

CHAPTER 7

Kidney Transplantation

Reporting the incidence and prevalence of renal transplantation in Australia and New Zealand; summarising immunosuppression regimens, rejection episodes, graft survival and patient survival

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SUMMARY AND HIGHLIGHTS

2022 saw an increase in total transplants performed in Australia, relative to the previous 2 years, but not yet to pre-pandemic levels (table 7.1 and figure 7.1.1). This increase was not uniform across all states and territories with Queensland and South Australia experiencing relative declines in transplant rates (table 7.5). New Zealand had a slight decrease in overall transplant numbers (table 7.1 and figure 7.1.2). For the first time, this year's report includes the number of blood group incompatible (ABOi) transplants performed. ABOi transplants comprised 14% and 7% of living donor transplants in Australia and New Zealand respectively for 2022.

There has been progressive growth in the number of people with functioning transplants in Australia and New Zealand (table 7.8 and figure 7.7). Older age groups are increasingly represented among prevalent transplant recipients with a noticeable uptick in the 75-84 years age group in the last 5 years, while approximately a quarter of prevalent transplant recipients are aged 65-74 years.

Death remains the leading cause of graft loss in Australia and New Zealand accounting for approximately 60% of cases (table 7.12). Cardiovascular death is prominent in both countries but particularly so in New Zealand (1/3 of deaths) (table 7.13). Malignancy is a frequent cause of death after the first post-transplant year (24%) while infection is the leading cause in the first 12 months following transplantation in Australia.

Another new addition to this year's report is an assessment of delayed graft function (DGF) and patient and graft survival for deceased donor transplants by donor subtypes of neurological death (DBD) and circulatory death (DCD). DGF was experienced by 25% and 20% of recipients of kidneys from DBD donors and 57% and 33% of recipients of kidneys from DCD donors in 2022 for Australia and New Zealand respectively (table 7.17). Reassuringly, patient and graft survival appear equivalent in the longer term (figures 7.41 - 7.44).

A final addition to this year's report is patient and graft survival by recipient age. For primary deceased donor transplants, patient and graft survival for recipients over 70 years of age is reduced in both countries and also for the 60-69 year group in Australia (figures 7.33 - 7.36). Similar curves are seen in Australia for primary living donor transplants. In New Zealand the numbers of >70-year old recipients make interpretation difficult but a similar trend is seen in the younger age groups.

SUGGESTED CITATION

W Mulley, C Davies, E Au, S Bateman, J Chen, K Hurst, G Irish, D Lee, H McCarthy, S McDonald, M Roberts, T Sun, P Clayton. 46th Report, Chapter 7: Kidney Transplantation. Australia and New Zealand Dialysis and Transplant Registry, Adelaide, Australia. 2023. Available at: <http://www.anzdata.org.au>

NEW TRANSPLANTS

Table 7.1 shows the number of transplants performed in each country over the last 20 years.

Table 7.1
Number of Grafts Performed by Country 2003-2022

Country	Year	Graft 1	Graft 2	Graft 3	Graft 4	Graft 5	Total Transplants	Living Donor Transplants
Australia	2003	472	60	10	1	0	543	218
	2004	583	53	11	3	0	650	244
	2005	539	67	15	2	0	623	246
	2006	549	70	17	5	0	641	273
	2007	527	75	11	0	2	615	271
	2008	708	84	16	5	0	813	354
	2009	675	88	11	0	0	774	328
	2010	744	83	18	1	0	846	296
	2011	744	68	9	3	0	824	254
	2012	746	81	15	1	2	845	238
	2013	792	85	7	2	0	886	254
	2014	805	100	5	3	0	913	267
	2015	842	93	12	2	0	949	242
	2016	932	138	19	2	0	1091	264
	2017	951	136	20	2	0	1109	271
	2018	1027	102	19	1	0	1149	238
	2019	987	92	23	2	0	1104	238
	2020	804	70	10	1	0	885	181
	2021	737	106	12	2	0	857	202
	2022	827	94	15	2	0	938	225
New Zealand	2003	94	13	4	0	0	111	44
	2004	98	7	0	0	0	105	48
	2005	87	5	0	1	0	93	46
	2006	80	8	2	0	0	90	49
	2007	112	9	2	0	0	123	58
	2008	111	10	1	0	0	122	69
	2009	109	12	0	0	0	121	67
	2010	104	5	1	0	0	110	60
	2011	110	7	1	0	0	118	57
	2012	99	9	0	0	0	108	54
	2013	111	5	0	0	0	116	59
	2014	126	12	0	0	0	138	72
	2015	133	10	3	1	0	147	74
	2016	155	17	0	0	0	172	82
	2017	174	13	0	0	0	187	69
	2018	170	11	0	1	0	182	84
	2019	196	24	1	0	0	221	91
	2020	169	17	1	0	0	187	87
	2021	173	14	0	0	0	187	85
	2022	165	9	0	0	0	174	70

Table 7.2 shows the types of transplants between 2018 and 2022.

Table 7.2
Transplant Type 2018-2022

Country		2018	2019	2020	2021	2022
Australia	Living Donor	238	238	181	202	225
	ABOi	41 (17.2%)	27 (11.3%)	27 (14.9%)	22 (10.9%)	31 (13.8%)
	Deceased Donor	911	866	704	655	713
	ABOi	2 (0.2%)	8 (0.9%)	3 (0.4%)	6 (0.9%)	5 (0.7%)
	DBD	648 (71.1%)	591 (68.2%)	497 (70.6%)	477 (72.8%)	534 (74.9%)
	DCD	249 (27.3%)	265 (30.6%)	207 (29.4%)	178 (27.2%)	179 (25.1%)
New Zealand	Living Donor	84	91	87	85	70
	ABOi	11 (13.1%)	17 (18.7%)	6 (6.9%)	9 (10.6%)	5 (7.1%)
	Deceased Donor	98	130	100	102	104
	DBD	83 (84.7%)	112 (86.2%)	87 (87.0%)	96 (94.1%)	89 (85.6%)
	DCD	15 (15.3%)	18 (13.8%)	13 (13.0%)	6 (5.9%)	15 (14.4%)

Figure 7.1.1
Deceased and Living Donor Transplants - Australia 2013-2022

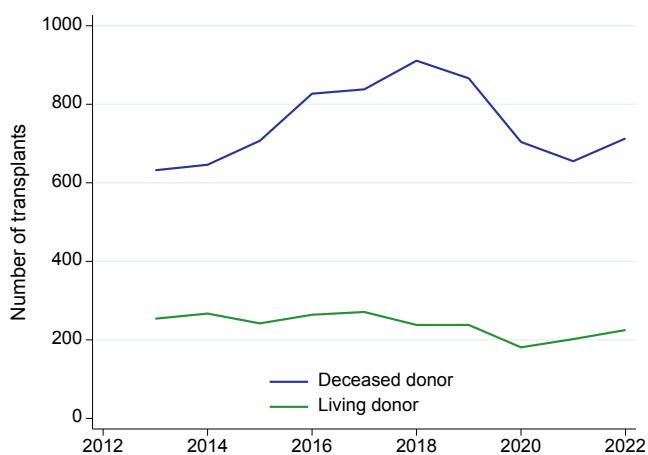
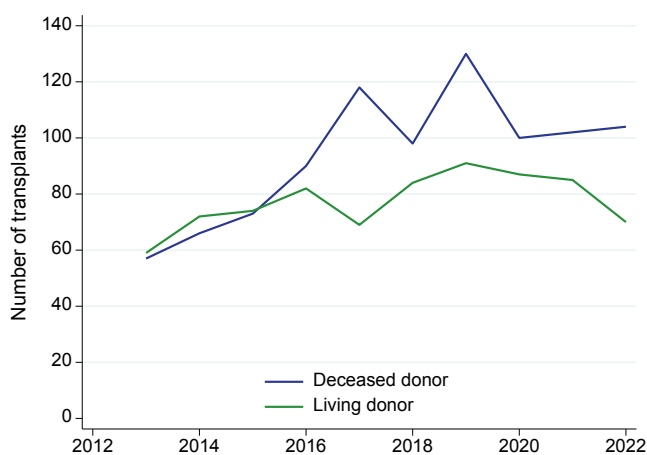


Figure 7.1.2
Deceased and Living Donor Transplants - New Zealand 2013-2022



The transplant rate for dialysed patients is presented in figure 7.2 (for all dialysis patients) and figure 7.3 (for dialysis patients aged 15-64 years). This represents the number of transplants performed per 100 years of dialysis. Differences in the rates between states/territories and countries depend on several factors including the case-mix of the dialysis patients and the local deceased donation rate. These rates are presented by age in figure 7.4, and by ethnicity in patients aged 15-64 years in figure 7.5. In both countries, the transplant rate of Indigenous patients is lower than in other ethnic groups; see also chapters 10 and 11.

Figure 7.2
Transplant Rate of Dialysed Patients 2022 - All Dialysis Patients

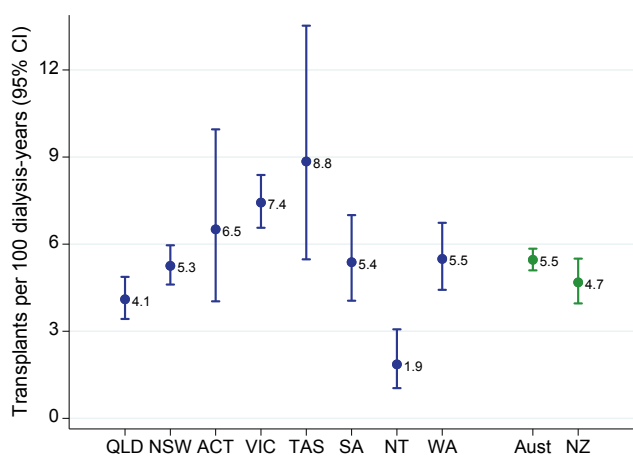


Figure 7.3
Transplant Rate of Dialysed Patients 2022 - Patients Aged 15-64

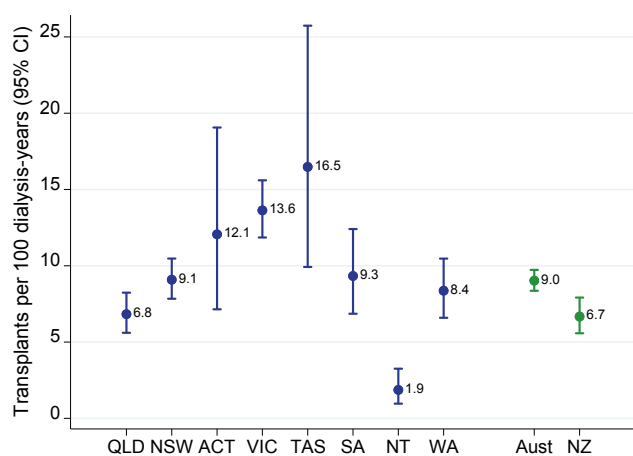


Figure 7.4.1
Transplant Rate of Dialysed Patients by Age 2022 - Australia

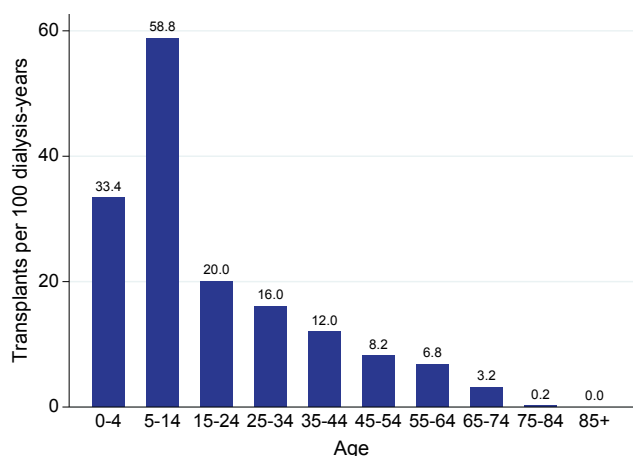


Figure 7.4.2
Transplant Rate of Dialysed Patients by Age 2022 - New Zealand

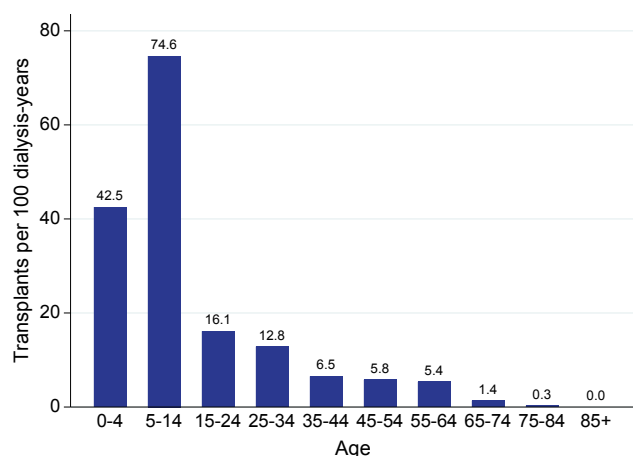


Figure 7.5.1
Transplant Rate of Dialysed Patients by Ethnicity
2013-2022 - Australia, Patients Aged 15-64

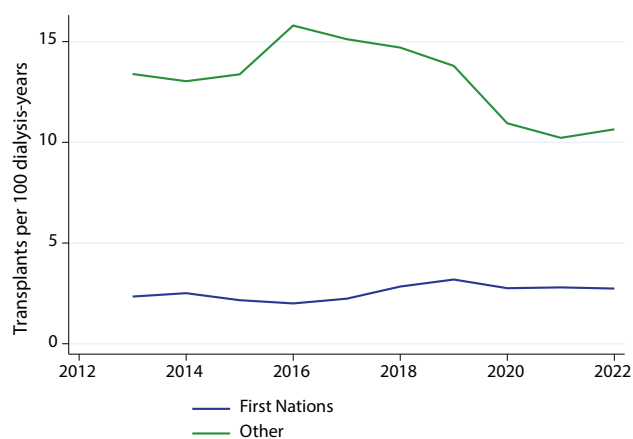


Figure 7.5.2
Transplant Rate of Dialysed Patients by Ethnicity
2013-2022 - New Zealand, Patients Aged 15-64

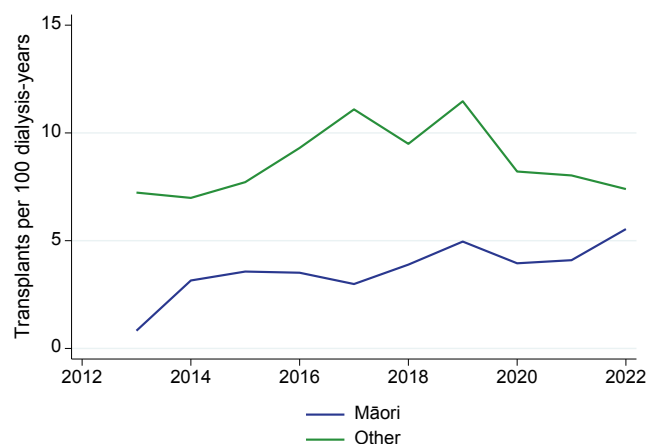


Table 7.3 shows the number of grafts performed according to donor type, graft number and recipient age in 2022. Transplant rates by age, per million population, are presented in figure 7.6.

Population estimates for Australia and New Zealand used throughout this chapter for the calculation of prevalence per million population were sourced from the Australian Bureau of Statistics (2022)¹ and Stats NZ (2022)².

Table 7.3
Age of Recipients Transplanted in 2022

Country	Donor type	Graft number	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84
Australia	Deceased	1	4	14	20	61	101	122	189	108	6
		2	0	0	6	8	12	24	16	9	0
		3	0	0	0	2	4	2	3	1	0
		4	0	0	0	0	1	0	0	0	0
	Living	1	6	3	14	21	35	46	52	22	3
		2	0	0	2	5	3	4	3	2	0
		3	0	0	0	0	1	1	0	1	0
		4	0	0	0	0	0	1	0	0	0
New Zealand	Deceased	1	1	2	2	12	18	25	30	10	0
		2	0	0	1	1	0	0	2	0	0
	Living	1	2	1	3	11	8	18	15	6	1
		2	0	0	0	3	1	0	1	0	0

Figure 7.6.1
Transplant Operations (Per Million Population)
2022 - Australia

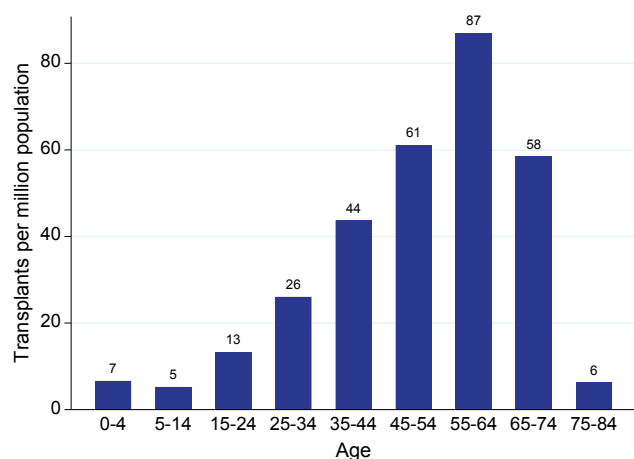


Figure 7.6.2
Transplant Operations (Per Million Population)
2022 - New Zealand

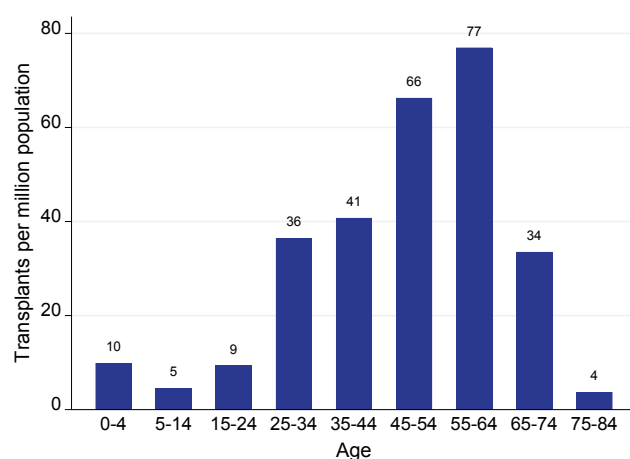


Table 7.4 shows the ethnicity of the recipients transplanted between 2018 and 2022.

Table 7.4
Ethnicity of Recipients Transplanted 2018-2022

Country	Ethnicity	2018	2019	2020	2021	2022
Australia	First Nations	52 (4.5%)	57 (5.2%)	48 (5.4%)	52 (6.1%)	55 (5.9%)
	Other	1009 (87.8%)	986 (89.3%)	800 (90.4%)	774 (90.3%)	844 (90.0%)
	Not reported	88 (7.7%)	61 (5.5%)	37 (4.2%)	31 (3.6%)	39 (4.2%)
	Total	1149	1104	885	857	938
New Zealand	Māori	29 (15.9%)	35 (15.8%)	37 (19.8%)	37 (19.8%)	42 (24.1%)
	Other	153 (84.1%)	186 (84.2%)	148 (79.1%)	148 (79.1%)	131 (75.3%)
	Not reported	-	-	2 (1.1%)	2 (1.1%)	1 (0.6%)
	Total	182	221	187	187	174

Table 7.5 shows the number of transplants (per million population) performed by transplanting region over 2018-2022.

Table 7.5
Transplants (pmp) by Transplanting Region and Country 2018-2022

State	2018	2019	2020	2021	2022
NSW/ACT	393 (47)	350 (41)	292 (34)	267 (31)	317 (37)
VIC/TAS	418 (60)	351 (50)	267 (37)	234 (33)	320 (45)
QLD	177 (35)	207 (41)	143 (28)	164 (31)	122 (23)
SA/NT	69 (35)	93 (46)	93 (46)	99 (48)	79 (38)
WA	92 (35)	103 (39)	90 (33)	93 (34)	100 (36)
Australia	1149 (46)	1104 (44)	885 (34)	857 (33)	938 (36)
New Zealand	182 (37)	221 (44)	187 (37)	187 (37)	174 (34)

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 2013-2022 are presented in table 7.6. 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 the ANZDATA Registry as lost to follow-up.

Table 7.6
Transplant Operations Performed Overseas on Australian/NZ Dialysis Patients 2013-2022

Year	Australia	New Zealand
2013	3	1
2014	3	0
2015	6	1
2016	3	1
2017	2	1
2018	3	1
2019	5	0
2020	0	0
2021	1	0
2022	0	0

PREVALENT TRANSPLANTS

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

Table 7.7 presents the number of transplants performed and functioning at the end of 2022 (categorised by country of transplantation and country of residence). The patients with transplants of “unknown” source were transplanted outside Australia/New Zealand.

Table 7.7
Total Number of Transplants Performed and Functioning at End of 2022*

Country	Donor type	Graft number	Performed	Functioning
Australia	Living	1	6590	3927
		2	627	345
		3	93	52
		4	12	6
		5	1	1
	Deceased	1	19960	8051
		2	2794	938
		3	432	127
		4	65	16
		5	6	0
Unknown	1	0	40	
	2	0	4	
New Zealand	Living	1	1711	1021
		2	140	81
		3	7	4
		4	1	1
	Deceased	1	3141	1080
		2	474	107
		3	80	13
		4	8	1
	Unknown	1	0	9

* Performed (Country of transplantation)

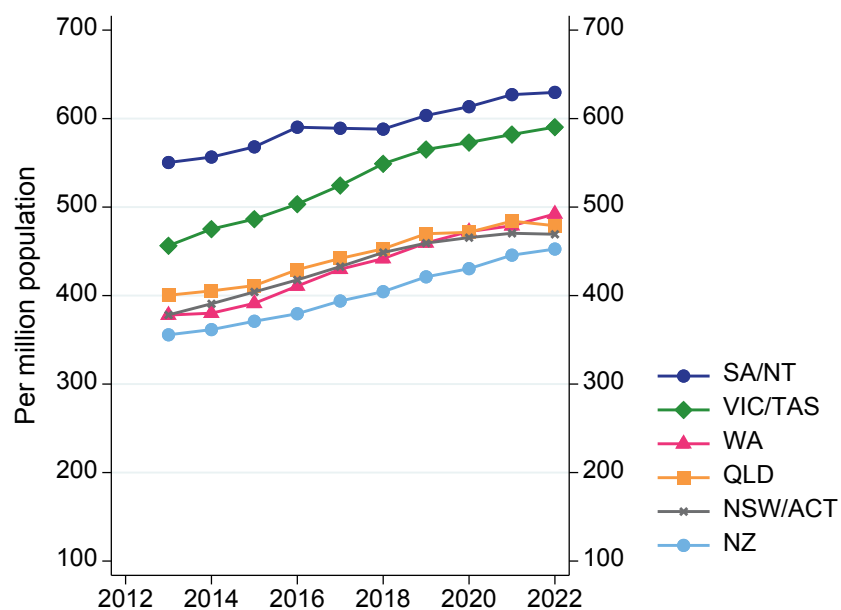
Functioning (Country of residence)

Table 7.8 presents the number of functioning transplants at the end of 2013-2022 by transplant region. These data are shown graphically in figure 7.7.

Table 7.8
Functioning Transplants (pmp) by Transplanting Region 2013-2022

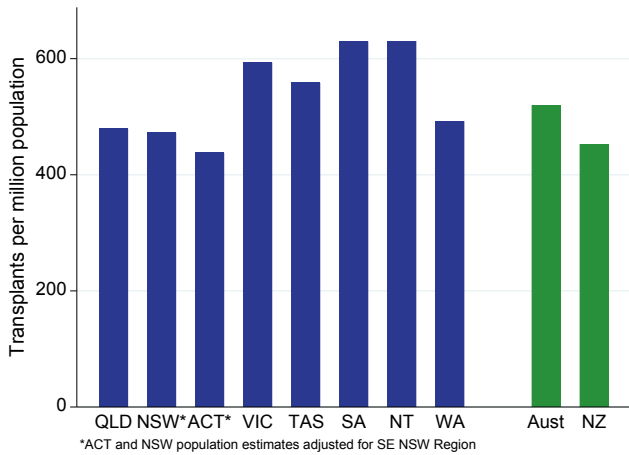
Year	NSW/ACT	VIC/TAS	QLD	SA/NT	WA	Australia	New Zealand
2013	2945 (378)	2868 (456)	1863 (400)	1053 (550)	940 (378)	9669 (418)	1580 (356)
2014	3086 (391)	3045 (475)	1913 (405)	1074 (557)	957 (380)	10075 (429)	1633 (362)
2015	3238 (404)	3180 (486)	1965 (411)	1105 (568)	994 (391)	10482 (440)	1710 (371)
2016	3399 (418)	3368 (503)	2080 (429)	1156 (590)	1050 (411)	11053 (457)	1789 (379)
2017	3578 (433)	3581 (524)	2178 (442)	1165 (589)	1112 (430)	11614 (472)	1896 (394)
2018	3758 (449)	3820 (549)	2269 (453)	1174 (588)	1158 (442)	12179 (488)	1982 (404)
2019	3893 (459)	4003 (565)	2394 (470)	1218 (604)	1224 (459)	12732 (503)	2097 (421)
2020	3978 (466)	4108 (573)	2440 (471)	1253 (613)	1284 (472)	13063 (509)	2191 (430)
2021	4021 (470)	4142 (582)	2526 (484)	1287 (627)	1317 (479)	13293 (518)	2278 (446)
2022	4041 (469)	4242 (590)	2549 (479)	1304 (630)	1371 (492)	13507 (520)	2317 (453)

Figure 7.7
Functioning Transplants Per Million Population by Transplanting Region - Australia and New Zealand 2013-2022



The prevalence of functioning transplants per million population at 31 December 2022 by state/territory is shown in figure 7.8. State/territory is based on the location of the treating hospital.*

Figure 7.8
Prevalence of Functioning Transplants 31 Dec 2022 - Per Million Population



*NSW population estimates exclude residents of the NSW South Eastern region which includes the local government areas of Bega Valley, Eurobodalla, Goulburn Mulwaree, Hilltops, Queanbeyan-Palerang Regional, Snowy Monaro Regional, Upper Lachlan Shire and Yass Valley. ACT population includes residents of the NSW South Eastern region. The population base for the NSW South Eastern region is based on the estimated resident population by local government area from the Australian Bureau of Statistics (2023)³.

The percentage of prevalent kidney replacement therapy patients with a functioning transplant is shown in figure 7.9 by age group. The number of prevalent transplant patients by age and donor source is shown in table 7.9. Finally, the age distribution, and distribution per million population, are shown in figures 7.10 and 7.11 for Australia and New Zealand, respectively.

Figure 7.9.1
Percentage of KRT Patients with a Functioning Transplant - By Age, Australia 2022

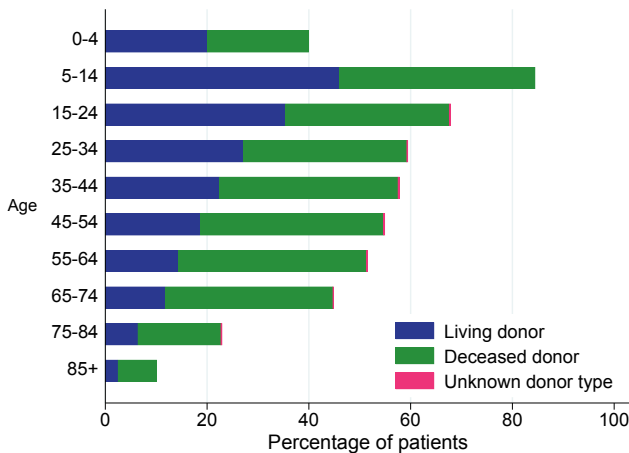


Figure 7.9.2
Percentage of KRT Patients with a Functioning Transplant - By Age, New Zealand 2022

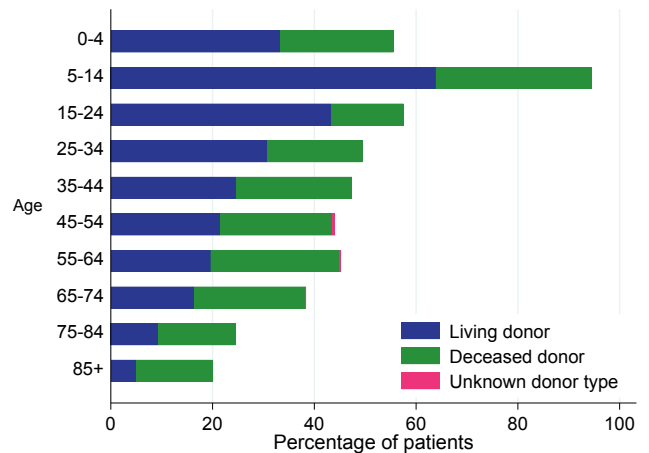


Table 7.9
Age Distribution of Functioning Transplant Patients - 31 Dec 2022

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	
Australia	All	All	12	147	364	817	1579	2784	3568	3168	986	82	13507	
	Unknown	1	-	-	2	1	7	11	7	9	3	-	-	40
		2	-	-	-	-	3	-	1	-	-	-	-	4
		All	-	-	2	1	10	11	8	9	3	-	-	44
	Deceased	1	6	66	142	373	812	1535	2250	2132	674	61	-	8051
		2	-	1	29	61	125	245	271	174	31	1	-	938
		3	-	-	1	9	19	39	42	14	3	-	-	127
		4	-	-	-	-	2	9	4	1	-	-	-	16
		All	6	67	172	443	958	1828	2567	2321	708	62	-	9132
		Living	1	6	80	174	337	544	833	895	777	263	18	-
	2		-	-	15	35	54	93	80	55	11	2	-	345
	3		-	-	1	1	12	17	15	6	-	-	-	52
	4		-	-	-	-	1	2	2	-	1	-	-	6
	5		-	-	-	-	-	-	1	-	-	-	-	1
	All		6	80	190	373	611	945	993	838	275	20	-	4331
New Zealand	All	All	5	34	65	164	303	436	678	500	124	8	2317	
	Unknown	1	-	-	-	-	-	4	3	2	-	-	-	9
		All	-	-	-	-	-	4	3	2	-	-	-	9
	Deceased	1	2	11	12	53	132	189	339	263	73	6	-	1080
		2	-	-	4	9	13	23	38	17	3	-	-	107
		3	-	-	-	-	-	7	3	2	1	-	-	13
		4	-	-	-	-	-	-	-	1	-	-	-	1
		All	2	11	16	62	145	219	380	283	77	6	-	1201
	Living	1	3	23	49	93	138	185	273	208	47	2	-	1021
		2	-	-	-	9	20	25	20	7	-	-	-	81
		3	-	-	-	-	-	2	2	-	-	-	-	4
		4	-	-	-	-	-	1	-	-	-	-	-	1
		All	3	23	49	102	158	213	295	215	47	2	-	1107

Figure 7.10.1
Age Distribution of Functioning Transplants - Australia 2022 (n=13507)

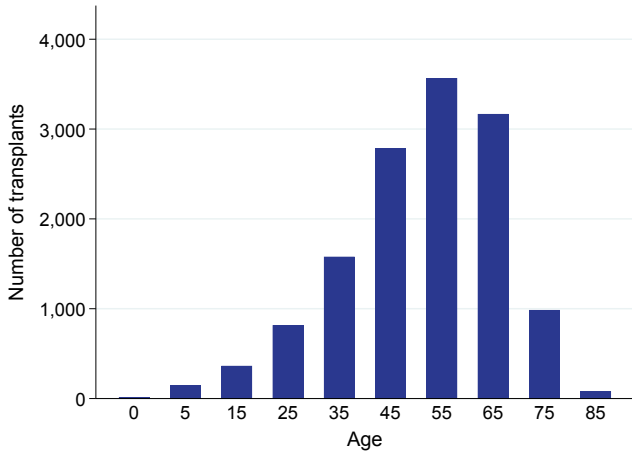


Figure 7.10.2
Age Distribution of Functioning Transplants - Per Million Population, Australia 2022

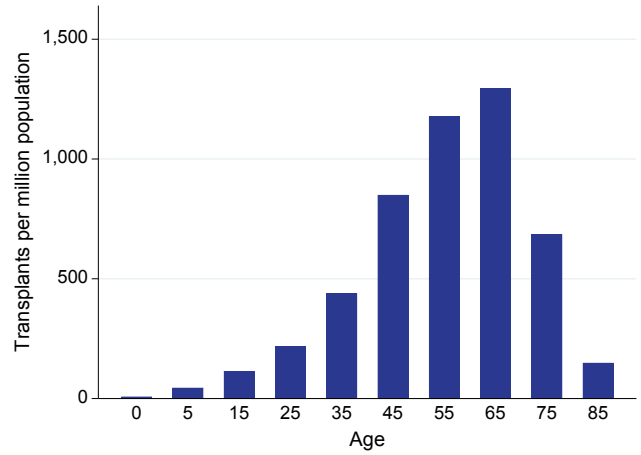


Figure 7.11.1
Age Distribution of Functioning Transplants - New Zealand 2022 (n=2317)

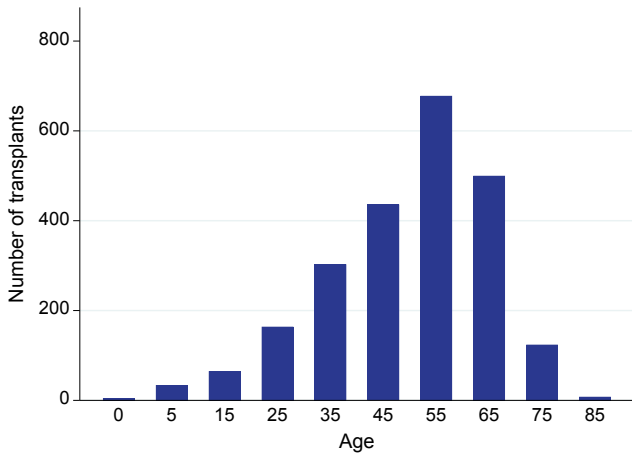
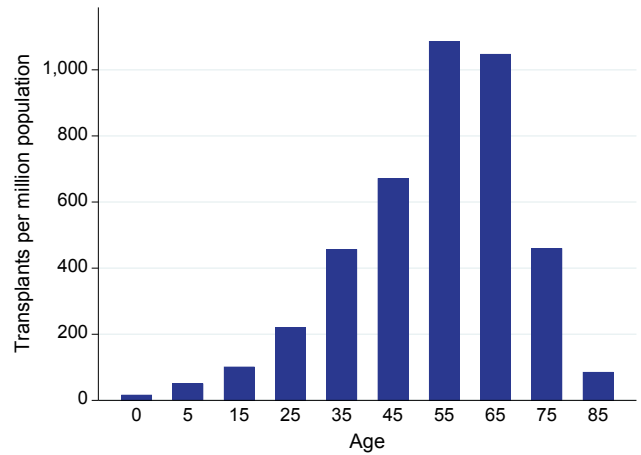


Figure 7.11.2
Age Distribution of Functioning Transplants - Per Million Population, New Zealand 2022



The trends in the age of prevalent transplant recipients are illustrated in figure 7.12 as a percentage of the total number of prevalent transplant patients, and as a rate per million population in figure 7.13.

Figure 7.12.1
Prevalent Transplant Recipients by Age Group
2003-2022 - Australia

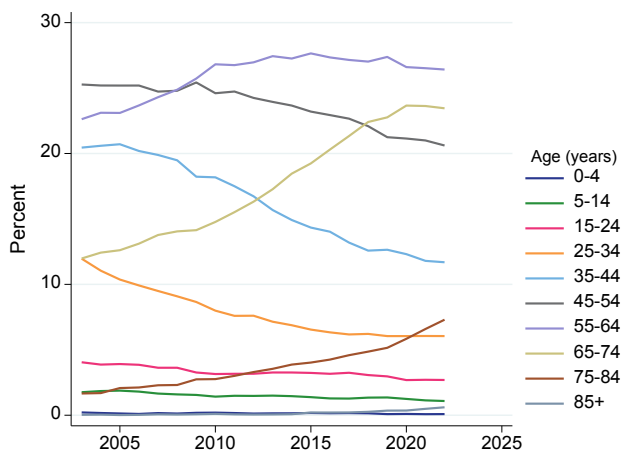


Figure 7.12.2
Prevalent Transplant Recipients by Age Group
2003-2022 - New Zealand

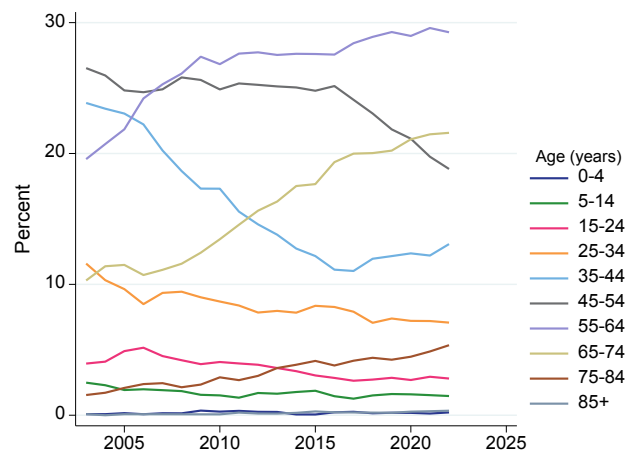


Figure 7.13.1
Prevalent Transplant Recipients Per Million
Population by Age Group - Australia 2003-2022

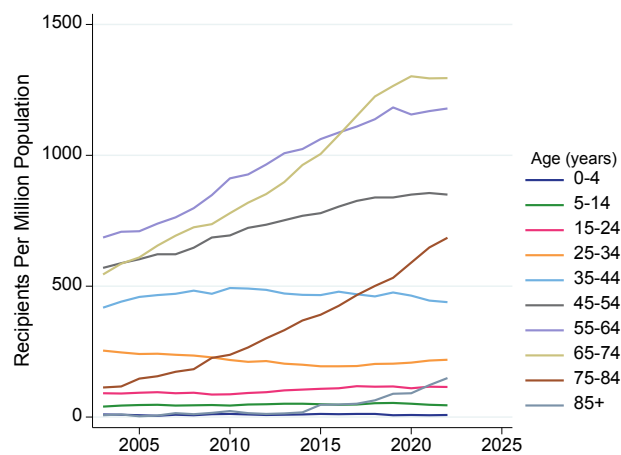


Figure 7.13.2
Prevalent Transplant Recipients Per Million
Population by Age Group - New Zealand 2003-2022

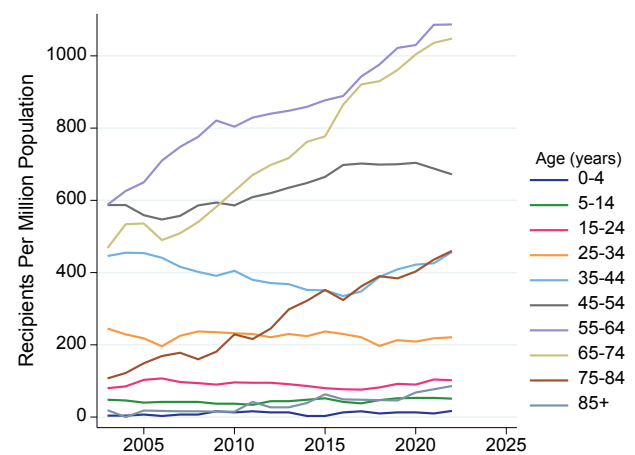


Table 7.10 presents the number of prevalent patients with a functioning transplant by gender, ethnicity and age.

Table 7.10
Functioning Transplant Patients by Gender, Ethnicity and Age Group - 31 Dec 2022

Country	Gender	Ethnicity	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85+	Total
Australia	All	Total	12	147	364	817	1579	2784	3568	3168	986	82	13507
		First Nations	-	2	6	20	21	54	54	17	1	-	175
		Other	3	43	117	275	601	979	1180	1084	330	27	4639
	Female	Not reported	-	1	5	21	43	75	93	110	32	3	383
		Total	3	46	128	316	665	1108	1327	1211	363	30	5197
		First Nations	-	5	13	20	30	60	69	43	6	-	246
	Male	Other	8	96	207	455	823	1488	2000	1782	571	44	7474
		Not reported	1	-	16	26	61	128	172	132	46	8	590
		Total	9	101	236	501	914	1676	2241	1957	623	52	8310
	New Zealand	All	Total	5	34	65	164	303	436	678	500	124	8
Māori			-	3	7	13	28	29	27	13	2	-	122
Other			1	12	23	69	99	153	241	176	37	5	816
Female		Not reported	-	-	-	1	-	-	-	-	-	-	1
		Total	1	15	30	83	127	182	268	189	39	5	939
		Māori	-	3	3	12	32	32	54	38	4	-	178
Male		Other	4	16	32	68	144	220	354	273	81	3	1195
		Not reported	-	-	-	1	-	2	2	-	-	-	5
		Total	4	19	35	81	176	254	410	311	85	3	1378

Figure 7.14 shows the duration of function of prevalent transplants at the end of 2022. In Australia there were 5277 grafts that had functioned for ≥10 years, 1555 ≥20 years and 366 ≥30 years. In New Zealand there were 828 grafts that had functioned for ≥10 years, 279 ≥20 years and 70 ≥30 years.

Figure 7.14.1
Number of Functioning Grafts by Graft Duration - Australia 2022 (n=13507)

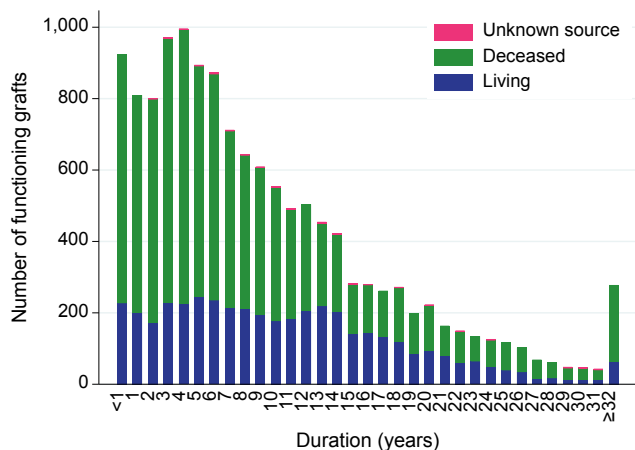
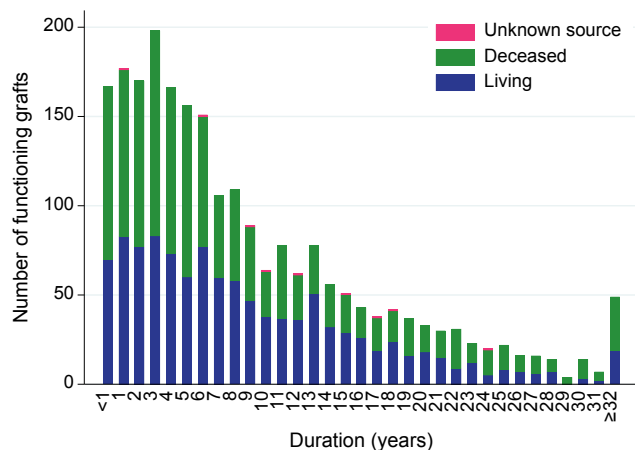


Figure 7.14.2
Number of Functioning Grafts by Graft Duration - New Zealand 2022 (n=2317)



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GRAFT LOSS

Table 7.11 presents the overall graft loss rate in 2013-2022 by country, stratified into graft failure and death with a functioning graft. These rates are expressed as graft losses per 100 graft-years. Approximately half of grafts are lost due to graft failure and half due to patient death.

Table 7.11
Graft Loss Rate 2013-2022

Country	Outcome	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Australia	Graft failure	2.6	2.7	3.0	2.6	2.8	3.1	2.6	2.5	2.6	2.9
	Death with function	2.7	2.4	2.5	2.5	2.4	2.5	2.5	2.6	3.1	3.8
	All losses	5.2	5.1	5.5	5.1	5.2	5.6	5.1	5.1	5.7	6.6
New Zealand	Graft failure	2.3	2.8	2.0	2.7	2.1	2.8	2.4	2.6	2.5	2.6
	Death with function	2.0	2.8	2.7	3.0	2.9	2.8	3.5	2.3	2.5	4.3
	All losses	4.3	5.6	4.7	5.7	5.0	5.6	5.8	4.9	5.0	6.9

The causes of graft loss over 2013-2022 are presented in table 7.12. Since 2020 chronic allograft nephropathy has been removed as a cause for graft loss and has been replaced by other options. 'Chronic antibody mediated rejection', 'interstitial fibrosis and tubular atrophy' (not due to rejection) and 'gradual graft failure' (where a biopsy has not been performed to confirm a specific diagnosis) have been added. These data are further categorised by timing post-transplant (first year versus later years) for 2018-2022 in table 7.13.

Table 7.12
Causes of Graft Loss 2013-2022

Country	Cause of graft loss	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Australia	Death with function	233	216	231	244	243	261	265	279	338	413	2723
	Acute rejection	13	11	16	14	15	18	12	15	22	12	148
	Chronic allograft nephropathy	155	167	189	153	148	177	121	31	-	-	1141
	Chronic antibody mediated rejection	-	-	-	-	-	1	2	31	56	54	144
	Interstitial fibrosis/ tubular atrophy - not due to rejection	-	-	-	-	-	1	-	9	8	11	29
	Gradual graft failure - biopsy not performed	-	-	-	-	-	4	3	79	82	75	243
	Hyperacute rejection	-	1	-	1	1	-	2	1	-	-	6
	Vascular	9	7	12	10	5	16	13	10	7	8	97
	Technical	-	6	2	6	6	4	4	6	3	5	42
	Glomerular Disease	16	12	20	19	19	13	16	13	15	26	169
	Non-compliance	9	14	3	8	16	17	9	9	14	16	115
	BK Virus Nephropathy	5	7	6	2	3	10	5	5	5	6	54
	Unknown	-	-	1	-	-	-	1	14	26	21	63
	Other	17	22	29	33	41	36	44	35	42	68	367
Not reported	-	-	-	7	31	23	47	13	9	15	145	
Total		457	463	509	497	528	581	544	550	627	730	5486
New Zealand	Death with function	30	43	42	50	50	50	64	44	50	87	510
	Acute rejection	2	3	1	2	2	4	5	2	5	4	30
	Chronic allograft nephropathy	21	28	22	26	17	31	18	4	-	-	167
	Chronic antibody mediated rejection	-	-	-	-	-	-	-	2	7	1	10
	Interstitial fibrosis/ tubular atrophy - not due to rejection	-	-	-	-	-	-	-	3	2	4	9
	Gradual graft failure - biopsy not performed	-	-	-	-	-	-	1	18	15	17	51
	Hyperacute rejection	-	-	-	-	-	-	-	-	-	-	0
	Vascular	2	1	-	3	1	-	1	1	4	2	15
	Technical	-	1	1	2	-	-	1	5	-	1	11
	Glomerular Disease	1	2	2	2	5	1	3	1	7	8	32
	Non-compliance	4	6	-	-	1	3	4	5	2	3	28
	BK Virus Nephropathy	1	-	2	-	1	-	-	-	1	-	5
	Unknown	-	-	-	-	-	-	-	-	-	1	1
	Other	3	2	3	6	3	8	2	3	5	10	45
Not reported	-	-	1	3	5	2	9	6	2	2	30	
Total		64	86	74	94	85	99	108	94	100	140	944

Table 7.13
Graft Losses 2018-2022

Country	Outcome	Cause of death or graft failure	First year	Beyond first year	Total
Australia	Death with function	Cardiovascular	20 (27%)	373 (25%)	393 (25%)
		Withdrawal	2 (3%)	65 (4%)	67 (4%)
		Cancer	4 (5%)	356 (24%)	360 (23%)
		Infection	32 (43%)	298 (20%)	330 (21%)
		Other	16 (21%)	353 (24%)	369 (24%)
		Not reported	1 (1%)	36 (2%)	37 (2%)
		Total	75 (100%)	1481 (100%)	1556 (100%)
	Graft Failure	Acute rejection	18 (14%)	61 (5%)	79 (5%)
		Chronic allograft nephropathy	6 (5%)	323 (24%)	329 (22%)
		Chronic antibody mediated rejection	2 (2%)	142 (11%)	144 (10%)
		Interstitial fibrosis/tubular atrophy - not due to rejection	1 (1%)	28 (2%)	29 (2%)
		Gradual graft failure - biopsy not performed	3 (2%)	240 (18%)	243 (16%)
		Hyperacute rejection	3 (2%)	-	3 (<1%)
		Vascular	38 (29%)	16 (1%)	54 (4%)
		Technical	14 (11%)	8 (<1%)	22 (1%)
		Glomerular Disease	2 (2%)	81 (6%)	83 (6%)
		Non-compliance	2 (2%)	63 (5%)	65 (4%)
		BK Virus Nephropathy	3 (2%)	28 (2%)	31 (2%)
		Unknown	1 (1%)	61 (5%)	62 (4%)
Other	34 (26%)	191 (14%)	225 (15%)		
Not reported	5 (4%)	102 (8%)	107 (7%)		
Total	132 (100%)	1344 (100%)	1476 (100%)		
New Zealand	Death with function	Cardiovascular	8 (50%)	89 (32%)	97 (33%)
		Withdrawal	-	5 (2%)	5 (2%)
		Cancer	1 (6%)	68 (24%)	69 (23%)
		Infection	5 (31%)	69 (25%)	74 (25%)
		Other	2 (12%)	43 (15%)	45 (15%)
		Not reported	-	5 (2%)	5 (2%)
		Total	16 (100%)	279 (100%)	295 (100%)
	Graft Failure	Acute rejection	2 (7%)	18 (8%)	20 (8%)
		Chronic allograft nephropathy	1 (4%)	52 (24%)	53 (22%)
		Chronic antibody mediated rejection	-	10 (5%)	10 (4%)
		Interstitial fibrosis/tubular atrophy - not due to rejection	-	9 (4%)	9 (4%)
		Gradual graft failure - biopsy not performed	-	51 (23%)	51 (21%)
		Vascular	8 (29%)	-	8 (3%)
		Technical	6 (21%)	1 (<1%)	7 (3%)
		Glomerular Disease	2 (7%)	18 (8%)	20 (8%)
		Non-compliance	-	17 (8%)	17 (7%)
		BK Virus Nephropathy	-	1 (<1%)	1 (<1%)
		Unknown	1 (4%)	-	1 (<1%)
		Other	7 (25%)	21 (10%)	28 (11%)
Not reported	1 (4%)	20 (9%)	21 (9%)		
Total	28 (100%)	218 (100%)	246 (100%)		

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IMMUNOSUPPRESSION

The induction immunosuppression is shown in table 7.14.

Table 7.14
Induction Immunosuppression 2018-2022; Number of Kidney Transplant Recipients Receiving Each Agent by Year (% Total New Transplants)

Country	Type of agent	2018	2019	2020	2021	2022
Australia	Intravenous immunoglobulin	34 (3.0%)	32 (2.9%)	11 (1.2%)	13 (1.5%)	23 (2.5%)
	Anti-CD25	1043 (90.8%)	872 (79.0%)	711 (80.3%)	657 (76.7%)	717 (76.4%)
	Rituximab	2 (0.2%)	6 (0.5%)	4 (0.5%)	4 (0.5%)	9 (1.0%)
	T cell depleting polyclonal Ab	73 (6.4%)	138 (12.5%)	125 (14.1%)	166 (19.4%)	163 (17.4%)
	Other	4 (0.3%)	4 (0.4%)	2 (0.2%)	3 (0.4%)	1 (0.1%)
	Not reported	35 (3.0%)	104 (9.4%)	49 (5.5%)	42 (4.9%)	55 (5.9%)
	Total new transplants	1149	1104	885	857	938
New Zealand	Anti-CD25	182 (100.0%)	217 (98.2%)	185 (98.9%)	186 (99.5%)	172 (98.9%)
	Rituximab	10 (5.5%)	12 (5.4%)	5 (2.7%)	5 (2.7%)	4 (2.3%)
	T cell depleting polyclonal Ab	2 (1.1%)	9 (4.1%)	4 (2.1%)	1 (0.5%)	2 (1.1%)
	Other	1 (0.5%)	-	-	-	-
	Not reported	-	4 (1.8%)	-	-	3 (1.7%)
	Total new transplants	182	221	187	187	174

Immunosuppressive therapy at baseline, 1 and 2 years post-transplant for primary grafts over 2015-2022 is presented for deceased and living donors in tables 7:15 and 7:16, respectively. (AZA azathioprine; CYC cyclosporine; TAC tacrolimus; MMF mycophenolate mofetil; MPA mycophenolic acid; SIR sirolimus; EVE everolimus; PRE prednisolone; NR No immunosuppression data reported)

Table 7.15.1
Immunosuppressive Therapy - Primary Deceased Donor Grafts Australia 2015-2022

Time	Year transplanted	AZA	CYC	TAC	MMF	MPA	SIR	EVE	PRE	NR	Number of deceased donor grafts
Initial treatment	2015	3 (<1%)	5 (1%)	585 (93%)	377 (60%)	209 (33%)	-	9 (1%)	593 (94%)	20 (3%)	630
	2016	-	3 (<1%)	612 (88%)	424 (61%)	201 (29%)	-	2 (<1%)	623 (89%)	67 (10%)	697
	2017	-	2 (<1%)	677 (95%)	485 (68%)	196 (28%)	-	1 (<1%)	679 (96%)	26 (4%)	710
	2018	3 (<1%)	3 (<1%)	758 (94%)	537 (66%)	228 (28%)	1 (<1%)	5 (1%)	773 (96%)	31 (4%)	809
	2019	-	3 (<1%)	746 (96%)	506 (65%)	237 (31%)	1 (<1%)	3 (<1%)	739 (95%)	20 (3%)	774
	2020	1 (<1%)	6 (1%)	612 (96%)	433 (68%)	181 (28%)	1 (<1%)	6 (1%)	606 (95%)	16 (3%)	637
	2021	2 (<1%)	-	545 (97%)	378 (68%)	165 (29%)	-	2 (<1%)	539 (96%)	14 (2%)	560
	2022	2 (<1%)	1 (<1%)	575 (92%)	510 (82%)	63 (10%)	-	3 (<1%)	572 (92%)	45 (7%)	625
Treatment at 1 year	2015	22 (4%)	11 (2%)	502 (86%)	279 (48%)	189 (33%)	2 (<1%)	17 (3%)	517 (89%)	56 (10%)	581
	2016	27 (4%)	20 (3%)	584 (89%)	355 (54%)	209 (32%)	5 (1%)	24 (4%)	607 (93%)	35 (5%)	654
	2017	19 (3%)	11 (2%)	591 (87%)	345 (51%)	209 (31%)	9 (1%)	29 (4%)	618 (91%)	54 (8%)	678
	2018	33 (4%)	11 (1%)	689 (89%)	425 (55%)	212 (27%)	9 (1%)	31 (4%)	705 (91%)	61 (8%)	776
	2019	39 (5%)	13 (2%)	615 (84%)	352 (48%)	197 (27%)	8 (1%)	25 (3%)	635 (87%)	88 (12%)	732
	2020	14 (2%)	16 (3%)	499 (82%)	286 (47%)	177 (29%)	11 (2%)	20 (3%)	511 (84%)	82 (14%)	605
	2021	20 (4%)	8 (2%)	405 (76%)	248 (47%)	112 (21%)	4 (1%)	13 (2%)	410 (77%)	111 (21%)	530
Treatment at 2 years	2015	35 (6%)	15 (3%)	493 (87%)	266 (47%)	185 (33%)	8 (1%)	21 (4%)	504 (89%)	43 (8%)	566
	2016	33 (5%)	17 (3%)	543 (86%)	323 (51%)	186 (29%)	5 (1%)	30 (5%)	563 (89%)	56 (9%)	631
	2017	28 (4%)	14 (2%)	556 (85%)	313 (48%)	197 (30%)	13 (2%)	27 (4%)	588 (90%)	60 (9%)	654
	2018	39 (5%)	11 (1%)	637 (84%)	367 (49%)	205 (27%)	13 (2%)	35 (5%)	653 (86%)	89 (12%)	755
	2019	39 (5%)	17 (2%)	591 (83%)	339 (48%)	199 (28%)	13 (2%)	31 (4%)	615 (86%)	79 (11%)	712
	2020	25 (4%)	20 (3%)	455 (78%)	248 (43%)	143 (25%)	8 (1%)	29 (5%)	471 (81%)	102 (18%)	582

Table 7.15.2

Immunosuppressive Therapy - Primary Deceased Donor Grafts New Zealand 2015-2022

Time	Year transplanted	AZA	CYC	TAC	MMF	MPA	SIR	EVE	PRE	NR	Number of deceased donor grafts
Initial treatment	2015	-	51 (77%)	16 (25%)	64 (98%)	-	-	-	64 (98%)	-	65
	2016	1 (1%)	54 (68%)	22 (28%)	79 (99%)	-	-	-	79 (99%)	1 (1%)	80
	2017	-	81 (72%)	31 (28%)	111 (99%)	-	-	-	111 (99%)	-	112
	2018	-	58 (65%)	31 (35%)	89 (100%)	-	-	-	89 (100%)	-	89
	2019	1 (1%)	66 (57%)	47 (41%)	112 (97%)	-	-	-	113 (98%)	2 (2%)	115
	2020	-	48 (54%)	42 (47%)	88 (99%)	-	-	-	89 (100%)	-	89
	2021	-	44 (46%)	52 (54%)	96 (100%)	-	-	-	96 (100%)	-	96
	2022	-	25 (25%)	74 (74%)	100 (100%)	-	-	-	100 (100%)	-	100
Treatment at 1 year	2015	1 (2%)	27 (41%)	31 (48%)	55 (86%)	-	-	-	60 (94%)	3 (5%)	64
	2016	3 (4%)	38 (51%)	35 (47%)	69 (92%)	1 (1%)	-	-	74 (99%)	-	75
	2017	4 (4%)	41 (38%)	64 (60%)	101 (94%)	-	-	-	105 (98%)	1 (1%)	107
	2018	-	39 (46%)	44 (52%)	81 (96%)	-	-	-	83 (99%)	1 (1%)	84
	2019	1 (1%)	38 (36%)	66 (62%)	98 (92%)	-	1 (1%)	-	105 (98%)	1 (1%)	107
	2020	1 (1%)	24 (28%)	62 (71%)	81 (93%)	-	-	-	86 (99%)	1 (1%)	87
	2021	1 (1%)	26 (29%)	57 (64%)	76 (85%)	-	-	-	83 (93%)	6 (7%)	89
Treatment at 2 years	2015	3 (5%)	24 (40%)	34 (58%)	52 (88%)	-	-	-	59 (100%)	-	59
	2016	5 (7%)	36 (49%)	38 (51%)	66 (89%)	1 (1%)	-	-	74 (100%)	-	74
	2017	6 (6%)	36 (35%)	66 (64%)	95 (92%)	-	-	-	101 (98%)	1 (1%)	103
	2018	1 (1%)	37 (45%)	45 (54%)	79 (95%)	-	-	-	81 (98%)	1 (1%)	83
	2019	2 (2%)	34 (33%)	67 (64%)	89 (86%)	-	1 (1%)	-	100 (96%)	3 (3%)	104
	2020	1 (1%)	22 (27%)	56 (67%)	74 (89%)	-	-	-	76 (92%)	5 (6%)	83

Table 7.16.1
Immunosuppressive Therapy - Primary Living Donor Grafts Australia 2015-2022

Time	Year transplanted	AZA	CYC	TAC	MMF	MPA	SIR	EVE	PRE	NR	Number of living donor grafts
Initial treatment	2015	1 (<1%)	3 (1%)	199 (94%)	122 (58%)	69 (33%)	-	10 (5%)	200 (94%)	6 (3%)	212
	2016	-	6 (3%)	212 (90%)	161 (69%)	54 (23%)	-	-	216 (92%)	16 (7%)	235
	2017	3 (1%)	1 (<1%)	227 (94%)	173 (72%)	53 (22%)	-	-	224 (93%)	13 (5%)	241
	2018	-	2 (1%)	200 (92%)	147 (67%)	54 (25%)	-	1 (<1%)	203 (93%)	13 (6%)	218
	2019	-	-	201 (94%)	142 (67%)	64 (30%)	-	1 (<1%)	207 (97%)	5 (2%)	213
	2020	-	2 (1%)	162 (97%)	118 (71%)	47 (28%)	-	-	162 (97%)	1 (<1%)	167
	2021	-	-	174 (98%)	119 (67%)	54 (31%)	-	1 (<1%)	169 (95%)	2 (1%)	177
	2022	1 (<1%)	1 (<1%)	183 (91%)	149 (74%)	34 (17%)	-	-	181 (90%)	18 (9%)	202
Treatment at 1 year	2015	6 (3%)	3 (1%)	179 (87%)	95 (46%)	66 (32%)	2 (1%)	7 (3%)	175 (85%)	22 (11%)	206
	2016	10 (4%)	9 (4%)	206 (88%)	142 (60%)	56 (24%)	3 (1%)	-	209 (89%)	19 (8%)	235
	2017	12 (5%)	7 (3%)	196 (84%)	138 (59%)	50 (21%)	3 (1%)	9 (4%)	206 (88%)	24 (10%)	234
	2018	11 (5%)	5 (2%)	177 (83%)	114 (54%)	53 (25%)	1 (<1%)	9 (4%)	187 (88%)	23 (11%)	212
	2019	3 (1%)	2 (1%)	185 (88%)	114 (54%)	57 (27%)	1 (<1%)	6 (3%)	185 (88%)	21 (10%)	211
	2020	6 (4%)	3 (2%)	139 (84%)	85 (52%)	42 (25%)	-	8 (5%)	143 (87%)	20 (12%)	165
	2021	9 (5%)	3 (2%)	150 (85%)	83 (47%)	46 (26%)	1 (<1%)	6 (3%)	148 (84%)	23 (13%)	176
Treatment at 2 years	2015	6 (3%)	5 (2%)	173 (85%)	94 (46%)	68 (33%)	5 (2%)	10 (5%)	173 (85%)	20 (10%)	203
	2016	14 (6%)	8 (4%)	191 (84%)	130 (57%)	47 (21%)	3 (1%)	4 (2%)	197 (86%)	26 (11%)	228
	2017	20 (9%)	8 (3%)	191 (82%)	133 (57%)	50 (22%)	2 (1%)	9 (4%)	201 (87%)	24 (10%)	232
	2018	12 (6%)	3 (1%)	180 (85%)	110 (52%)	49 (23%)	2 (1%)	9 (4%)	185 (87%)	26 (12%)	212
	2019	5 (2%)	3 (1%)	170 (81%)	98 (46%)	53 (25%)	3 (1%)	9 (4%)	167 (79%)	36 (17%)	211
	2020	9 (6%)	4 (2%)	128 (80%)	77 (48%)	36 (22%)	-	9 (6%)	133 (83%)	26 (16%)	161

Table 7.16.2
Immunosuppressive Therapy - Primary Living Donor Grafts New Zealand 2015-2022

Time	Year transplanted	AZA	CYC	TAC	MMF	MPA	SIR	EVE	PRE	NR	Number of living donor grafts
Initial treatment	2015	1 (1%)	41 (60%)	27 (40%)	67 (99%)	-	1 (1%)	-	67 (99%)	-	68
	2016	-	47 (63%)	27 (36%)	74 (99%)	-	-	-	74 (99%)	1 (1%)	75
	2017	3 (5%)	27 (44%)	35 (56%)	58 (94%)	1 (2%)	-	-	62 (100%)	-	62
	2018	1 (1%)	44 (54%)	37 (46%)	79 (98%)	1 (1%)	-	-	81 (100%)	-	81
	2019	-	25 (31%)	56 (69%)	81 (100%)	-	-	-	81 (100%)	-	81
	2020	1 (1%)	42 (52%)	37 (46%)	79 (99%)	-	-	-	80 (100%)	-	80
	2021	-	29 (38%)	48 (62%)	76 (99%)	1 (1%)	-	-	77 (100%)	-	77
	2022	-	16 (25%)	49 (75%)	64 (98%)	-	-	-	64 (98%)	1 (2%)	65
Treatment at 1 year	2015	2 (3%)	29 (43%)	34 (51%)	61 (91%)	-	1 (1%)	-	63 (94%)	3 (4%)	67
	2016	1 (1%)	33 (45%)	39 (53%)	71 (97%)	-	-	-	72 (99%)	-	73
	2017	4 (7%)	15 (26%)	42 (72%)	52 (90%)	-	-	-	58 (100%)	-	58
	2018	1 (1%)	28 (35%)	49 (61%)	72 (90%)	-	2 (2%)	-	78 (98%)	1 (1%)	80
	2019	2 (2%)	17 (21%)	61 (76%)	73 (91%)	-	-	-	78 (98%)	1 (1%)	80
	2020	4 (5%)	29 (39%)	43 (57%)	70 (93%)	-	-	-	74 (99%)	-	75
	2021	5 (7%)	20 (26%)	55 (72%)	68 (89%)	1 (1%)	-	-	75 (99%)	1 (1%)	76
Treatment at 2 years	2015	4 (6%)	28 (42%)	37 (56%)	60 (91%)	-	-	-	65 (98%)	1 (2%)	66
	2016	3 (4%)	32 (44%)	39 (54%)	67 (93%)	-	-	-	71 (99%)	-	72
	2017	10 (17%)	16 (28%)	42 (72%)	46 (79%)	-	-	-	58 (100%)	-	58
	2018	6 (8%)	26 (33%)	50 (63%)	65 (82%)	-	1 (1%)	-	76 (96%)	1 (1%)	79
	2019	5 (6%)	15 (19%)	62 (78%)	67 (85%)	-	-	-	75 (95%)	2 (3%)	79
	2020	6 (8%)	28 (38%)	43 (59%)	65 (89%)	-	-	-	72 (99%)	-	73

DELAYED GRAFT FUNCTION

The proportion of patients experiencing delayed graft function (requiring dialysis within 7 days of transplant), stratified by donor type, is presented in table 7.17.

Table 7.17
Delayed Graft Function by Donor Type 2018-2022

Country	Donor Type	2018	2019	2020	2021	2022
Australia	Living donor	4.7%	4.4%	3.4%	3.0%	4.0%
	Deceased donor	33.3%	34.1%	30.1%	28.5%	33.0%
	DBD	25.0%	22.9%	21.4%	22.7%	25.0%
	DCD	54.4%	59.6%	51.0%	44.0%	56.7%
New Zealand	Living donor	1.2%	3.3%	3.4%	2.4%	0.0%
	Deceased donor	21.4%	28.7%	22.0%	17.6%	22.1%
	DBD	16.9%	27.0%	18.4%	16.7%	20.2%
	DCD	46.7%	38.9%	46.2%	33.3%	33.3%

REJECTION

The proportion of patients experiencing a rejection episode within 6 months post-transplant, stratified by donor type and graft number, is presented in table 7.18. Antibody-mediated rejection rates are presented in table 7.19. The years shown are the year that the transplants were performed. Variability is noted year on year and with a small number of reported episodes some years, these tables represent the Australia and Aotearoa New Zealand cohort combined.

Table 7.18
Rejection Rates at Six Months Post-Transplant 2012-2021

Donor Type	Graft Number	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Living donor	First	14.1%	19.1%	22.4%	17.1%	17.4%	19.1%	14.7%	10.2%	11.7%	10.2%
	Second and subsequent	10.0%	16.1%	28.6%	11.1%	16.7%	21.6%	13.0%	14.3%	19.0%	15.2%
Deceased donor	First	16.8%	18.5%	19.8%	17.7%	15.3%	18.5%	14.7%	13.2%	14.9%	11.7%
	Second and subsequent	24.4%	25.0%	25.9%	24.7%	18.6%	20.1%	22.5%	15.0%	11.5%	25.7%

Table 7.19
Antibody-Mediated Rejection Rates at Six Months Post-Transplant 2012-2021

Donor Type	Graft Number	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Living donor	First	2.3%	5.3%	4.6%	3.9%	3.9%	4.0%	5.0%	1.0%	2.0%	1.6%
	Second and subsequent	6.7%	3.2%	5.7%	5.6%	2.8%	8.1%	0.0%	14.3%	9.5%	0.0%
Deceased donor	First	3.9%	5.0%	5.1%	6.0%	5.8%	4.6%	2.7%	2.9%	4.0%	3.7%
	Second and subsequent	10.3%	10.3%	12.9%	17.6%	8.6%	9.7%	11.7%	7.5%	5.1%	10.9%

Table 7.20 shows the number of people who received antibody agents for treating acute rejection by calendar year. The percentage shown represents the number of rejection episodes treated with antibodies divided by the number of new transplant recipients in each calendar year, but readers should be aware that although the 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 at risk during the year is also reported.

Table 7.20
Antibody Therapy for Acute Rejection 2018-2022

Country	Type of agent	2018	2019	2020	2021	2022
Australia	Intravenous immunoglobulin	86 (7.5%)	63 (5.7%)	79 (8.9%)	57 (6.7%)	61 (6.5%)
	Anti-CD25	-	1 (0.1%)	-	-	-
	Rituximab	15 (1.3%)	9 (0.8%)	4 (0.5%)	5 (0.6%)	3 (0.3%)
	T cell depleting polyclonal Ab	30 (2.6%)	32 (2.9%)	45 (5.1%)	48 (5.6%)	26 (2.8%)
	Not specified	42 (3.7%)	18 (1.6%)	24 (2.7%)	16 (1.9%)	10 (1.1%)
	Total new transplants	1149	1104	885	857	938
	Total transplants at risk	12763	13283	13617	13920	14231
New Zealand	Intravenous immunoglobulin	4 (2.2%)	-	4 (2.1%)	9 (4.8%)	4 (2.3%)
	Rituximab	-	-	1 (0.5%)	3 (1.6%)	1 (0.6%)
	T cell depleting polyclonal Ab	13 (7.1%)	16 (7.2%)	16 (8.6%)	14 (7.5%)	15 (8.6%)
	Not specified	2 (1.1%)	2 (0.9%)	1 (0.5%)	3 (1.6%)	2 (1.1%)
	Total new transplants	182	221	187	187	174
	Total transplants at risk	2078	2203	2284	2378	2452

PATIENT AND GRAFT SURVIVAL

The remainder of the chapter presents patient and graft survival by transplant era and by 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 7.15
Primary Deceased Donor Grafts - Patient Survival - Australia

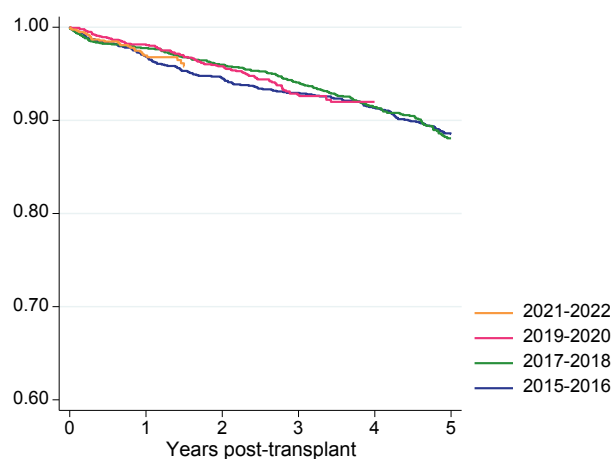


Figure 7.16
Primary Deceased Donor Grafts - Graft Survival - Australia

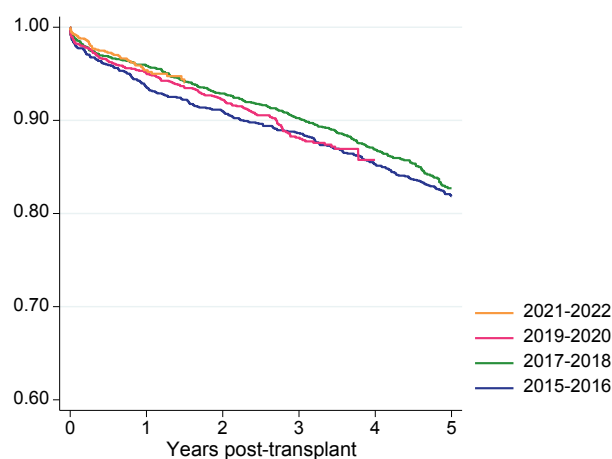


Table 7.21
Primary Deceased Donor Grafts - Australia 2015-2022; % [95% Confidence Interval]

Outcome	Era	1 month	6 months	1 year	5 years
Patient survival	2015-2016 (n=1327)	100 [99, 100]	98 [97, 99]	97 [96, 98]	89 [87, 90]
	2017-2018 (n=1519)	99 [99, 100]	98 [97, 99]	98 [97, 98]	88 [86, 90]
	2019-2020 (n=1411)	100 [99, 100]	99 [98, 99]	98 [97, 99]	-
	2021-2022 (n=1185)	100 [99, 100]	98 [98, 99]	97 [96, 98]	-
Graft survival	2015-2016 (n=1327)	98 [97, 99]	96 [95, 97]	94 [92, 95]	82 [80, 84]
	2017-2018 (n=1519)	99 [98, 99]	97 [96, 98]	96 [95, 97]	83 [81, 85]
	2019-2020 (n=1411)	98 [97, 99]	96 [95, 97]	95 [94, 96]	-
	2021-2022 (n=1185)	99 [98, 100]	97 [96, 98]	95 [94, 97]	-

Figure 7.17
Primary Deceased Donor Grafts -
Patient Survival - New Zealand

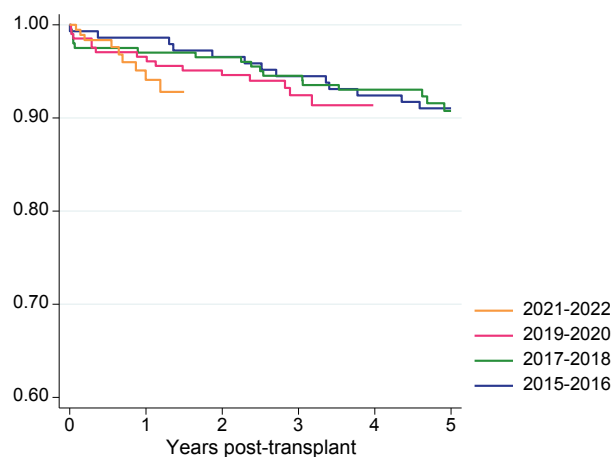


Figure 7.18
Primary Deceased Donor Grafts -
Graft Survival - New Zealand

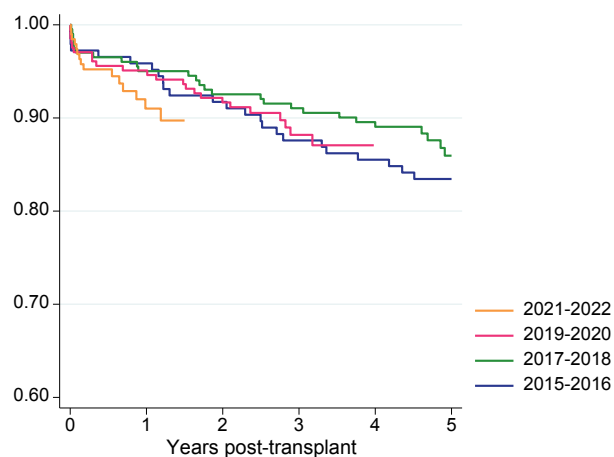


Table 7.22
Primary Deceased Donor Grafts - New Zealand 2015-2022; % [95% Confidence Interval]

Outcome	Era	1 month	6 months	1 year	5 years
Patient survival	2015-2016 (n=145)	99 [95, 100]	99 [95, 100]	99 [95, 100]	91 [85, 95]
	2017-2018 (n=201)	98 [94, 99]	98 [94, 99]	97 [93, 99]	91 [85, 94]
	2019-2020 (n=204)	99 [96, 100]	97 [94, 99]	97 [93, 98]	-
	2021-2022 (n=196)	99 [96, 100]	98 [95, 99]	94 [88, 97]	-
Graft survival	2015-2016 (n=145)	97 [93, 99]	97 [92, 99]	96 [91, 98]	83 [76, 89]
	2017-2018 (n=201)	97 [93, 99]	97 [93, 98]	95 [91, 97]	86 [80, 90]
	2019-2020 (n=204)	97 [94, 99]	96 [92, 98]	95 [91, 97]	-
	2021-2022 (n=196)	97 [94, 99]	95 [91, 97]	91 [85, 95]	-

Figure 7.19
Primary Deceased Donor Grafts - Patient Survival - Australia and New Zealand

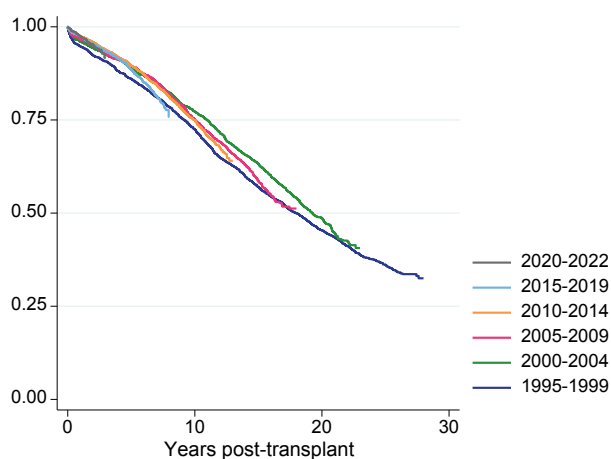


Figure 7.20
Primary Deceased Donor Grafts - Graft Survival - Australia and New Zealand

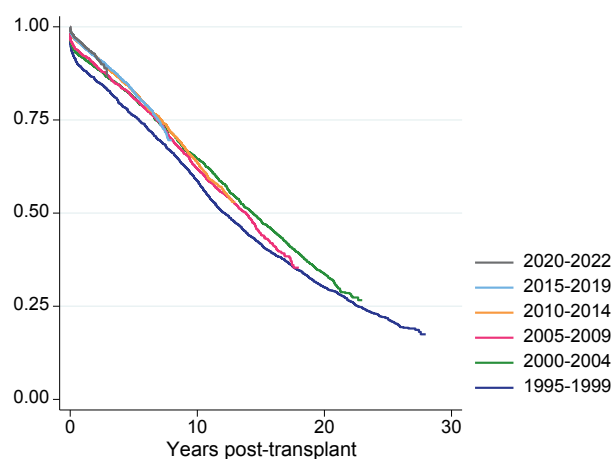


Table 7.23
Primary Deceased Donor Grafts - Australia and New Zealand 1995-2022; % [95% Confidence Interval]

Outcome	Era	1 year	5 years	10 years	15 years	20 years
Patient survival	1995-1999 (n=1779)	95 [94, 96]	86 [84, 88]	72 [70, 74]	57 [55, 59]	45 [43, 48]
	2000-2004 (n=1849)	96 [95, 97]	89 [88, 90]	77 [75, 79]	63 [61, 65]	49 [46, 51]
	2005-2009 (n=1911)	97 [96, 97]	90 [88, 91]	75 [73, 77]	59 [56, 61]	-
	2010-2014 (n=2923)	98 [97, 98]	90 [88, 91]	75 [73, 76]	-	-
	2015-2019 (n=4081)	97 [97, 98]	89 [87, 90]	-	-	-
	2020-2022 (n=2107)	97 [97, 98]	-	-	-	-
Graft survival	1995-1999 (n=1779)	89 [87, 90]	76 [74, 78]	59 [56, 61]	42 [39, 44]	30 [28, 32]
	2000-2004 (n=1849)	92 [90, 93]	81 [79, 83]	65 [62, 67]	48 [46, 50]	34 [31, 36]
	2005-2009 (n=1911)	92 [91, 93]	81 [79, 83]	62 [60, 64]	44 [42, 47]	-
	2010-2014 (n=2923)	95 [94, 96]	83 [81, 84]	64 [62, 65]	-	-
	2015-2019 (n=4081)	95 [94, 95]	83 [81, 84]	-	-	-
	2020-2022 (n=2107)	95 [94, 96]	-	-	-	-

Figure 7.21
Second and Subsequent Deceased Donor Grafts -
Patient Survival - Australia and New Zealand

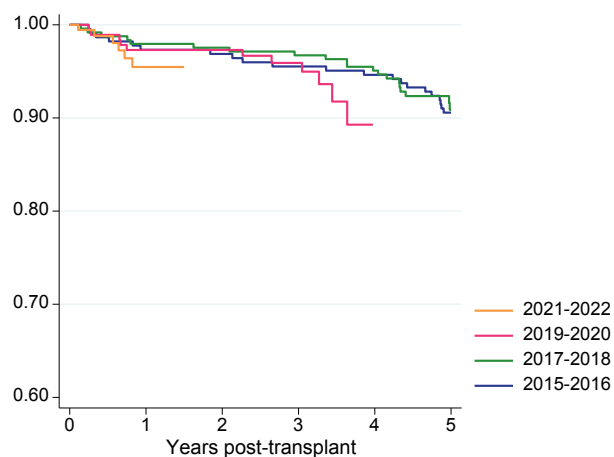


Figure 7.22
Second and Subsequent Deceased Donor Grafts -
Graft Survival - Australia and New Zealand

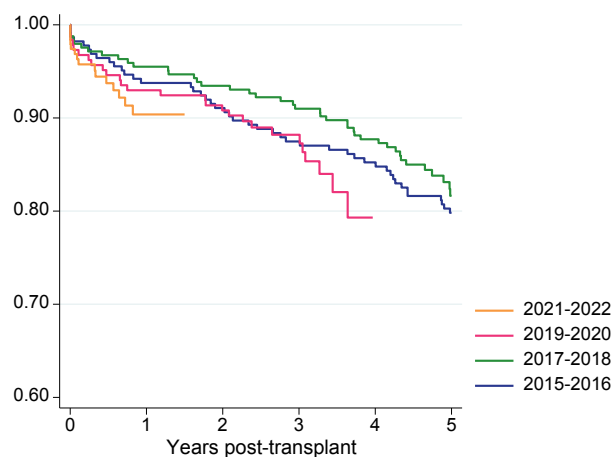


Table 7.24
Second and Subsequent Deceased Donor Grafts - Australia and New Zealand 2015-2022;
% [95% Confidence Interval]

Outcome	Era	1 month	6 months	1 year	5 years
Patient survival	2015-2016 (n=225)	100	99 [96, 100]	97 [94, 99]	91 [86, 94]
	2017-2018 (n=245)	100	99 [96, 100]	98 [95, 99]	91 [86, 94]
	2019-2020 (n=185)	100	99 [96, 100]	97 [94, 99]	-
	2021-2022 (n=193)	100	99 [95, 100]	95 [90, 98]	-
Graft survival	2015-2016 (n=225)	98 [95, 99]	96 [93, 98]	94 [90, 96]	80 [74, 85]
	2017-2018 (n=245)	98 [95, 99]	97 [94, 98]	96 [92, 97]	82 [76, 86]
	2019-2020 (n=185)	97 [94, 99]	95 [90, 97]	93 [88, 96]	-
	2021-2022 (n=193)	97 [93, 99]	94 [89, 96]	90 [84, 94]	-

Figure 7.23
Second and Subsequent Deceased Donor Grafts - Patient Survival - Australia and New Zealand

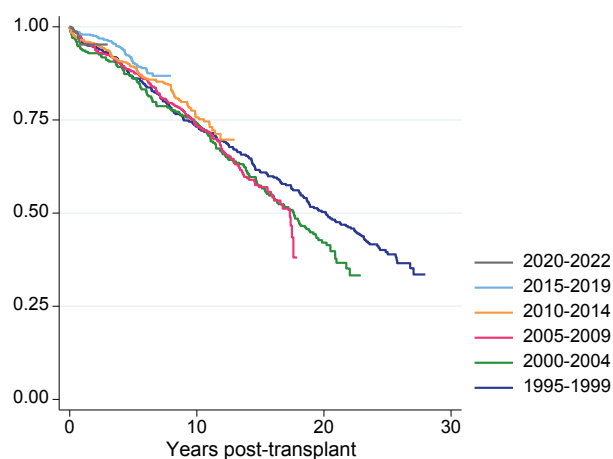


Figure 7.24
Second and Subsequent Deceased Donor Grafts - Graft Survival - Australia and New Zealand

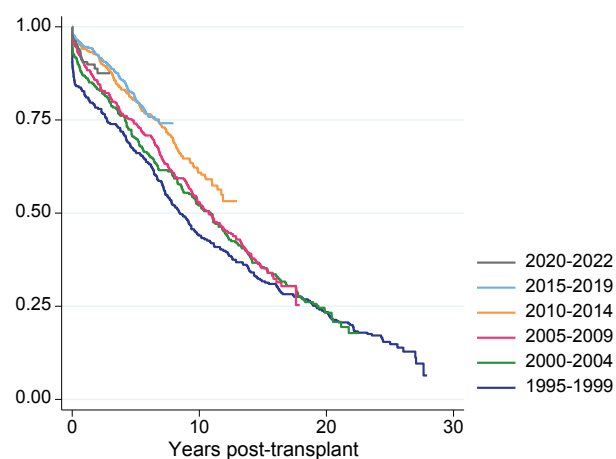


Table 7.25
Second and Subsequent Deceased Donor Grafts - Australia and New Zealand 1995-2022;
% [95% Confidence Interval]

Outcome	Era	1 year	5 years	10 years	15 years	20 years
Patient survival	1995-1999 (n=295)	96 [93, 98]	86 [82, 90]	73 [68, 78]	61 [55, 66]	50 [44, 56]
	2000-2004 (n=268)	94 [90, 96]	86 [81, 90]	74 [68, 79]	57 [51, 63]	42 [36, 48]
	2005-2009 (n=343)	96 [94, 98]	88 [84, 91]	74 [69, 78]	57 [51, 62]	-
	2010-2014 (n=370)	96 [94, 98]	89 [86, 92]	76 [71, 80]	-	-
	2015-2019 (n=577)	98 [96, 99]	90 [87, 93]	-	-	-
	2020-2022 (n=271)	95 [91, 97]	-	-	-	-
Graft survival	1995-1999 (n=295)	82 [77, 86]	66 [61, 72]	44 [38, 50]	32 [26, 37]	23 [19, 28]
	2000-2004 (n=268)	87 [82, 90]	70 [64, 75]	52 [46, 58]	36 [30, 41]	23 [18, 29]
	2005-2009 (n=343)	90 [86, 92]	74 [69, 78]	53 [47, 58]	35 [30, 41]	-
	2010-2014 (n=370)	94 [91, 96]	80 [76, 84]	61 [55, 66]	-	-
	2015-2019 (n=577)	95 [92, 96]	80 [76, 83]	-	-	-
	2020-2022 (n=271)	91 [86, 94]	-	-	-	-

Figure 7.25
Primary Living Donor Grafts - Patient Survival - Australia

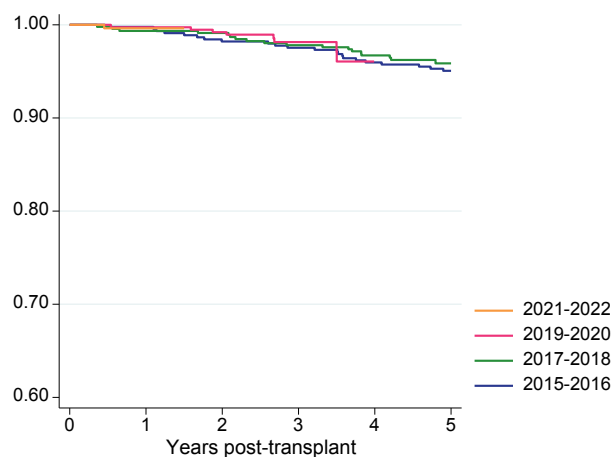


Figure 7.26
Primary Living Donor Grafts - Graft Survival - Australia

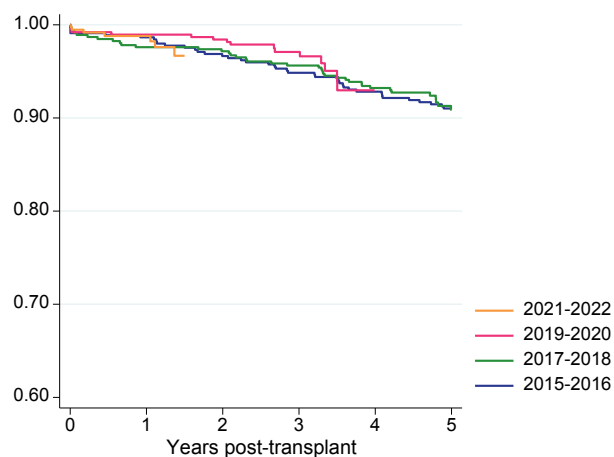


Table 7.26
Primary Living Donor Grafts - Australia 2015-2022; % [95% Confidence Interval]

Outcome	Era	1 month	6 months	1 year	5 years
Patient survival	2015-2016 (n=447)	100	100 [98, 100]	100 [98, 100]	95 [93, 97]
	2017-2018 (n=459)	100	100 [98, 100]	99 [98, 100]	96 [93, 97]
	2019-2020 (n=380)	100	100	100 [98, 100]	-
	2021-2022 (n=379)	100	100 [97, 100]	100 [97, 100]	-
Graft survival	2015-2016 (n=447)	99 [98, 100]	99 [97, 100]	99 [97, 99]	91 [88, 93]
	2017-2018 (n=459)	99 [98, 100]	98 [97, 99]	98 [96, 99]	91 [88, 93]
	2019-2020 (n=380)	99 [98, 100]	99 [98, 100]	99 [97, 100]	-
	2021-2022 (n=379)	99 [98, 100]	99 [97, 100]	99 [97, 100]	-

Figure 7.27
Primary Living Donor Grafts - Patient Survival -
New Zealand

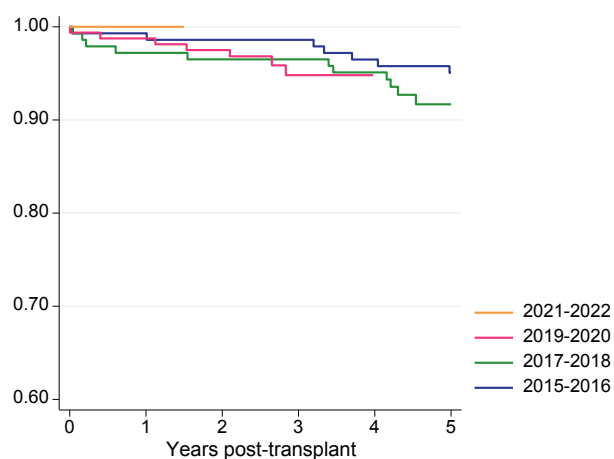


Figure 7.28
Primary Living Donor Grafts - Graft Survival -
New Zealand

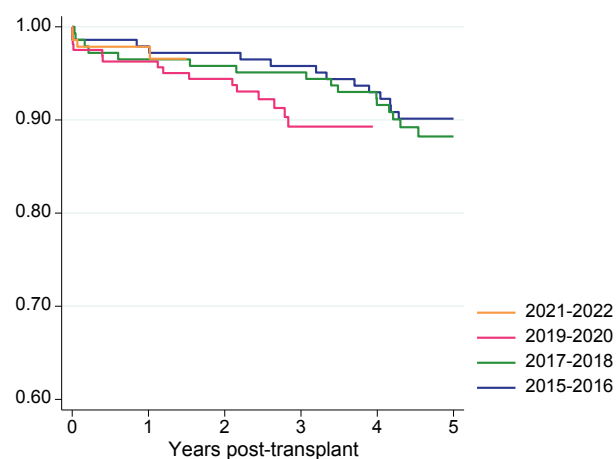


Table 7.27
Primary Living Donor Grafts - New Zealand 2015-2022; % [95% Confidence Interval]

Outcome	Era	1 month	6 months	1 year	5 years
Patient survival	2015-2016 (n=143)	99 [95, 100]	99 [95, 100]	99 [95, 100]	95 [90, 98]
	2017-2018 (n=143)	99 [95, 100]	98 [94, 99]	97 [93, 99]	92 [85, 95]
	2019-2020 (n=161)	99 [96, 100]	99 [95, 100]	99 [95, 100]	-
	2021-2022 (n=142)	100	100	100	-
Graft survival	2015-2016 (n=143)	99 [95, 100]	99 [95, 100]	98 [94, 99]	90 [84, 94]
	2017-2018 (n=143)	99 [95, 100]	97 [93, 99]	97 [92, 99]	88 [81, 93]
	2019-2020 (n=161)	98 [94, 99]	96 [92, 98]	96 [92, 98]	-
	2021-2022 (n=142)	98 [94, 99]	98 [94, 99]	98 [94, 99]	-

Figure 7.29
Primary Living Donor Grafts - Patient Survival -
Australia and New Zealand

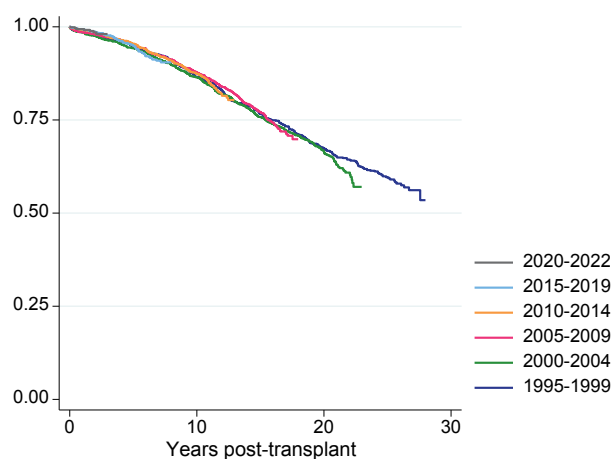


Figure 7.30
Primary Living Donor Grafts - Graft Survival -
Australia and New Zealand

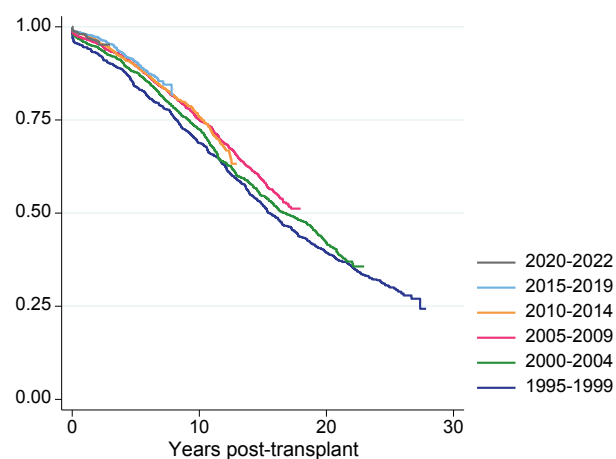


Table 7.28
Primary Living Donor Grafts - Australia and New Zealand 1995-2022; % [95% Confidence Interval]

Outcome	Era	1 year	5 years	10 years	15 years	20 years
Patient survival	1995-1999 (n=767)	99 [97, 99]	95 [93, 96]	87 [84, 89]	77 [73, 80]	67 [64, 71]
	2000-2004 (n=1194)	98 [98, 99]	94 [93, 95]	86 [84, 88]	76 [73, 78]	66 [64, 69]
	2005-2009 (n=1586)	99 [98, 99]	95 [94, 96]	88 [86, 89]	77 [75, 79]	-
	2010-2014 (n=1458)	99 [98, 99]	95 [94, 96]	87 [85, 89]	-	-
	2015-2019 (n=1486)	99 [99, 100]	95 [94, 96]	-	-	-
	2020-2022 (n=768)	99 [98, 100]	-	-	-	-
Graft survival	1995-1999 (n=767)	95 [93, 96]	84 [81, 86]	69 [65, 72]	52 [49, 56]	39 [36, 43]
	2000-2004 (n=1194)	96 [95, 97]	88 [86, 90]	72 [70, 75]	55 [52, 57]	42 [39, 45]
	2005-2009 (n=1586)	97 [96, 97]	90 [88, 91]	75 [73, 77]	59 [56, 61]	-
	2010-2014 (n=1458)	98 [97, 98]	90 [88, 91]	76 [73, 78]	-	-
	2015-2019 (n=1486)	98 [97, 99]	91 [89, 92]	-	-	-
	2020-2022 (n=768)	98 [97, 99]	-	-	-	-

Figure 7.31
Second and Subsequent Living Donor Grafts -
Patient Survival - Australia and New Zealand

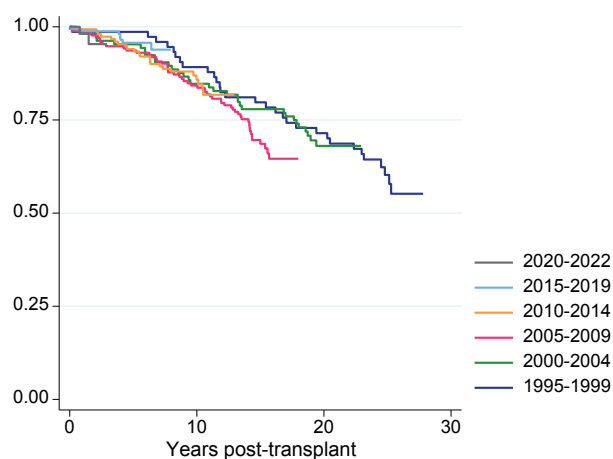


Figure 7.32
Second and Subsequent Living Donor Grafts -
Graft Survival - Australia and New Zealand

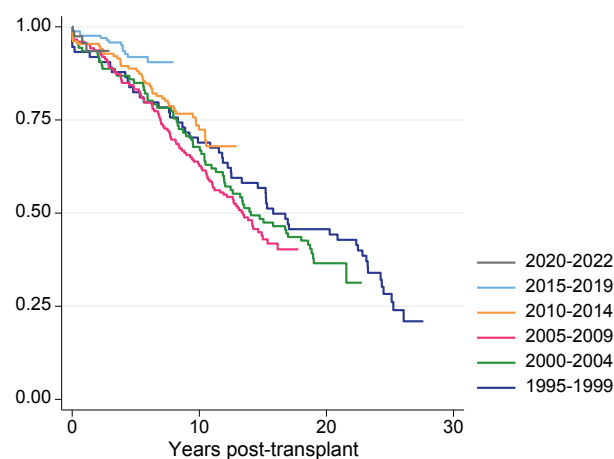


Table 7.29
Second and Subsequent Living Donor Grafts - Australia and New Zealand 1995-2022; % [95% Confidence Interval]

Outcome	Era	1 year	5 years	10 years	15 years	20 years
Patient survival	1995-1999 (n=74)	99 [91, 100]	99 [91, 100]	89 [80, 94]	80 [69, 87]	71 [60, 80]
	2000-2004 (n=107)	98 [93, 100]	95 [89, 98]	85 [76, 90]	78 [69, 85]	68 [58, 76]
	2005-2009 (n=175)	98 [95, 99]	94 [89, 96]	84 [78, 89]	69 [61, 75]	-
	2010-2014 (n=153)	99 [95, 100]	94 [89, 97]	86 [79, 91]	-	-
	2015-2019 (n=167)	99 [95, 100]	96 [91, 98]	-	-	-
	2020-2022 (n=82)	98 [88, 100]	-	-	-	-
Graft survival	1995-1999 (n=74)	93 [85, 97]	82 [72, 89]	69 [57, 78]	57 [45, 67]	46 [34, 57]
	2000-2004 (n=107)	93 [87, 97]	85 [77, 90]	68 [58, 76]	48 [39, 58]	37 [27, 46]
	2005-2009 (n=175)	95 [91, 98]	83 [77, 88]	63 [55, 69]	43 [35, 51]	-
	2010-2014 (n=153)	95 [91, 98]	89 [83, 93]	72 [64, 79]	-	-
	2015-2019 (n=167)	98 [94, 99]	92 [86, 95]	-	-	-
	2020-2022 (n=82)	96 [87, 99]	-	-	-	-

The following figures show patient and graft survival for primary transplants by recipient age. Note that in the survival graphs the y axis ranges from 0.40 to 1.00 in order to show the differences between the age groups more clearly.

Figure 7.33
Primary Deceased Donor Grafts - Patient Survival by Age - Australia 2008-2022

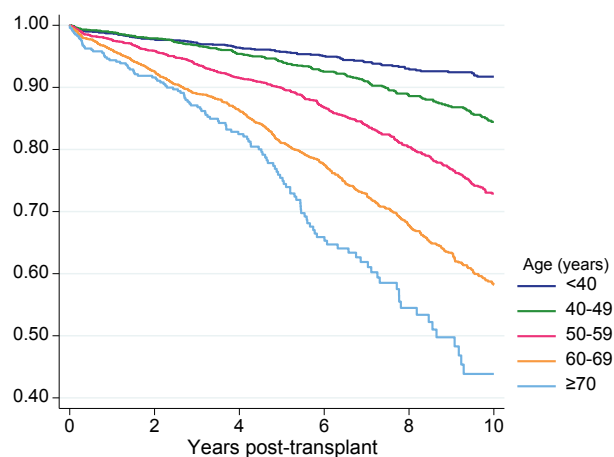


Figure 7.34
Primary Deceased Donor Grafts - Graft Survival by Age - Australia 2008-2022

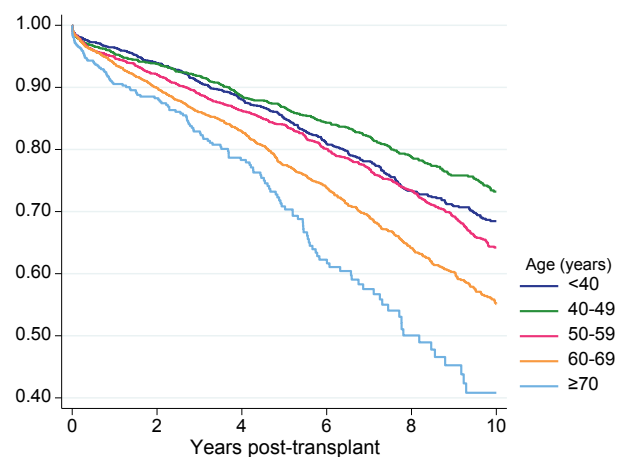


Table 7.30
Primary Deceased Donor Grafts - Australia 2008-2022; % [95% Confidence Interval]

Outcome	Age (years)	1 month	6 months	1 year	5 years	10 years
Patient survival	<40 (n=1822)	100 [99, 100]	99 [98, 99]	99 [98, 99]	96 [95, 97]	92 [90, 93]
	40-49 (n=1767)	100 [100, 100]	99 [99, 100]	99 [98, 99]	94 [93, 95]	84 [82, 87]
	50-49 (n=2463)	100 [99, 100]	98 [98, 99]	98 [97, 98]	90 [89, 91]	73 [70, 75]
	60-69 (n=2352)	99 [99, 100]	98 [97, 98]	96 [95, 97]	81 [79, 83]	58 [55, 61]
	≥70 (n=462)	99 [97, 100]	96 [94, 98]	94 [92, 96]	75 [70, 80]	44 [35, 53]
Graft survival	<40 (n=1822)	98 [98, 99]	97 [96, 98]	96 [95, 97]	85 [83, 87]	68 [65, 71]
	40-49 (n=1767)	98 [98, 99]	97 [96, 97]	95 [94, 96]	87 [85, 88]	73 [70, 76]
	50-49 (n=2463)	98 [98, 99]	96 [95, 97]	95 [94, 96]	84 [82, 86]	64 [61, 67]
	60-69 (n=2352)	98 [98, 99]	96 [95, 97]	94 [93, 95]	77 [76, 79]	55 [52, 58]
	≥70 (n=462)	97 [95, 98]	94 [91, 96]	91 [87, 93]	71 [65, 76]	41 [32, 49]

Figure 7.35
Primary Deceased Donor Grafts - Patient Survival
by Age - New Zealand 2008-2022

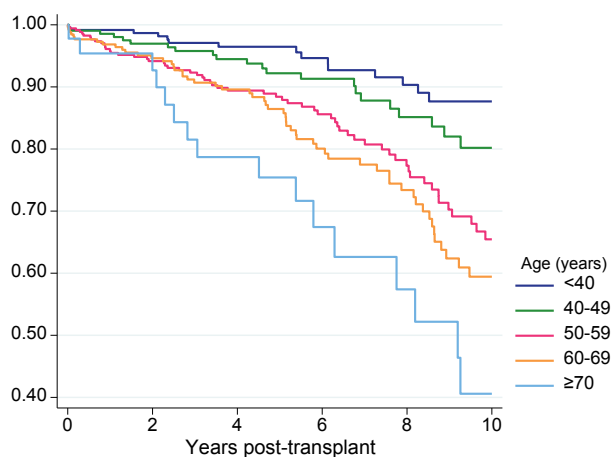


Figure 7.36
Primary Deceased Donor Grafts - Graft Survival
by Age - New Zealand 2008-2022

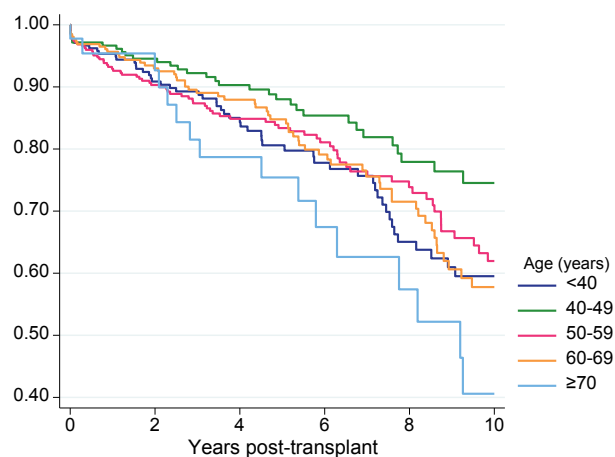


Table 7.31
Primary Deceased Donor Grafts - New Zealand 2008-2022; % [95% Confidence Interval]

Outcome	Age (years)	1 month	6 months	1 year	5 years	10 years
Patient survival	<40 (n=241)	99 [97, 100]	99 [97, 100]	99 [97, 100]	96 [93, 98]	88 [80, 93]
	40-49 (n=211)	99 [96, 100]	99 [96, 100]	99 [96, 100]	92 [87, 95]	80 [70, 87]
	50-49 (n=351)	99 [98, 100]	98 [96, 99]	96 [93, 97]	88 [84, 92]	65 [56, 73]
	60-69 (n=259)	98 [96, 99]	98 [95, 99]	97 [94, 98]	86 [81, 91]	59 [49, 68]
	≥70 (n=45)	98 [85, 100]	95 [83, 99]	95 [83, 99]	75 [58, 86]	41 [20, 60]
Graft survival	<40 (n=241)	98 [95, 99]	96 [93, 98]	95 [92, 97]	81 [74, 86]	60 [49, 68]
	40-49 (n=211)	97 [94, 99]	97 [94, 99]	97 [93, 98]	88 [82, 92]	75 [65, 82]
	50-49 (n=351)	97 [95, 99]	96 [93, 98]	93 [90, 95]	83 [78, 87]	62 [53, 70]
	60-69 (n=259)	98 [95, 99]	97 [94, 98]	96 [92, 98]	85 [79, 89]	58 [48, 67]
	≥70 (n=45)	98 [85, 100]	95 [83, 99]	95 [83, 99]	75 [58, 86]	41 [20, 60]

Figure 7.37
Primary Living Donor Grafts - Patient Survival by Age - Australia 2008-2022

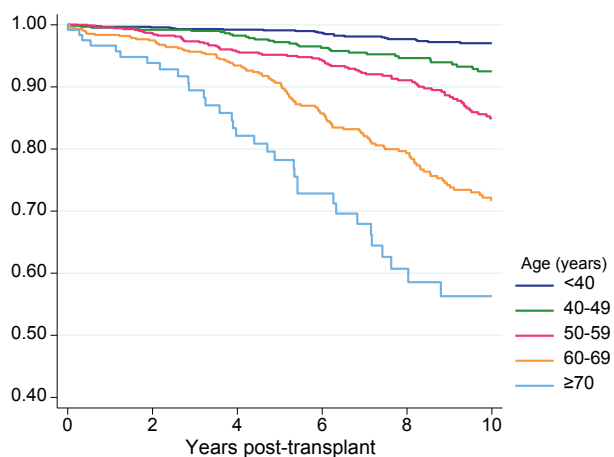


Figure 7.38
Primary Living Donor Grafts - Graft Survival by Age - Australia 2008-2022

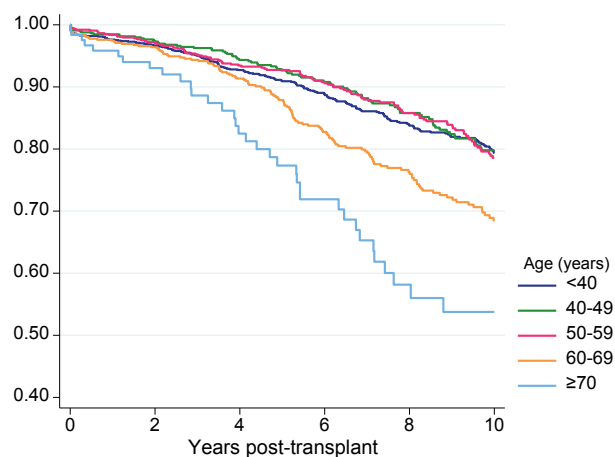


Table 7.32
Primary Living Donor Grafts - Australia 2008-2022; % [95% Confidence Interval]

Outcome	Age (years)	1 month	6 months	1 year	5 years	10 years
Patient survival	<40 (n=1281)	100	100 [99, 100]	100 [99, 100]	99 [98, 100]	97 [96, 98]
	40-49 (n=661)	100 [99, 100]	100 [99, 100]	100 [99, 100]	97 [95, 98]	93 [89, 95]
	50-49 (n=759)	100	100 [99, 100]	100 [99, 100]	95 [93, 97]	85 [81, 88]
	60-69 (n=631)	100 [99, 100]	99 [97, 99]	98 [97, 99]	91 [88, 93]	72 [67, 76]
	≥70 (n=123)	99 [94, 100]	98 [92, 99]	97 [91, 99]	78 [68, 85]	56 [43, 67]
Graft survival	<40 (n=1281)	99 [98, 99]	98 [97, 99]	98 [97, 98]	91 [89, 92]	79 [76, 82]
	40-49 (n=661)	99 [98, 100]	99 [97, 99]	98 [97, 99]	93 [90, 95]	80 [75, 84]
	50-49 (n=759)	99 [99, 100]	99 [98, 100]	98 [97, 99]	93 [90, 94]	79 [74, 82]
	60-69 (n=631)	99 [97, 99]	98 [96, 99]	97 [96, 98]	88 [85, 90]	68 [63, 73]
	≥70 (n=123)	98 [94, 100]	97 [91, 99]	96 [90, 98]	77 [67, 85]	54 [41, 65]

Figure 7.39
Primary Living Donor Grafts - Patient Survival by Age - New Zealand 2008-2022

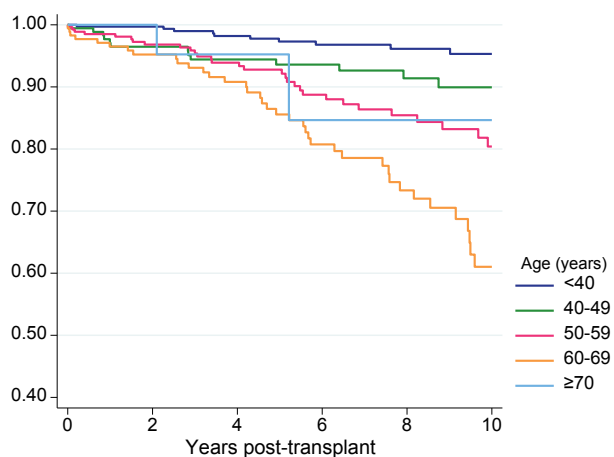


Figure 7.40
Primary Living Donor Grafts - Graft Survival by Age - New Zealand 2008-2022

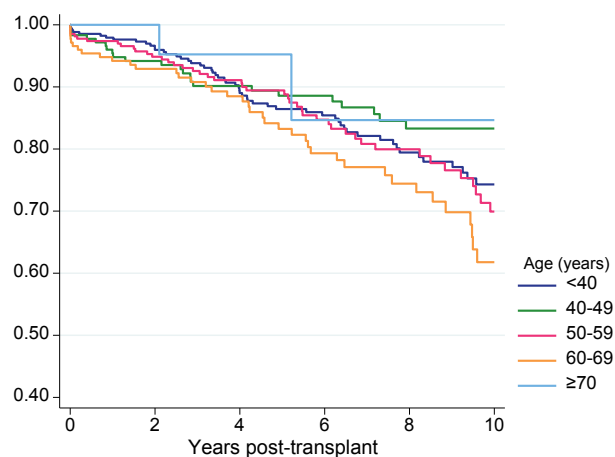


Table 7.33
Primary Living Donor Grafts - New Zealand 2008-2022; % [95% Confidence Interval]

Outcome	Age (years)	1 month	6 months	1 year	5 years	10 years
Patient survival	<40 (n=345)	100	100 [98, 100]	100 [98, 100]	97 [94, 99]	95 [91, 98]
	40-49 (n=179)	99 [96, 100]	99 [96, 100]	97 [93, 99]	94 [88, 97]	90 [83, 94]
	50-49 (n=269)	100 [97, 100]	99 [96, 99]	99 [96, 99]	93 [88, 96]	80 [72, 86]
	60-69 (n=175)	98 [95, 99]	98 [94, 99]	96 [92, 98]	86 [78, 91]	61 [49, 71]
	≥70 (n=30)	100	100	100	95 [71, 99]	85 [47, 96]
Graft survival	<40 (n=345)	99 [97, 100]	99 [97, 99]	98 [96, 99]	86 [82, 90]	74 [67, 80]
	40-49 (n=179)	98 [95, 99]	98 [94, 99]	95 [91, 98]	89 [82, 93]	83 [76, 89]
	50-49 (n=269)	99 [96, 99]	97 [95, 99]	97 [95, 99]	89 [85, 93]	70 [61, 77]
	60-69 (n=175)	97 [93, 98]	95 [91, 98]	94 [89, 97]	83 [76, 89]	62 [50, 72]
	≥70 (n=30)	100	100	100	95 [71, 99]	85 [47, 96]

The following figures show patient and graft survival for primary deceased donor transplants by donor pathway (DBD/DCD). Note that in the survival graphs the y axis ranges from 0.40 to 1.00 in order to show the differences between the age groups more clearly.

Figure 7.41
Primary Deceased Donor Grafts by Donor Pathway - Patient Survival - Australia 2008-2022

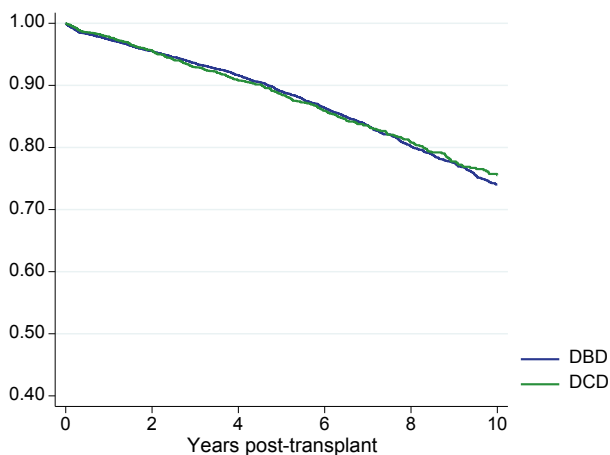


Figure 7.42
Primary Deceased Donor Grafts by Donor Pathway - Graft Survival - Australia 2008-2022

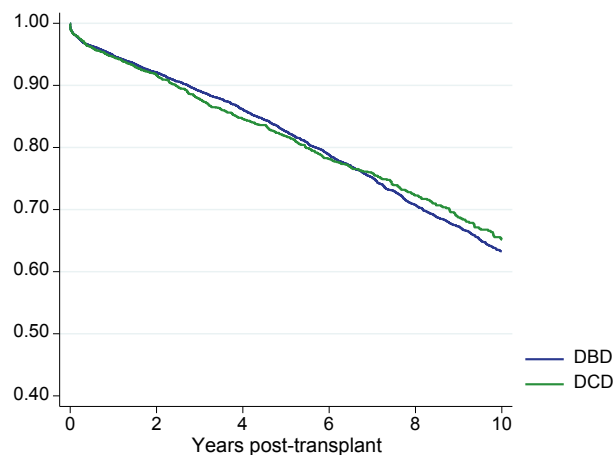


Table 7.34
Primary Deceased Donor Grafts - Australia 2008-2022; % [95% Confidence Interval]

Outcome	Donor Pathway	1 month	6 months	1 year	5 years	10 years
Patient survival	DBD (n=6587)	100 [99, 100]	98 [98, 99]	97 [97, 98]	89 [88, 90]	74 [72, 76]
	DCD (n=2228)	100 [99, 100]	99 [98, 99]	98 [97, 98]	88 [87, 90]	76 [73, 78]
Graft survival	DBD (n=6587)	98 [98, 99]	96 [96, 97]	95 [94, 95]	83 [82, 84]	63 [62, 65]
	DCD (n=2228)	98 [98, 99]	96 [95, 97]	95 [94, 95]	82 [80, 84]	65 [62, 68]

Figure 7.43
Primary Deceased Donor Grafts by Donor Pathway - Patient Survival - New Zealand 2008-2022

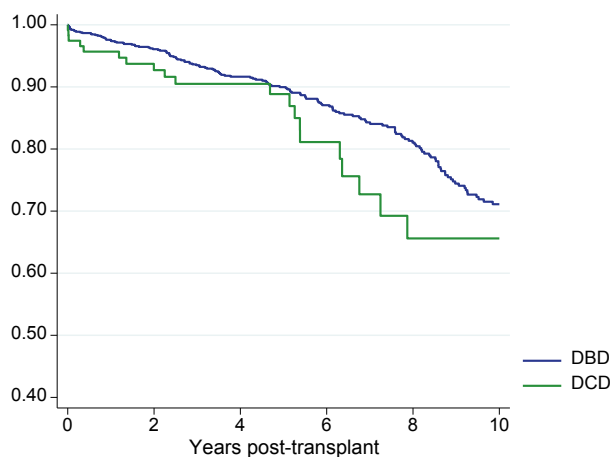


Figure 7.44
Primary Deceased Donor Grafts by Donor Pathway - Graft Survival - New Zealand 2008-2022

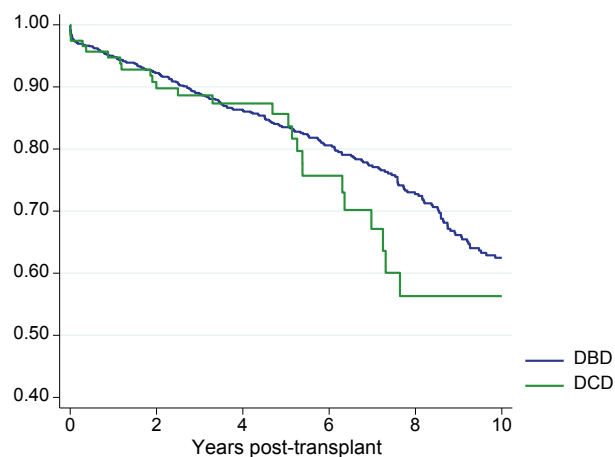
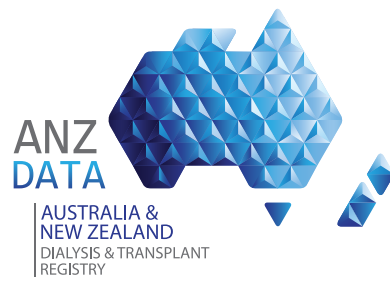


Table 7.35
Primary Deceased Donor Grafts - New Zealand 2008-2022; % [95% Confidence Interval]

Outcome	Donor Pathway	1 month	6 months	1 year	5 years	10 years
Patient survival	DBD (n=990)	99 [98, 100]	99 [98, 99]	97 [96, 98]	90 [88, 92]	71 [66, 75]
	DCD (n=117)	97 [92, 99]	96 [90, 98]	96 [90, 98]	89 [80, 94]	66 [49, 78]
Graft survival	DBD (n=990)	97 [96, 98]	97 [95, 98]	95 [93, 96]	84 [81, 86]	62 [58, 67]
	DCD (n=117)	97 [92, 99]	96 [90, 98]	95 [89, 98]	86 [77, 91]	56 [39, 70]

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2. This work is based on/includes Stats NZ's data which are licensed by Stats NZ for re-use under the Creative Commons Attribution 4.0 International licence. Stats NZ, 2022, Estimated Resident Population by Age and Sex (1991+) (Annual-Jun), NZ Infoshare, viewed 20 Dec 2022, <http://infoshare.stats.govt.nz/>
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CHAPTER 7

Kidney Transplantation