	2014
Australia	<b>Total</b>	<b>846 (100.0%)</b>	<b>825 (100.0%)</b>	<b>845 (100.0%)</b>	<b>883 (100.0%)</b>	<b>914 (100.0%)</b>
	Caucasian	706 (83.5%)	657 (79.6%)	671 (79.4%)	680 (77.0%)	689 (75.4%)
	Aboriginal/TSI	28 (3.3%)	28 (3.4%)	20 (2.4%)	31 (3.5%)	41 (4.5%)
	Asian	82 (9.7%)	97 (11.8%)	89 (10.5%)	102 (11.6%)	93 (10.2%)
	Māori	2 (0.2%)	11 (1.3%)	11 (1.3%)	8 (0.9%)	7 (0.8%)
	Pacific	12 (1.4%)	16 (1.9%)	13 (1.5%)	24 (2.7%)	24 (2.6%)
	Other	16 (1.9%)	16 (1.9%)	28 (3.3%)	31 (3.5%)	37 (4.0%)
	Not reported	-	-	13 (1.5%)	7 (0.8%)	23 (2.5%)
New Zealand	<b>Total</b>	<b>110 (100.0%)</b>	<b>118 (100.0%)</b>	<b>108 (100.0%)</b>	<b>116 (100.0%)</b>	<b>138 (100.0%)</b>
	Caucasian	71 (64.5%)	77 (65.3%)	75 (69.4%)	81 (69.8%)	80 (58.0%)
	Asian	8 (7.3%)	11 (9.3%)	11 (10.2%)	16 (13.8%)	16 (11.6%)
	Māori	20 (18.2%)	20 (16.9%)	15 (13.9%)	9 (7.8%)	22 (15.9%)
	Pacific	9 (8.2%)	9 (7.6%)	7 (6.5%)	8 (6.9%)	15 (10.9%)
	Other	2 (1.8%)	1 (0.8%)	-	1 (0.9%)	3 (2.2%)
	Not reported	-	-	-	1 (0.9%)	2 (1.4%)

Table 8.4 shows the number of transplants (per million population) performed by transplanting region over 2010-2014. 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.

**Table 8.4. Transplants (pmp) by Transplanting Region 2010-2014**

State	2010	2011	2012	2013	2014
<b>NSW/ACT</b>	265 (35)	232 (31)	247 (32)	288 (37)	300 (38)
<b>VIC/TAS</b>	285 (48)	278 (46)	268 (44)	267 (43)	307 (48)
<b>QLD</b>	137 (31)	155 (35)	159 (35)	149 (32)	145 (31)
<b>SA/NT</b>	82 (44)	74 (40)	88 (47)	81 (42)	85 (44)
<b>WA</b>	77 (34)	86 (37)	83 (34)	98 (39)	77 (30)
<b>AUSTRALIA</b>	<b>846 (38)</b>	<b>825 (37)</b>	<b>845 (37)</b>	<b>883 (38)</b>	<b>914 (39)</b>

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 2005-14 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.

**Table 8.5. Transplant Operations Performed Overseas on Australian/NZ Dialysis Patients 2005-2014**

Year	Australia	New Zealand
<b>2005</b>	9	2
<b>2006</b>	5	2
<b>2007</b>	11	1
<b>2008</b>	5	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

## 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 2014 (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 2014**

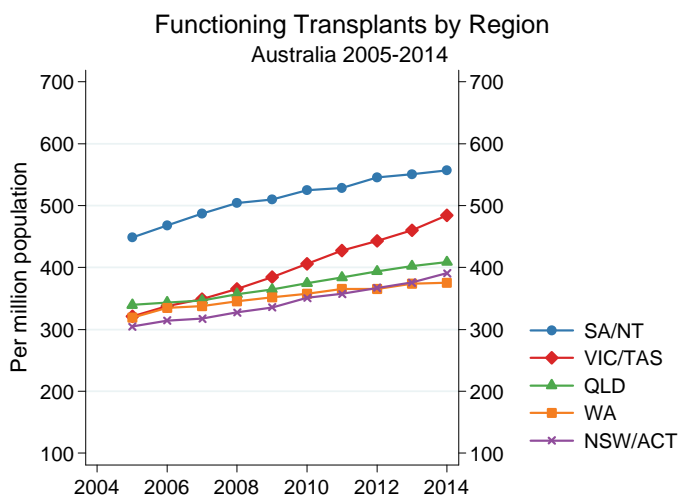
Country	Donor type	Graft number	Performed	Functioning
Australia	Living	1	4923	3332
		2	464	288
		3	63	45
		4	10	7
		5	1	0
	Deceased	1	14519	5669
		2	2127	662
		3	334	101
		4	53	16
		5	6	2
Unknown	1	0	19	
	2	0	2	
New Zealand	Living	1	1122	699
		2	89	50
		3	6	4
	Deceased	1	2395	777
		2	410	79
		3	76	16
		4	7	0
	Unknown	1	0	3

Table 8.8 presents the number of functioning transplants at the end of 2005-14 by transplant region. In Australia SA/NT has the highest prevalence of transplant patients per million population (557 pmp) and WA the lowest (375 pmp). These data are shown graphically in figures 8.7 and 8.8.

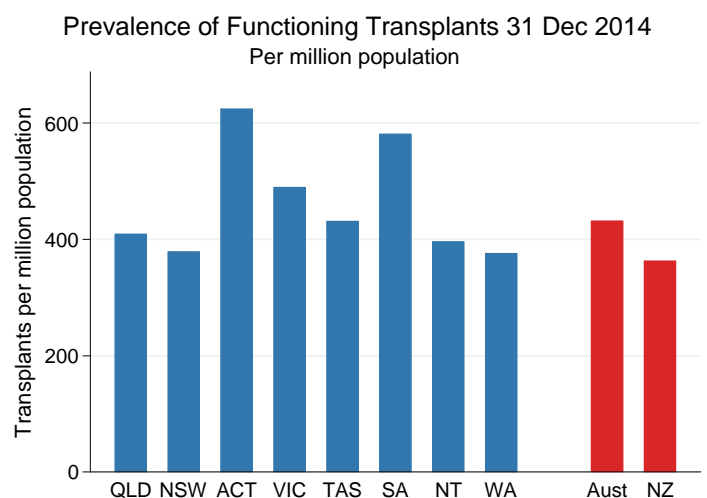
**Table 8.7. Functioning Transplants (pmp) by Transplanting Region 2005-2014**

Year	NSW/ACT	VIC/TAS	QLD	SA/NT	WA	AUSTRALIA	NEW ZEALAND
2005	2141 (305)	1758 (321)	1330 (339)	783 (449)	642 (319)	6654 (330)	1243 (302)
2006	2224 (314)	1872 (337)	1377 (344)	825 (468)	686 (335)	6984 (342)	1258 (302)
2007	2279 (318)	1969 (349)	1425 (347)	870 (488)	711 (338)	7254 (348)	1302 (309)
2008	2387 (327)	2103 (365)	1507 (357)	912 (504)	750 (345)	7659 (360)	1353 (319)
2009	2487 (336)	2260 (385)	1578 (365)	936 (510)	788 (352)	8049 (371)	1405 (328)
2010	2635 (351)	2425 (406)	1651 (375)	975 (525)	819 (358)	8505 (386)	1443 (333)
2011	2712 (357)	2584 (427)	1718 (384)	989 (529)	860 (365)	8863 (397)	1484 (340)
2012	2820 (367)	2724 (443)	1799 (394)	1032 (545)	890 (365)	9265 (408)	1525 (347)
2013	2929 (376)	2874 (460)	1871 (402)	1053 (550)	941 (374)	9668 (418)	1574 (356)
2014	3090 (391)	3080 (485)	1931 (409)	1076 (557)	966 (375)	10143 (432)	1628 (362)

**Figure 8.7**



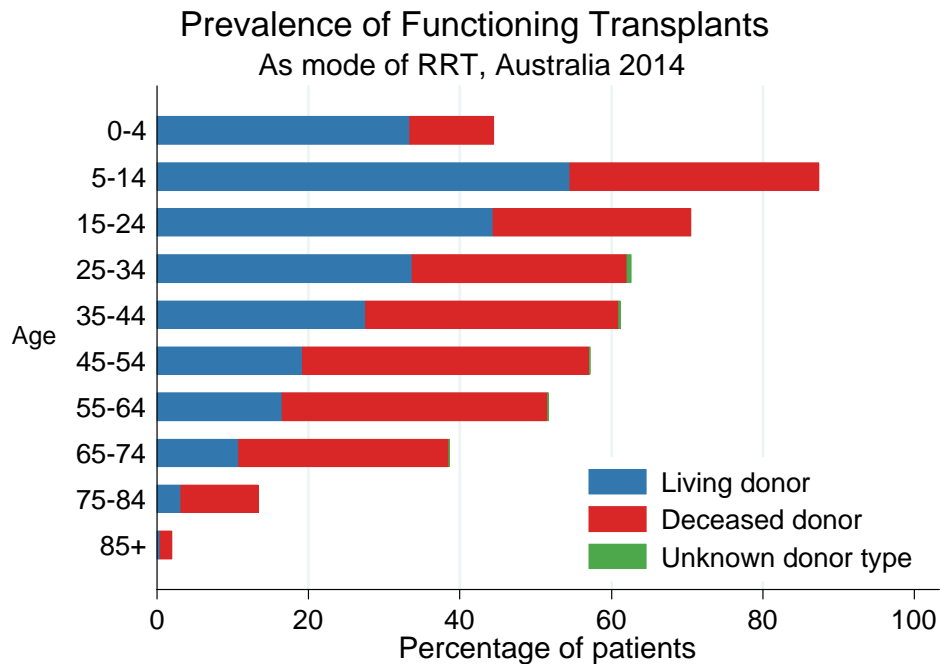
**Figure 8.8**





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 8.9. 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**

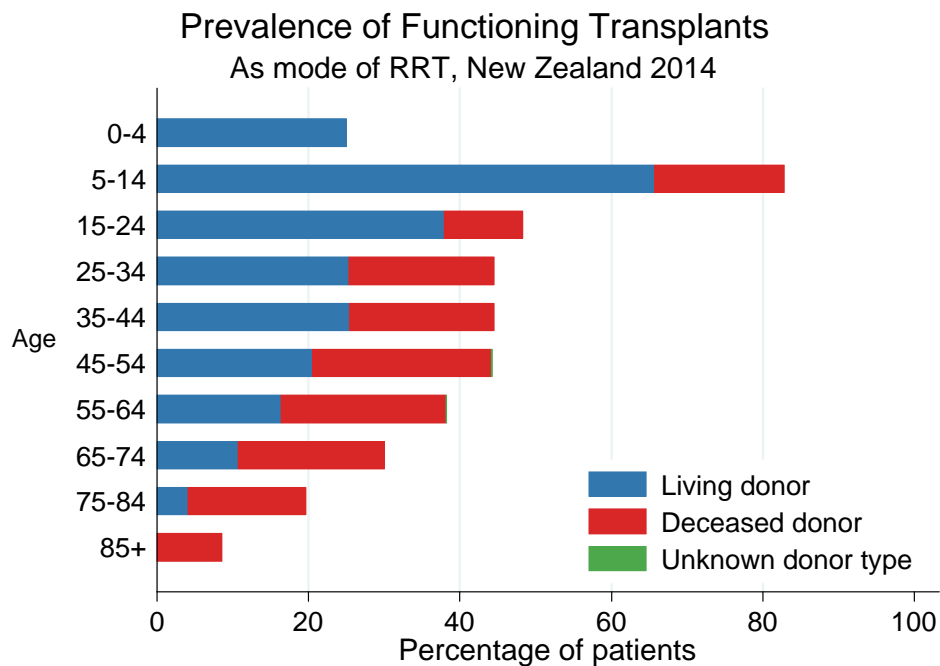
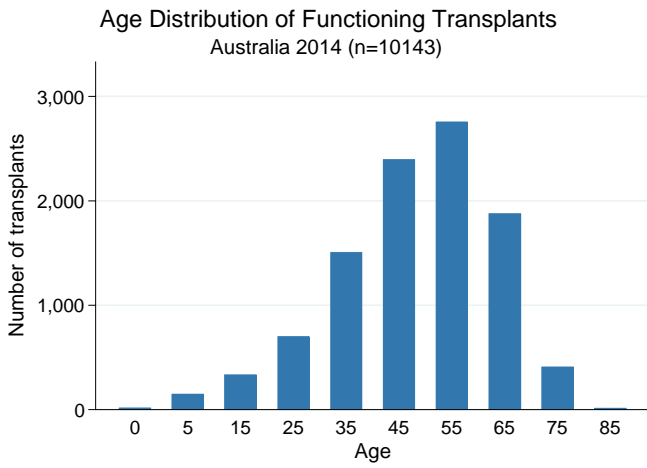


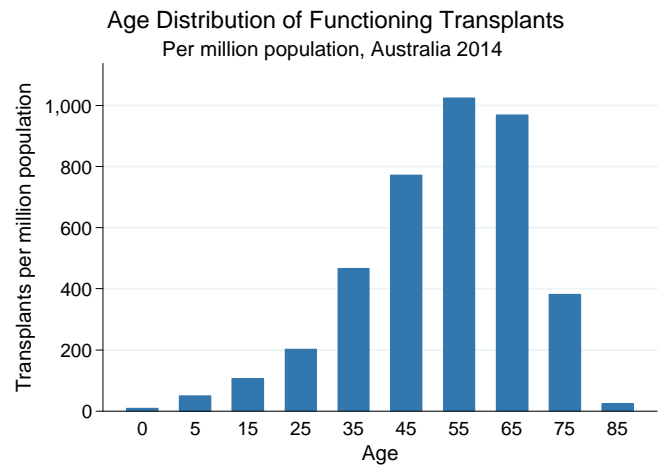
Table 8.8. Age Distribution of Functioning Transplant Patients - 31 Dec 2014

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	
	All	All	16	146	332	699	1506	2395	2754	1879	405	11	10143	
	Living Donor	1	12	90	190	347	603	715	790	494	89	2	3332	
		2	-	1	17	27	64	70	78	26	5	-	288	
		3	-	-	2	2	9	17	10	5	-	-	45	
		4	-	-	-	-	2	3	1	1	-	-	7	
		All	All	12	91	209	376	678	805	879	526	94	2	3672
Australia	Deceased Donor	1	4	50	105	276	693	1345	1657	1235	296	8	5669	
		2	-	5	15	34	105	195	187	106	14	1	662	
		3	-	-	3	6	21	39	21	10	1	-	101	
		4	-	-	-	1	4	7	4	-	-	-	16	
		5	-	-	-	-	-	1	1	-	-	-	2	
		All	All	4	55	123	317	823	1587	1870	1351	311	9	6450
		Unknown	1	-	-	-	5	5	2	5	2	-	-	19
			2	-	-	-	1	-	1	-	-	-	-	2
			All	All	-	-	-	6	5	3	5	2	-	-
	New Zealand	All	All	1	29	56	123	205	410	451	287	63	3	1628
Living Donor		1	1	23	43	66	103	170	178	102	13	-	699	
		2	-	-	1	4	14	18	13	-	-	-	50	
		3	-	-	-	-	-	2	2	-	-	-	4	
		All	All	1	23	44	70	117	190	193	102	13	-	753
Deceased Donor		1	-	6	11	49	76	175	232	175	50	3	777	
		2	-	-	1	4	9	38	19	8	-	-	79	
		3	-	-	-	-	3	5	6	2	-	-	16	
		All	All	-	6	12	53	88	218	257	185	50	3	872
Unknown		1	-	-	-	-	-	2	1	-	-	-	3	
		All	All	-	-	-	-	-	2	1	-	-	-	3

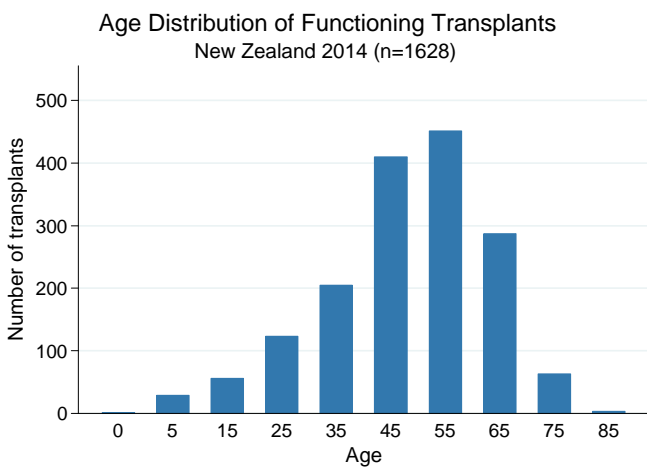
**Figure 8.10.1**



**Figure 8.10.2**



**Figure 8.11.1**



**Figure 8.11.2**

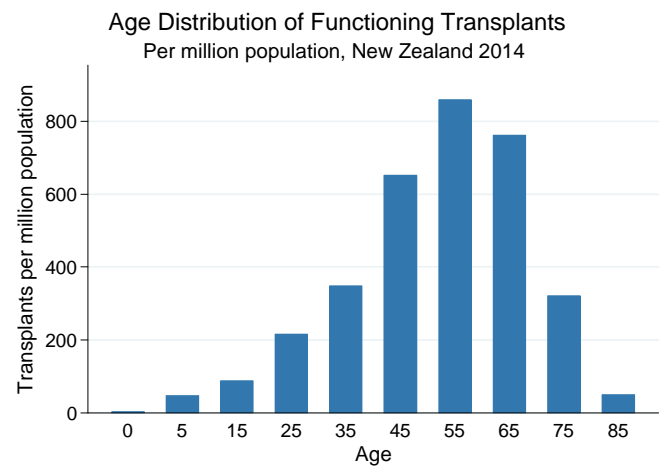


Table 8.9 presents the number of prevalent patients by sex, racial origin and age; the great majority of prevalent transplant patients in both countries are Caucasian.

**Table 8.9. Functioning Transplant Patients Related to Ethnicity and Age Group - 31 Dec 2014**

Country	Sex	Race	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85+	Total	
Australia	All	Total	16	146	332	699	1506	2395	2754	1879	405	11	10143	
		Caucasian	5	44	104	228	481	725	861	603	160	5	3216	
	F	Aboriginal/TSI	-	3	3	8	19	34	26	4	-	-	-	97
		Asian	-	5	8	25	75	113	156	66	8	-	-	456
		Other	1	8	8	23	26	32	31	10	4	-	-	143
		Not reported	-	2	2	4	1	4	2	1	-	-	-	16
		Total	6	62	125	288	602	908	1076	684	172	5	-	3928
	M	Caucasian	8	61	170	334	755	1266	1403	1060	211	6	-	5274
		Aboriginal/TSI	-	3	2	13	18	31	42	13	2	-	-	124
		Asian	-	7	19	36	87	138	168	91	15	-	-	561
		Other	2	10	13	22	39	40	61	30	5	-	-	222
		Not reported	-	3	3	6	5	12	4	1	-	-	-	34
		Total	10	84	207	411	904	1487	1678	1195	233	6	-	6215
New Zealand	All	Total	1	29	56	123	205	410	451	287	63	3	1628	
		Caucasian	-	9	19	25	64	121	128	95	23	1	-	485
	F	Asian	-	1	5	3	5	16	15	7	1	-	-	53
		Māori	-	4	4	7	14	11	10	7	3	-	-	60
		Pacific	-	-	1	7	8	15	9	3	1	-	-	44
		Total	-	14	29	42	91	163	162	112	28	1	-	642
	M	Caucasian	1	14	22	54	88	189	205	125	26	1	-	725
		Asian	-	-	-	10	13	15	26	19	3	-	-	86
		Māori	-	1	3	11	6	25	28	17	6	1	-	98
		Pacific	-	-	2	5	5	13	24	11	-	-	-	60
Other		-	-	-	1	2	3	5	3	-	-	-	14	
Not reported		-	-	-	-	-	2	1	-	-	-	-	3	
Total	1	15	27	81	114	247	289	175	35	2	-	986		

Figure 8.12 shows the duration of function of prevalent transplants at the end of 2014. In Australia there were 3,547 grafts that had functioned for  $\geq 10$  years, 936  $\geq 20$  years and 228  $\geq 30$  years. In New Zealand there were 659 grafts that had functioned for  $\geq 10$  years, 181  $\geq 20$  years and 39  $\geq 30$  years.

Figure 8.12.1

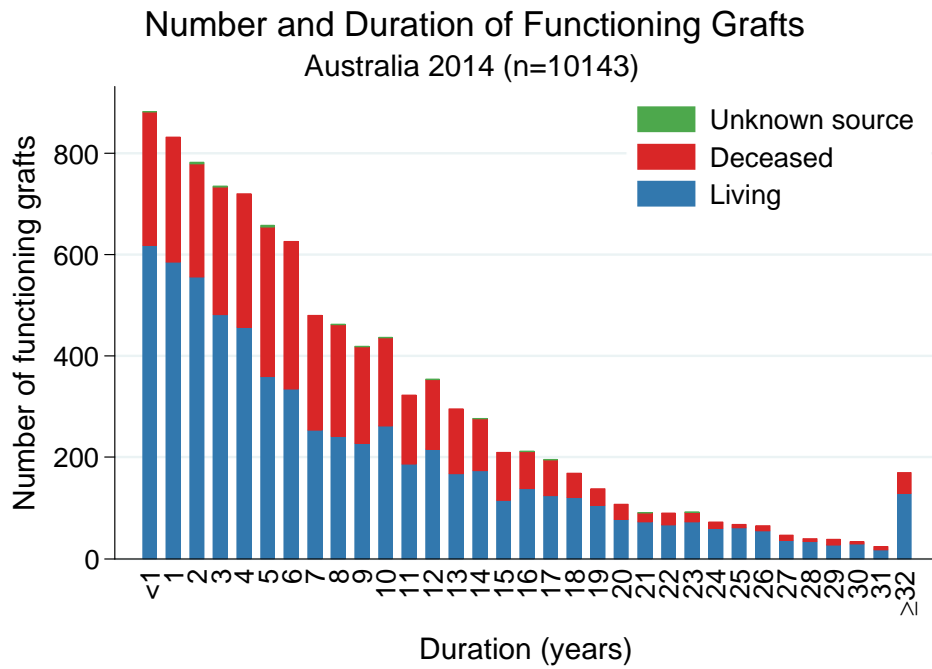
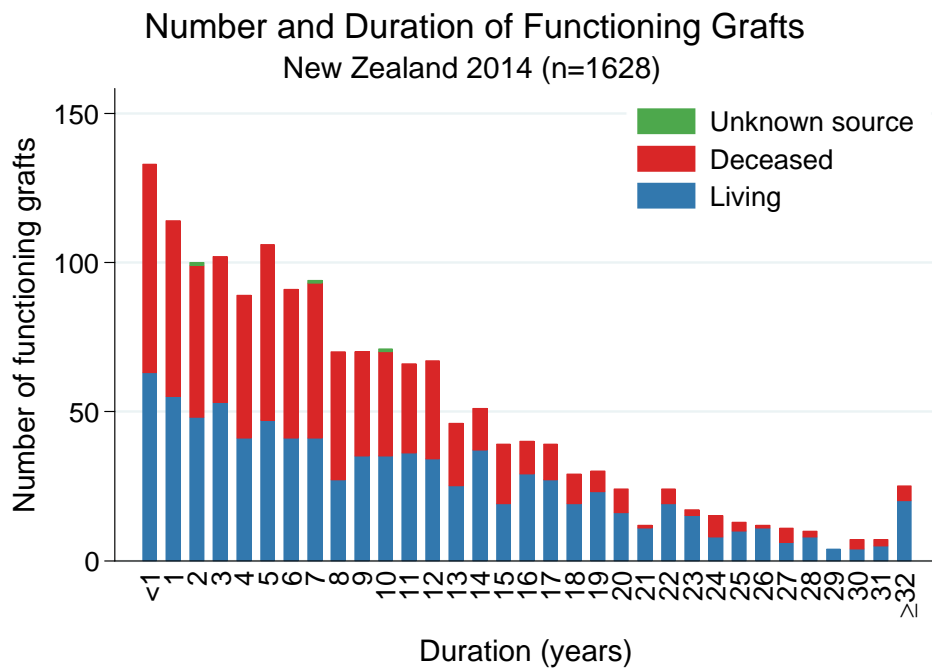


Figure 8.12.2



## Graft Loss

Table 8.10 presents the overall graft loss rate in 2005-14 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.

**Table 8.10. Graft Loss Rate 2005-2014**

Country	Outcome	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Australia	Graft failure	3.2	2.9	3.0	3.5	3.3	2.8	2.9	3.2	2.7	2.8
	Death with function	2.8	2.3	2.5	2.6	2.1	2.4	2.9	2.2	2.8	2.2
	All losses	5.9	5.2	5.5	6.1	5.4	5.2	5.8	5.3	5.5	5.0
New Zealand	Graft failure	3.8	4.0	3.5	2.4	2.8	2.4	2.4	2.7	2.5	3.1
	Death with function	2.7	3.0	3.8	2.2	2.7	2.6	3.1	2.2	2.1	3.0
	All losses	6.5	6.9	7.3	4.6	5.5	5.0	5.5	4.9	4.6	6.0

The causes of graft loss over 2005-14 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 2010-14 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.

**Table 8.11. Causes of Graft Loss 2005-2014**

Country	Cause of Graft Loss	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Australia	Death with function	165	146	165	175	149	178	221	171	229	188	1787
	Acute rejection	3	7	11	10	17	8	10	10	15	10	101
	Chronic allograft nephropathy	134	108	132	174	153	149	155	175	152	161	1493
	Hyperacute rejection	-	1	-	2	-	-	-	-	-	1	4
	Vascular	13	14	8	14	17	11	6	10	9	7	109
	Technical	4	5	2	4	3	3	5	2	-	7	35
	Glomerulonephritis	16	23	15	10	15	16	15	18	16	12	156
	Non-compliance	5	3	7	6	12	6	6	8	8	11	72
	Other	15	19	17	16	15	17	27	30	22	25	203
	Total	355	326	357	411	381	388	445	424	451	422	3960
New Zealand	Death with function	31	34	44	26	34	33	41	30	29	42	344
	Acute rejection	2	2	1	1	1	-	3	1	2	3	16
	Chronic allograft nephropathy	23	31	20	20	28	17	15	26	21	28	229
	Hyperacute rejection	-	-	-	-	-	-	-	-	-	-	0
	Vascular	4	-	3	1	2	3	2	1	2	1	19
	Technical	2	3	1	-	-	-	-	-	-	1	7
	Glomerulonephritis	3	6	5	5	-	4	4	5	1	2	35
	Non-compliance	1	1	6	1	1	5	3	-	4	6	28
	Other	8	3	5	1	3	2	4	3	4	2	35
Total	74	80	85	55	69	64	72	66	63	85	713	

Table 8.12. Graft Losses 2010-2014

Country	Outcome	Cause	First year	Beyond first	Total	
	Death with function	Cardiovascular	28 (37%)	220 (24%)	248 (25%)	
		Withdrawal	2 (3%)	68 (7%)	70 (7%)	
		Cancer	3 (4%)	294 (32%)	297 (30%)	
		Infection	27 (36%)	138 (15%)	165 (17%)	
		Other	16 (21%)	191 (21%)	207 (21%)	
		<b>Total</b>	<b>76 (100%)</b>	<b>911 (100%)</b>	<b>987 (100%)</b>	
	Australia	Graft Failure	Acute rejection	22 (19%)	31 (3%)	53 (5%)
			Chronic allograft nephropathy	8 (7%)	784 (76%)	792 (69%)
Hyperacute rejection			1 (1%)	-	1 (<1%)	
Vascular			31 (27%)	12 (1%)	43 (4%)	
Technical			14 (12%)	3 (<1%)	17 (1%)	
Glomerulonephritis			5 (4%)	72 (7%)	77 (7%)	
Non-compliance			-	39 (4%)	39 (3%)	
Other			35 (30%)	86 (8%)	121 (11%)	
<b>Total</b>	<b>116 (100%)</b>	<b>1027 (100%)</b>	<b>1143 (100%)</b>			
	Death with function	Cardiovascular	6 (60%)	49 (30%)	55 (31%)	
		Withdrawal	-	8 (5%)	8 (5%)	
		Cancer	1 (10%)	50 (30%)	51 (29%)	
		Infection	-	25 (15%)	25 (14%)	
		Other	3 (30%)	33 (20%)	36 (21%)	
		<b>Total</b>	<b>10 (100%)</b>	<b>165 (100%)</b>	<b>175 (100%)</b>	
New Zealand	Graft Failure	Acute rejection	2 (13%)	7 (4%)	9 (5%)	
		Chronic allograft nephropathy	-	107 (67%)	107 (61%)	
		Vascular	4 (27%)	5 (3%)	9 (5%)	
		Technical	1 (7%)	-	1 (1%)	
		Glomerulonephritis	2 (13%)	14 (9%)	16 (9%)	
		Non-compliance	1 (7%)	17 (11%)	18 (10%)	
		Other	5 (33%)	10 (6%)	15 (9%)	
		<b>Total</b>	<b>15 (100%)</b>	<b>160 (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 2012-14 may represent underreporting rather than a change in practice; caution is advised when interpreting these data.

**Table 8.13. Antibody Use for Induction Immunosuppression 2010-2014; Number of Kidney Transplant Recipients Receiving Each Agent by Year (% Total New Transplants)**

Country	Type of agent	2010	2011	2012	2013	2014
Australia	Intravenous immunoglobulin	39 (4.6%)	42 (5.1%)	29 (3.4%)	42 (4.8%)	27 (3.0%)
	Anti-CD25	801 (94.7%)	767 (93.0%)	719 (85.1%)	787 (89.1%)	718 (78.6%)
	Rituximab	9 (1.1%)	10 (1.2%)	7 (0.8%)	2 (0.2%)	2 (0.2%)
	T cell depleting polyclonal Ab	52 (6.1%)	34 (4.1%)	30 (3.6%)	34 (3.9%)	31 (3.4%)
	Other	2 (0.2%)	-	13 (1.5%)	4 (0.5%)	12 (1.3%)
	<b>Total new transplants</b>		<b>846</b>	<b>825</b>	<b>845</b>	<b>883</b>
New Zealand	Intravenous immunoglobulin	-	-	1 (0.9%)	-	-
	Anti-CD25	65 (59.1%)	114 (96.6%)	101 (93.5%)	114 (98.3%)	133 (96.4%)
	Rituximab	1 (0.9%)	3 (2.5%)	4 (3.7%)	6 (5.2%)	8 (5.8%)
	T cell depleting polyclonal Ab	1 (0.9%)	1 (0.8%)	-	2 (1.7%)	2 (1.4%)
	<b>Total new transplants</b>	<b>110</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 2007-14 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 2012-14.

**Table 8.14. Immunosuppressive Therapy - Primary Deceased Donor Grafts Australia 2007-2014**

Country	Time	Year Trans-planted	AZA	CYC	TAC	MMF	MPA	SIR	EVE	PRE	Number of Grafts
Australia	Initial Treatment	2007	2 (1%)	138 (48%)	140 (49%)	244 (85%)	36 (13%)	-	5 (2%)	285 (99%)	287
		2008	2 (1%)	137 (35%)	240 (61%)	364 (93%)	22 (6%)	-	-	389 (99%)	391
		2009	4 (1%)	62 (16%)	309 (82%)	355 (94%)	13 (3%)	-	3 (1%)	374 (99%)	376
		2010	-	66 (14%)	409 (86%)	426 (89%)	37 (8%)	1 (<1%)	3 (1%)	477 (100%)	478
		2011	1 (<1%)	54 (11%)	446 (87%)	299 (59%)	205 (40%)	-	-	505 (99%)	511
		2012	1 (<1%)	27 (5%)	478 (90%)	296 (56%)	222 (42%)	2 (<1%)	-	517 (97%)	533
		2013	4 (1%)	11 (2%)	535 (95%)	344 (61%)	205 (36%)	-	-	551 (98%)	565
	2014	3 (1%)	10 (2%)	498 (88%)	340 (60%)	166 (29%)	1 (<1%)	11 (2%)	514 (90%)	569	
	Treatment at 1 Year	2007	13 (5%)	86 (32%)	149 (56%)	189 (71%)	51 (19%)	12 (5%)	14 (5%)	252 (95%)	265
		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%)	33 (7%)	420 (87%)	225 (47%)	208 (43%)	8 (2%)	13 (3%)	468 (97%)	482
		2012	21 (4%)	24 (5%)	433 (86%)	216 (43%)	225 (45%)	12 (2%)	17 (3%)	473 (94%)	503
2013		16 (3%)	21 (4%)	452 (85%)	260 (49%)	184 (35%)	11 (2%)	3 (1%)	478 (90%)	533	
Treatment at 2 Years	2007	12 (5%)	79 (31%)	152 (59%)	181 (70%)	54 (21%)	14 (5%)	13 (5%)	243 (94%)	259	
	2008	20 (6%)	80 (23%)	238 (68%)	275 (79%)	39 (11%)	12 (3%)	9 (3%)	324 (93%)	350	
	2009	23 (7%)	39 (11%)	272 (79%)	252 (73%)	55 (16%)	20 (6%)	11 (3%)	329 (96%)	344	
	2010	25 (6%)	46 (11%)	343 (79%)	305 (70%)	77 (18%)	21 (5%)	14 (3%)	410 (94%)	435	
	2011	30 (6%)	32 (7%)	391 (83%)	196 (42%)	205 (44%)	8 (2%)	20 (4%)	437 (93%)	469	
	2012	24 (5%)	18 (4%)	399 (81%)	199 (40%)	203 (41%)	11 (2%)	19 (4%)	434 (88%)	493	

Table 8.14. Immunosuppressive Therapy - Primary Deceased Donor Grafts New Zealand 2007-2014

Country	Time	Year Transplanted	AZA	CYC	TAC	MMF	MPA	SIR	EVE	PRE	Number of Grafts
Initial Treatment	2007	-	43 (74%)	15 (26%)	57 (98%)	-	-	1 (2%)	58 (100%)	58	
	2008	-	30 (67%)	15 (33%)	42 (93%)	3 (7%)	-	-	45 (100%)	45	
	2009	-	39 (78%)	10 (20%)	49 (98%)	-	-	-	49 (98%)	50	
	2010	-	32 (71%)	13 (29%)	45 (100%)	-	-	-	45 (100%)	45	
	2011	-	41 (71%)	17 (29%)	58 (100%)	-	-	-	58 (100%)	58	
	2012	-	36 (72%)	13 (26%)	49 (98%)	-	-	-	49 (98%)	50	
	2013	-	44 (81%)	9 (17%)	52 (96%)	-	-	-	52 (96%)	54	
	2014	-	44 (75%)	13 (22%)	58 (98%)	-	-	-	58 (98%)	59	
New Zealand Treatment at 1 Year	2007	3 (6%)	31 (60%)	20 (38%)	43 (83%)	-	2 (4%)	1 (2%)	48 (92%)	52	
	2008	2 (5%)	21 (48%)	23 (52%)	39 (89%)	1 (2%)	-	-	41 (93%)	44	
	2009	-	24 (50%)	23 (48%)	48 (100%)	-	1 (2%)	-	45 (94%)	48	
	2010	2 (5%)	16 (37%)	27 (63%)	41 (95%)	-	-	-	42 (98%)	43	
	2011	2 (4%)	25 (46%)	29 (54%)	50 (93%)	-	-	-	52 (96%)	54	
	2012	2 (4%)	27 (56%)	21 (44%)	45 (94%)	-	-	-	47 (98%)	48	
	2013	2 (4%)	33 (63%)	18 (35%)	49 (94%)	-	-	-	51 (98%)	52	
Treatment at 2 Years	2007	3 (6%)	29 (58%)	20 (40%)	41 (82%)	-	2 (4%)	1 (2%)	45 (90%)	50	
	2008	2 (5%)	20 (48%)	22 (52%)	37 (88%)	-	1 (2%)	-	40 (95%)	42	
	2009	-	21 (46%)	24 (52%)	45 (98%)	-	1 (2%)	-	42 (91%)	46	
	2010	2 (5%)	17 (40%)	25 (60%)	39 (93%)	-	-	-	39 (93%)	42	
	2011	4 (7%)	25 (46%)	29 (54%)	45 (83%)	-	-	-	51 (94%)	54	
	2012	1 (2%)	24 (52%)	19 (41%)	41 (89%)	-	1 (2%)	-	42 (91%)	46	

## 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 2004-2013**

Donor Type	Graft Number	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Living Donor	First	21.6%	19.6%	19.6%	21.1%	17.0%	16.8%	17.8%	17.5%	13.7%	18.9%
	Second and Subsequent	34.8%	18.5%	33.3%	34.3%	30.0%	24.3%	12.9%	18.5%	10.3%	12.9%
Deceased Donor	First	22.8%	18.6%	16.3%	17.7%	22.0%	21.1%	18.7%	19.9%	16.8%	18.4%
	Second and Subsequent	27.5%	31.7%	36.4%	32.8%	32.9%	36.5%	27.3%	19.4%	21.8%	23.5%

**Table 8.16. Antibody-Mediated Rejection Rates at Six Months Post Transplant 2005-2013**

Donor Type	Graft Number	2005	2006	2007	2008	2009	2010	2011	2012	2013
Living Donor	First	1.1%	1.4%	3.4%	3.1%	4.5%	3.7%	4.9%	2.3%	5.0%
	Second and Subsequent	3.7%	5.6%	20.0%	12.5%	13.5%	3.2%	11.1%	6.9%	3.2%
Deceased Donor	First	3.0%	2.9%	5.8%	4.8%	5.6%	5.2%	5.4%	3.9%	5.0%
	Second and Subsequent	4.8%	15.2%	10.9%	15.8%	24.3%	13.0%	11.3%	10.3%	10.3%

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. Muromonab-CD3 has been withdrawn from sale and was unavailable from 2011.

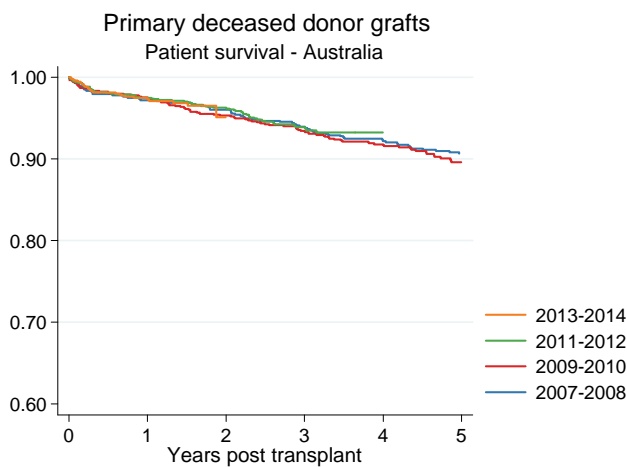
**Table 8.17. Antibody Therapy for Acute Rejection 2010-2014**

Country	Type of agent	2010	2011	2012	2013	2014
Australia	Muromonab-CD3	2 (0.2%)	-	-	-	-
	Intravenous immunoglobulin	93 (11.0%)	106 (12.8%)	69 (8.2%)	104 (11.8%)	71 (7.8%)
	Anti-CD25	-	-	-	1 (0.1%)	1 (0.1%)
	Rituximab	15 (1.8%)	11 (1.3%)	8 (0.9%)	11 (1.2%)	11 (1.2%)
	T cell depleting polyclonal Ab	41 (4.8%)	44 (5.3%)	33 (3.9%)	47 (5.3%)	23 (2.5%)
	Total new transplants	846	825	845	883	914
	Total transplants at risk	8895	9330	9708	10148	10582
New Zealand	Muromonab-CD3	4 (3.6%)	-	-	-	-
	Intravenous immunoglobulin	4 (3.6%)	4 (3.4%)	3 (2.8%)	2 (1.7%)	6 (4.3%)
	Anti-CD25	-	1 (0.8%)	-	1 (0.9%)	-
	Rituximab	-	-	1 (0.9%)	1 (0.9%)	5 (3.6%)
	T cell depleting polyclonal Ab	12 (10.9%)	11 (9.3%)	4 (3.7%)	4 (3.4%)	7 (5.1%)
	Total new transplants	110	118	108	116	138
	Total transplants at risk	1515	1561	1592	1641	1712

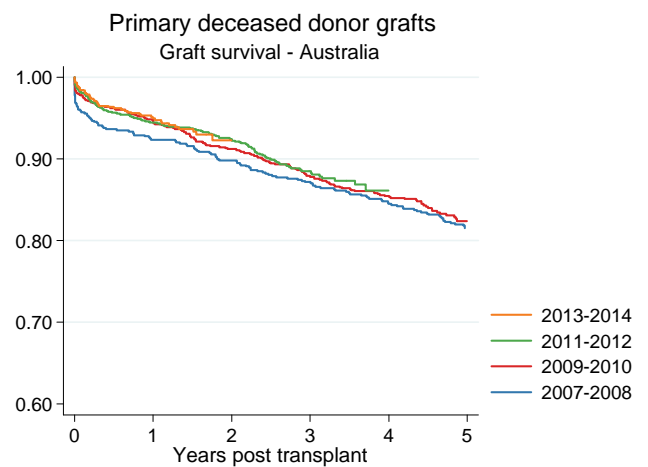
## Patient and Graft Survival

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 2007-2014**

Outcome	Era	1 month	6 months	1 year	5 years
<b>Patient survival</b>	2007-2008 (n=678)	99 (98, 100)	98 (97, 99)	97 (96, 98)	91 (88, 93)
	2009-2010 (n=854)	99 (98, 100)	98 (97, 99)	98 (96, 98)	90 (87, 92)
	2011-2012 (n=1044)	100 (99, 100)	98 (97, 99)	98 (96, 98)	-
	2013-2014 (n=1134)	100 (99, 100)	98 (97, 99)	97 (96, 98)	-
<b>Graft survival</b>	2007-2008 (n=678)	96 (94, 97)	94 (92, 95)	92 (90, 94)	82 (78, 84)
	2009-2010 (n=854)	98 (97, 99)	96 (95, 97)	95 (93, 96)	82 (80, 85)
	2011-2012 (n=1044)	98 (97, 99)	96 (94, 97)	94 (93, 96)	-
	2013-2014 (n=1134)	98 (98, 99)	96 (95, 97)	95 (93, 96)	-

Figure 8.15

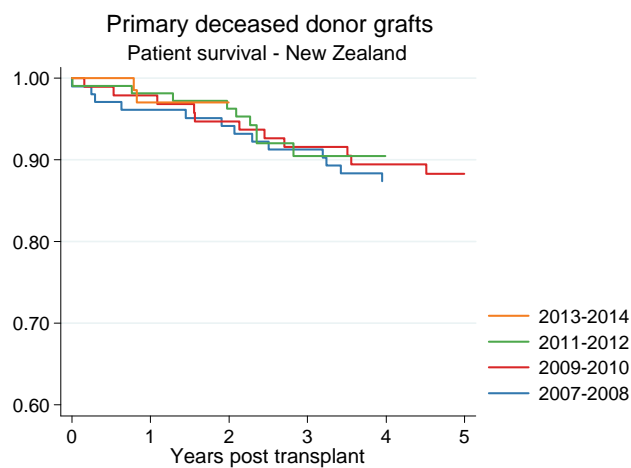


Figure 8.16

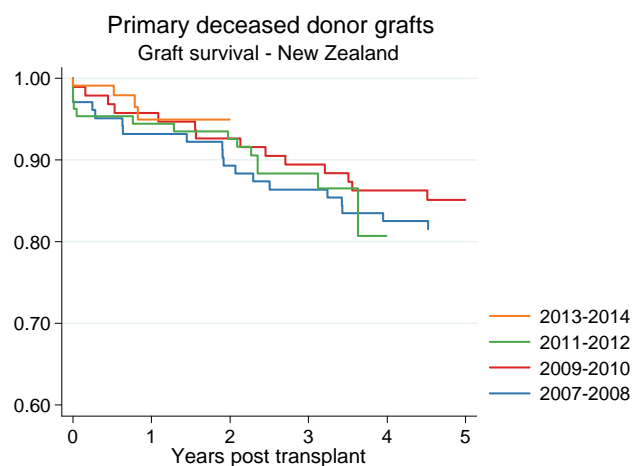


Table 8.19. Primary Deceased Donor Grafts - New Zealand 2007-2014

Outcome	Era	1 month	6 months	1 year	5 years
Patient survival	2007-2008 (n=103)	99 (93, 100)	97 (91, 99)	96 (90, 99)	87 (79, 92)
	2009-2010 (n=95)	100	99 (93, 100)	98 (92, 99)	88 (80, 93)
	2011-2012 (n=108)	99 (94, 100)	99 (94, 100)	98 (93, 100)	-
	2013-2014 (n=113)	100	100	97 (89, 99)	-
Graft survival	2007-2008 (n=103)	97 (91, 99)	95 (89, 98)	93 (86, 97)	82 (73, 88)
	2009-2010 (n=95)	99 (93, 100)	97 (91, 99)	96 (89, 98)	85 (76, 91)
	2011-2012 (n=108)	95 (89, 98)	95 (89, 98)	94 (88, 97)	-
	2013-2014 (n=113)	99 (94, 100)	99 (94, 100)	95 (87, 98)	-

Figure 8.17

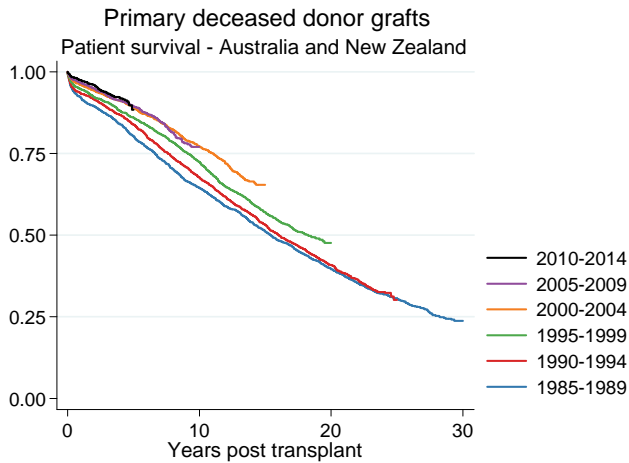


Figure 8.18

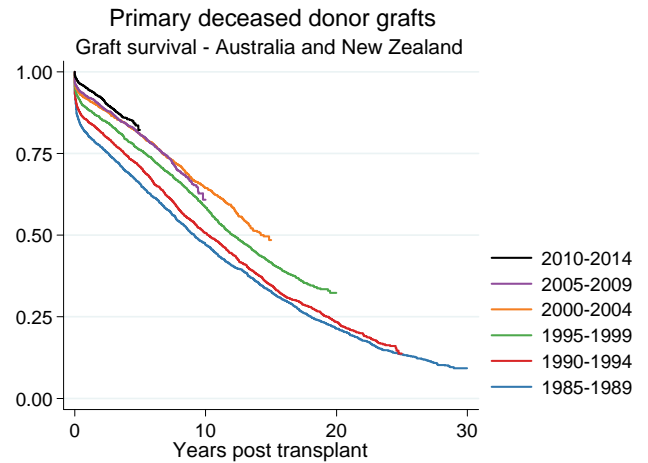


Table 8.20. Primary Deceased Donor Grafts - Australia and New Zealand 1985-2014

Outcome	Era	1 year	5 years	10 years	15 years	20 years
Patient survival	1985-1989 (n=1916)	92 (91, 93)	80 (78, 82)	65 (62, 67)	51 (49, 53)	40 (37, 42)
	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)	-
	2000-2004 (n=1849)	96 (95, 97)	89 (88, 90)	77 (75, 79)	-	-
	2005-2009 (n=1911)	97 (96, 97)	90 (88, 91)	-	-	-
	2010-2014 (n=2922)	98 (97, 98)	-	-	-	-
Graft survival	1985-1989 (n=1916)	81 (79, 83)	66 (64, 68)	47 (45, 49)	33 (31, 35)	21 (20, 23)
	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)	-
	2000-2004 (n=1849)	92 (90, 93)	81 (79, 83)	65 (62, 67)	-	-
	2005-2009 (n=1911)	92 (91, 93)	81 (79, 83)	-	-	-
	2010-2014 (n=2922)	95 (94, 96)	-	-	-	-

Figure 8.19

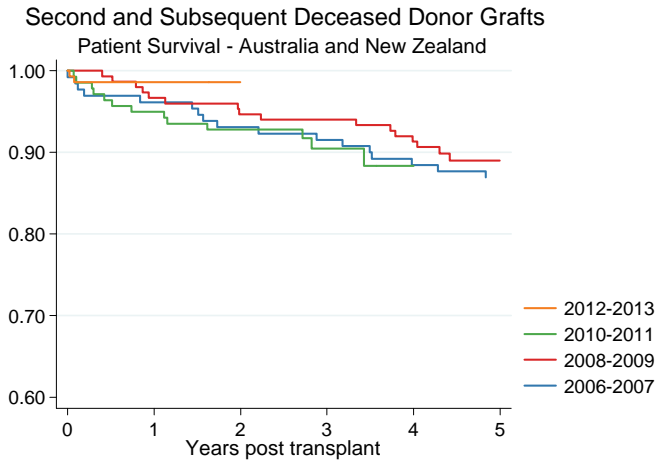


Figure 8.20

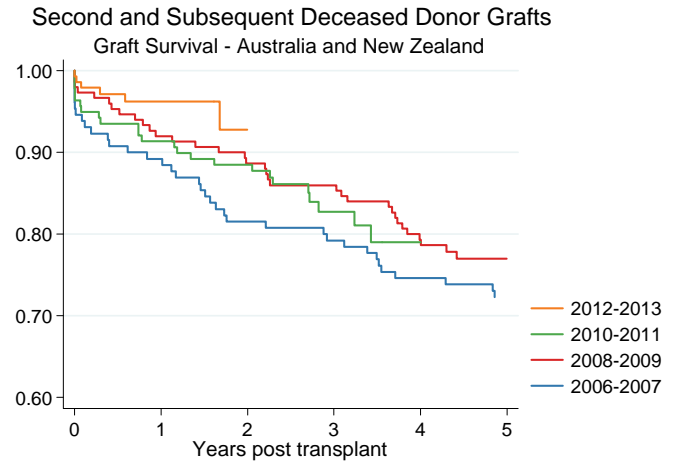


Table 8.21. Second and Subsequent Deceased Donor Grafts - Australia and New Zealand 2007-2014

Outcome	Era	1 month	6 months	1 year	5 years
Patient survival	2007-2008 (n=140)	99 (95, 100)	97 (93, 99)	94 (89, 97)	85 (78, 90)
	2009-2010 (n=151)	99 (95, 100)	97 (93, 99)	95 (91, 98)	88 (82, 93)
	2011-2012 (n=140)	100	99 (95, 100)	99 (95, 100)	-
	2013-2014 (n=153)	98 (94, 99)	97 (92, 99)	96 (90, 98)	-
Graft survival	2007-2008 (n=140)	96 (91, 98)	92 (86, 96)	89 (82, 93)	72 (64, 79)
	2009-2010 (n=151)	95 (90, 97)	93 (88, 96)	91 (86, 95)	79 (71, 85)
	2011-2012 (n=140)	99 (94, 100)	98 (94, 99)	96 (91, 98)	-
	2013-2014 (n=153)	98 (94, 99)	95 (90, 98)	94 (89, 97)	-



Figure 8.21

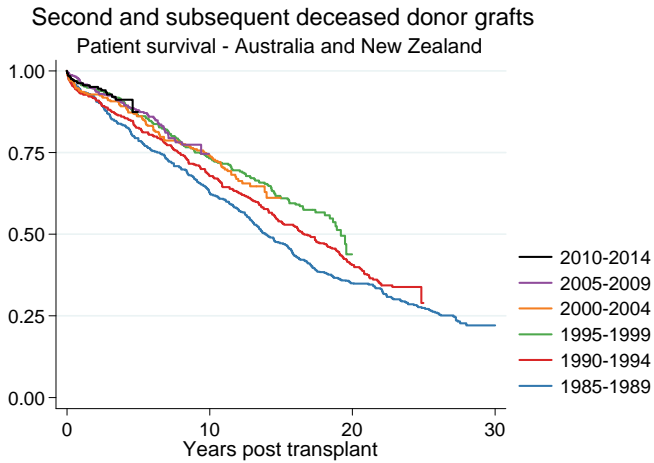


Figure 8.22

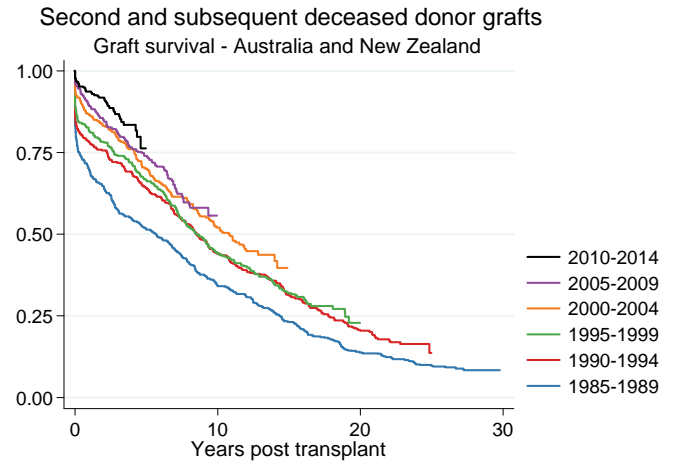


Table 8.22. Second and Subsequent Deceased Donor Grafts - Australia and New Zealand 1985-2014

Outcome	Era	1 year	5 years	10 years	15 years	20 years
Patient survival	1985-1989 (n=458)	94 (91, 96)	79 (75, 83)	63 (58, 67)	47 (43, 52)	35 (31, 39)
	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)	-
	2000-2004 (n=268)	94 (90, 96)	86 (81, 90)	74 (68, 79)	-	-
	2005-2009 (n=343)	96 (94, 98)	88 (84, 91)	-	-	-
	2010-2014 (n=370)	96 (94, 98)	-	-	-	-
Graft survival	1985-1989 (n=458)	70 (66, 74)	52 (47, 56)	34 (30, 39)	23 (19, 27)	14 (11, 17)
	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)	-
	2000-2004 (n=268)	87 (82, 90)	70 (64, 75)	52 (46, 58)	-	-
	2005-2009 (n=343)	90 (86, 92)	74 (69, 78)	-	-	-
	2010-2014 (n=370)	94 (91, 96)	-	-	-	-

Figure 8.23

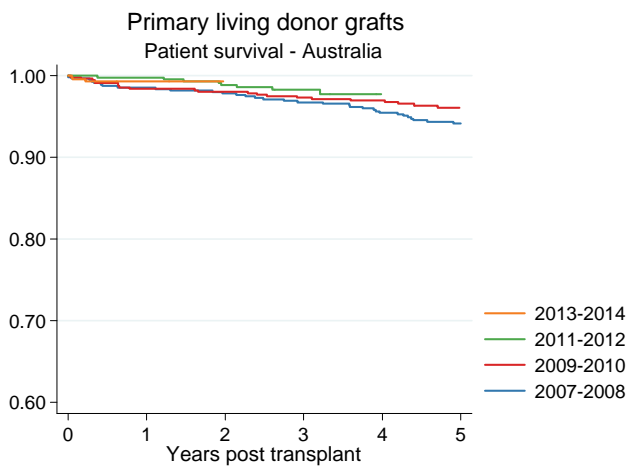


Figure 8.24

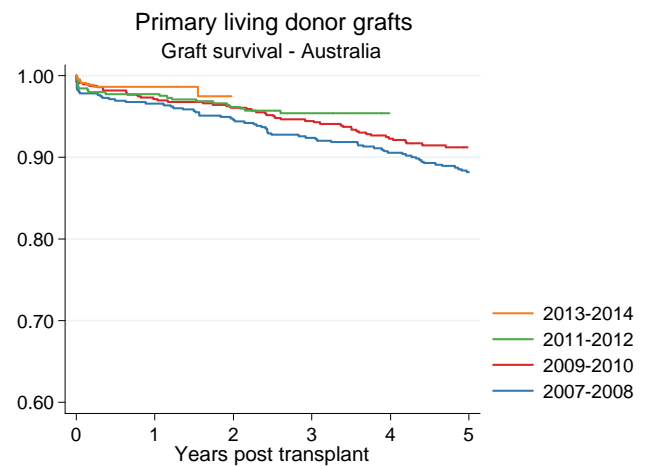


Table 8.23. Primary Living Donor Grafts - Australia 2007-2014

Outcome	Era	1 month	6 months	1 year	5 years
Patient survival	2007-2008 (n=557)	100 (99, 100)	99 (97, 99)	99 (97, 99)	94 (92, 96)
	2009-2010 (n=564)	100 (99, 100)	99 (98, 100)	98 (97, 99)	96 (94, 97)
	2011-2012 (n=447)	100	100 (98, 100)	100 (98, 100)	-
	2013-2014 (n=461)	100 (98, 100)	99 (98, 100)	99 (98, 100)	-
Graft survival	2007-2008 (n=557)	98 (96, 99)	97 (95, 98)	97 (95, 98)	88 (85, 91)
	2009-2010 (n=564)	99 (98, 100)	98 (97, 99)	97 (95, 98)	91 (89, 93)
	2011-2012 (n=447)	98 (97, 99)	98 (96, 99)	98 (96, 99)	-
	2013-2014 (n=461)	99 (98, 100)	99 (97, 99)	99 (97, 99)	-

Figure 8.25

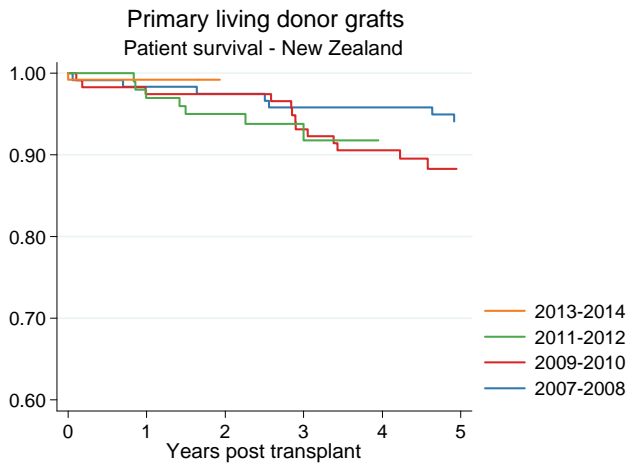


Figure 8.26

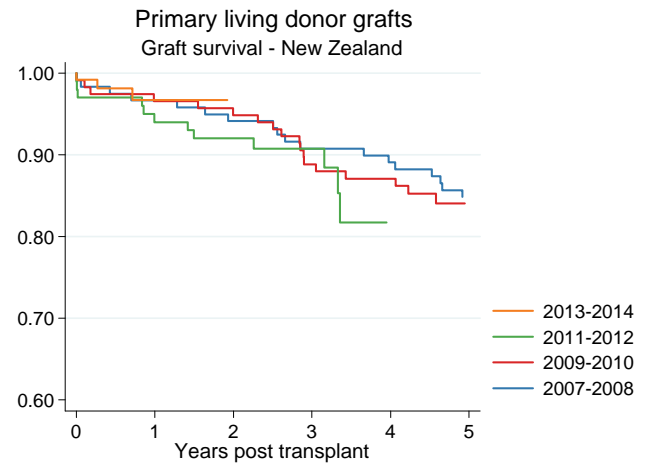


Table 8.24. Primary Living Donor Grafts - New Zealand 2007-2014

Outcome	Era	1 month	6 months	1 year	5 years
Patient Survival	2007-2008 (n=120)	99 (94, 100)	99 (94, 100)	98 (94, 100)	94 (88, 97)
	2009-2010 (n=118)	100	98 (93, 100)	97 (92, 99)	88 (81, 93)
	2011-2012 (n=101)	100	100	97 (91, 99)	-
	2013-2014 (n=124)	99 (94, 100)	99 (94, 100)	99 (94, 100)	-
Graft Survival	2007-2008 (n=120)	98 (94, 100)	98 (92, 99)	97 (91, 99)	85 (77, 90)
	2009-2010 (n=118)	99 (94, 100)	97 (92, 99)	97 (91, 99)	84 (76, 90)
	2011-2012 (n=101)	97 (91, 99)	97 (91, 99)	94 (87, 97)	-
	2013-2014 (n=124)	99 (94, 100)	98 (93, 100)	97 (90, 99)	-

Figure 8.27

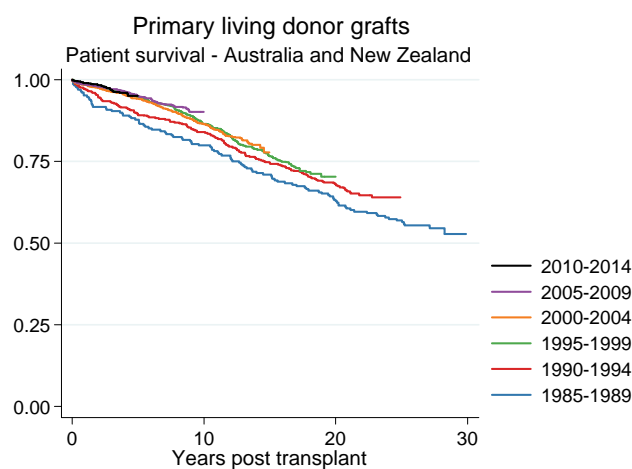


Figure 8.28

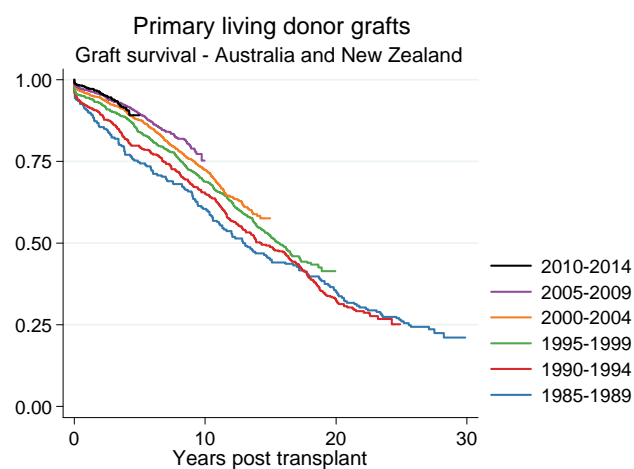


Table 8.25. Primary Living Donor Grafts - Australia and New Zealand 1985-2014

Outcome	Era	1 year	5 years	10 years	15 years	20 years
Patient Survival	1985-1989 (n=230)	95 (92, 97)	88 (83, 91)	80 (74, 85)	71 (65, 76)	63 (56, 69)
	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)	-
	2000-2004 (n=1193)	98 (98, 99)	94 (93, 95)	86 (84, 88)	-	-
	2005-2009 (n=1585)	99 (98, 99)	95 (94, 96)	-	-	-
	2010-2014 (n=1458)	99 (98, 99)	-	-	-	-
Graft Survival	1985-1989 (n=230)	91 (86, 94)	75 (69, 80)	60 (54, 67)	45 (38, 51)	35 (29, 41)
	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)	-
	2000-2004 (n=1193)	96 (95, 97)	88 (86, 89)	73 (70, 75)	-	-
	2005-2009 (n=1585)	97 (96, 97)	90 (88, 91)	-	-	-
	2010-2014 (n=1458)	98 (97, 98)	-	-	-	-

Figure 8.29

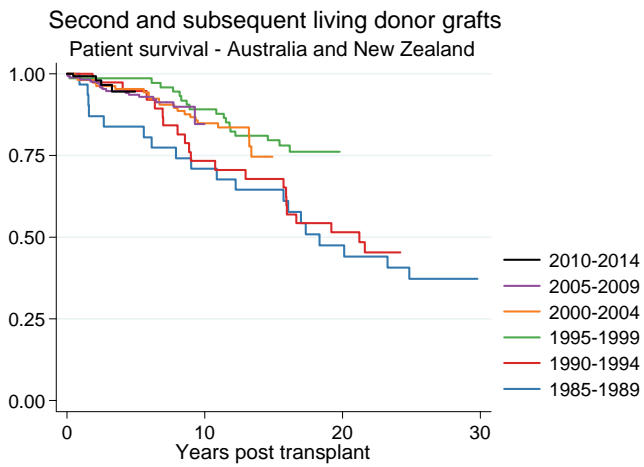


Figure 8.30

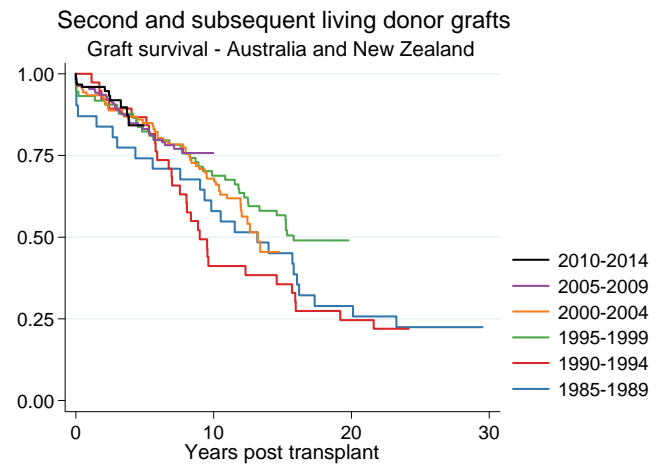


Table 8.26. Second and Subsequent Living Donor Grafts - Australia and New Zealand 1985-2014

Outcome	Era	1 year	5 years	10 years	15 years	20 years
Patient Survival	1985-1989 (n=31)	97 (79, 100)	84 (66, 93)	71 (52, 84)	65 (45, 79)	48 (29, 64)
	1990-1994 (n=38)	100	95 (81, 99)	73 (56, 85)	68 (50, 80)	52 (35, 66)
	1995-1999 (n=74)	99 (91, 100)	99 (91, 100)	89 (80, 94)	80 (69, 87)	-
	2000-2004 (n=107)	98 (93, 100)	95 (89, 98)	85 (76, 90)	-	-
	2005-2009 (n=175)	98 (95, 99)	94 (89, 96)	-	-	-
	2010-2014 (n=153)	99 (95, 100)	-	-	-	-
Graft Survival	1985-1989 (n=31)	87 (69, 95)	74 (55, 86)	58 (39, 73)	45 (27, 61)	29 (15, 45)
	1990-1994 (n=38)	100	87 (71, 94)	41 (25, 56)	36 (21, 51)	25 (12, 39)
	1995-1999 (n=74)	93 (85, 97)	82 (72, 89)	69 (57, 78)	57 (45, 67)	-
	2000-2004 (n=107)	93 (87, 97)	85 (77, 91)	68 (58, 76)	-	-
	2005-2009 (n=175)	95 (91, 98)	83 (77, 88)	-	-	-
	2010-2014 (n=153)	96 (91, 98)	-	-	-	-

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