

CHAPTER 3



Mortality in End Stage Kidney Disease

Reporting the survival of patients on renal replacement therapy in Australia and New Zealand and causes of death in this population.

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Suggested citation

ANZDATA Registry. 40th Report, Chapter 3: Mortality in End Stage Kidney Disease. Australia and New Zealand Dialysis and Transplant Registry, Adelaide, Australia. 2018. Available at: <http://www.anzdata.org.au>

Survival

Overall survival for patients who started renal replacement therapy (RRT) in the period 2007-2016 is shown in figure 3.1 using the Kaplan Meier method to calculate survival curves. Table 3.1 shows the survival at 1,2 and 5 years for incident renal replacement therapy patients by age group of the same period.

Figure 3.1.1 - Survival on Renal Replacement Therapy - Australia 2007-2016

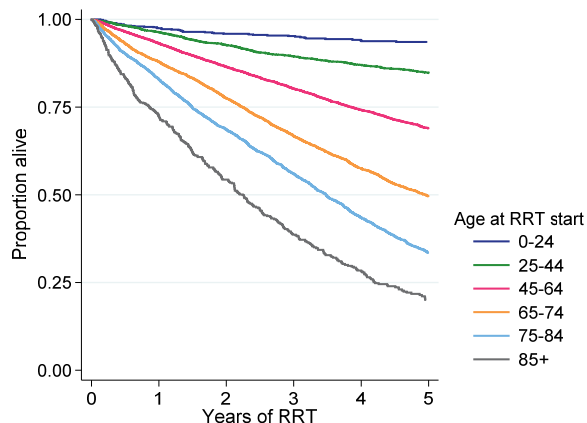


Figure 3.1.2 - Survival on Renal Replacement Therapy - New Zealand 2007-2016

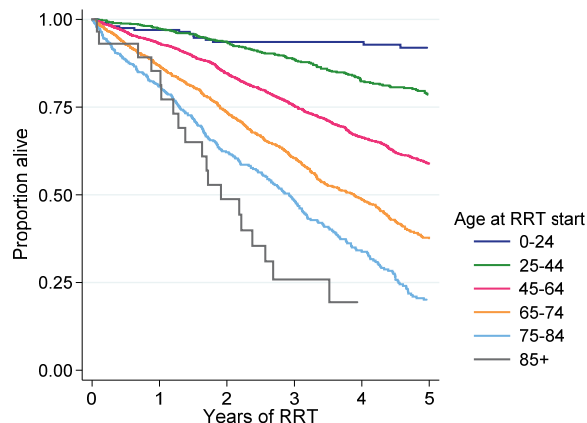


Table 3.1 Survival (95% CI) Among People Who Commenced Renal Replacement Therapy 2007-2016

Age at RRT start	Years	Australia	New Zealand
0-24	1	98 (96, 98)	97 (94, 99)
0-24	2	96 (94, 97)	94 (89, 96)
0-24	5	94 (91, 95)	92 (87, 95)
25-44	1	96 (96, 97)	97 (96, 98)
25-44	2	93 (92, 94)	94 (91, 95)
25-44	5	85 (83, 86)	79 (75, 82)
45-64	1	93 (93, 94)	93 (92, 94)
45-64	2	87 (86, 87)	85 (83, 86)
45-64	5	69 (68, 70)	59 (56, 61)
65-74	1	88 (87, 89)	87 (85, 89)
65-74	2	78 (76, 79)	74 (71, 76)
65-74	5	50 (48, 51)	38 (34, 41)
75-84	1	83 (82, 84)	81 (77, 84)
75-84	2	69 (67, 70)	62 (57, 67)
75-84	5	33 (32, 35)	20 (16, 25)
85+	1	72 (69, 76)	85 (65, 94)
85+	2	54 (50, 58)	49 (28, 66)
85+	5	20 (16, 24)	19 (6, 39)

To allow for international comparisons, survival of non-Indigenous patients who commenced RRT in 2007-2016, censored at transplantation, is shown in table 3.2. The Indigenous populations of Australia and New Zealand experience a unique burden of end stage renal disease that is explored in further detail in Chapter 10.

Table 3.2 Survival (95% CI) Among Non-Indigenous People Who Commenced Dialysis 2007-2016

Age at start	Years	Australia	New Zealand
0-24	1	97 (96, 99)	95 (87, 98)
0-24	2	95 (92, 97)	93 (83, 97)
0-24	5	90 (85, 94)	93 (83, 97)
25-44	1	97 (96, 97)	98 (95, 99)
25-44	2	93 (91, 94)	92 (88, 95)
25-44	5	77 (74, 80)	75 (66, 82)
45-64	1	93 (92, 93)	92 (91, 94)
45-64	2	86 (85, 86)	82 (79, 85)
45-64	5	62 (60, 64)	53 (48, 58)
65-74	1	88 (87, 89)	87 (84, 89)
65-74	2	77 (76, 78)	74 (70, 77)
65-74	5	47 (46, 49)	37 (32, 42)
75-84	1	83 (82, 84)	79 (75, 83)
75-84	2	69 (67, 70)	61 (55, 66)
75-84	5	33 (32, 35)	19 (14, 25)
85+	1	72 (69, 76)	84 (62, 94)
85+	2	54 (50, 58)	46 (25, 65)
85+	5	20 (16, 24)	17 (4, 39)

Unadjusted death rates for dialysis and transplantation during 2016 are shown in table 3.3 for various groups. This table includes all episodes of dialysis and transplantation (i.e. analyses are not censored at first transplant date), and deaths are attributed to the modality in use at the time of death. For this table, episodes of treatment include all people treated in 2016, regardless of year of first treatment.

Mortality rates are generally higher with older age, diabetes and coronary artery disease. The comparison between indigenous rates (and some other comparisons) will be subject to several confounders. Comparisons of mortality rates with the general population (stratified by gender) are shown in figures 3.2 and 3.3.

Table 3.3 Death Rates per 100 patient-years during Renal Replacement Therapy - 2016

Category	Level	Dialysis			Transplant		
		Rate	Lower CI	Upper CI	Rate	Lower CI	Upper CI
Country	Australia	13.8	13.1	14.4	2.1	1.8	2.4
	New Zealand	13.9	12.5	15.4	2.7	2.0	3.6
Age	<25	4.1	2.1	7.4	0.0	0.0	0.6
	25-44	4.7	3.8	5.8	0.4	0.2	0.7
	45-64	10.1	9.3	11.0	1.6	1.3	1.9
	65-84	18.1	17.1	19.2	5.4	4.6	6.4
	85+	36.1	31.1	41.5	30.2	12.1	62.2
Diabetes status	Non-diabetic	11.8	11.0	12.5	2.1	1.8	2.4
	Type 1 diabetes	12.3	9.6	15.7	2.2	1.3	3.6
	Type 2 diabetes	16.3	15.3	17.3	3.4	2.3	4.6
Coronary disease	No	11.1	10.4	11.7	2.1	1.8	2.3
	Yes	19.7	18.5	21.0	3.7	2.6	5.1
Ethnicity	Aus Non-Indigenous	14.3	13.6	15.1	2.1	1.9	2.4
	NZ Non-Indigenous	14.4	12.3	16.8	2.6	1.8	3.6
	Aus Aboriginal/TSI	11.1	9.5	12.8	2.4	0.9	5.3
	Aus Māori	13.3	7.9	21.0	0.0	0.0	6.0
	NZ Māori	14.0	11.7	16.8	2.2	0.6	5.7
	Aus Pacific	10.7	7.7	14.3	0.0	0.0	3.0
	NZ Pacific	12.8	10.3	15.7	4.9	1.8	10.6

Figure 3.2.1 - Prevalent Dialysis Mortality – Australian Patients vs General Population

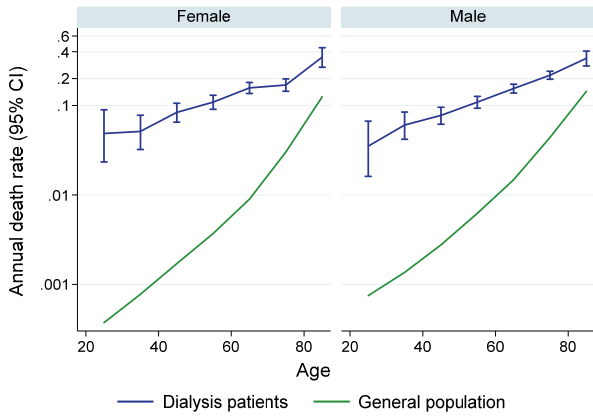


Figure 3.2.2 - Prevalent Transplant Mortality – Australian Patients vs General Population

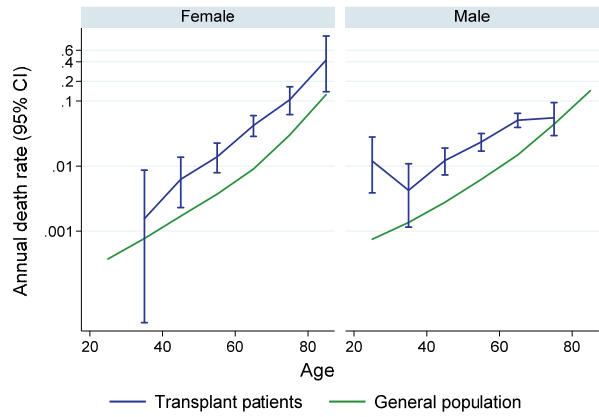


Figure 3.3.1 - Prevalent Dialysis Mortality - New Zealand Patients vs General Population

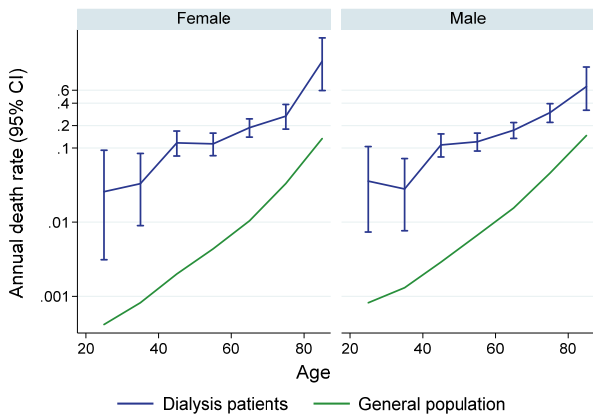
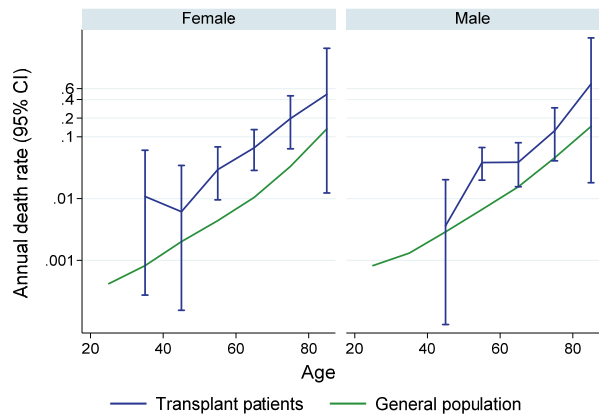


Figure 3.3.2 - Prevalent Transplant Mortality - New Zealand Patients vs General Population



The evolution of mortality rates over time is shown in figure 3.4. In Australia, there is steady improvement in most groups over time. For New Zealand, the trends are less clear, in part reflecting the lower precision with smaller numbers. Note the different y axis scales in each graph.

Figure 3.4.1 - Dialysis Mortality Rates in Australia - 2007- 2016

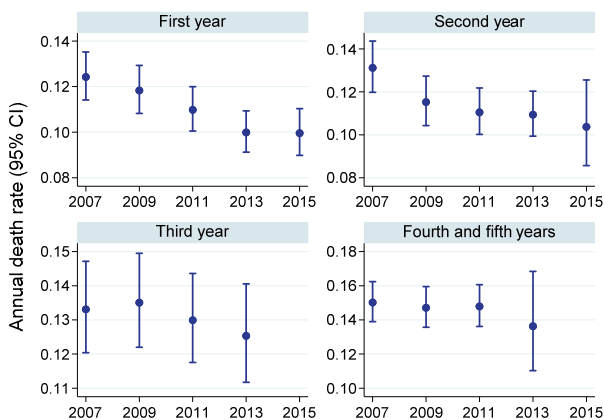
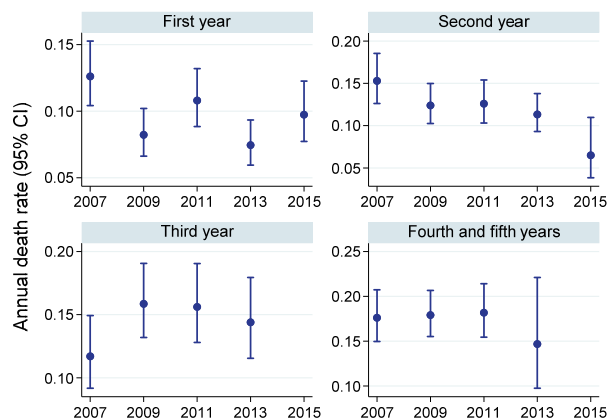


Figure 3.4.2 - Dialysis Mortality Rates in New Zealand - 2007-2016



Another perspective on survival during dialysis is presented in table 3.4. Median survival is the time to which 50% of people can expect to survive. Table 3.5 shows the median survival of people who started dialysis treatment, by various categories. These survival data are censored at the time of transplantation and include those who started

dialysis in the period 2007-2016. In addition to the median, the 25th and 75th centiles are included to give an indication of the range of observed survivals. Some figures are not observed - for example if half of a cohort have not yet died it is not possible to observe a median survival. These occurrences are indicated by * in the tables. The survival times amongst younger people are likely to be strongly affected by the selection bias (fitter people will be progressively transplanted and not be included in the analysis from that point).

Table 3.4 Median Survival on Dialysis by Age 2007-2016

Country	Age at Start	Median (25th and 75th centiles), Years
Australia	0-24	* (8.6, *)
	25-44	* (5.3, *)
	45-64	6.5 (3.3, *)
	65-74	4.6 (2.2, 8.1)
	75-84	3.5 (1.5, 6.1)
	85+	2.2 (0.9, 4.2)
New Zealand	0-24	* (7.4, *)
	25-44	7.9 (4.8, *)
	45-64	5.4 (2.8, 8.5)
	65-74	3.7 (1.9, 6.1)
	75-84	2.9 (1.3, 4.5)
	85+	1.9 (1.2, 3.5)

Table 3.5 Survival on Dialysis by Age and Comorbidity Amongst Older People; Years (Median, 25th and 75th Centiles) 2007-2016

Age at Start	Any Vascular Disease	Diabetes	Australia	New Zealand
65-69	No	No	6.7 (3.1, *)	5.0 (3.0, 7.2)
65-69	No	Yes	5.9 (3.4, 8.4)	4.6 (2.6, 7.4)
65-69	Yes	No	4.5 (2.0, 8.3)	4.1 (1.9, 5.9)
65-69	Yes	Yes	4.3 (2.2, 7.2)	2.9 (1.6, 5.1)
70-74	No	No	5.9 (2.7, 9.0)	4.4 (2.2, 9.1)
70-74	No	Yes	5.7 (2.7, 8.6)	4.4 (2.3, 6.3)
70-74	Yes	No	3.9 (1.8, 7.6)	3.0 (1.6, 5.2)
70-74	Yes	Yes	3.6 (1.6, 6.0)	2.9 (1.6, 5.3)
75-79	No	No	5.5 (2.6, 8.3)	3.6 (1.7, 5.3)
75-79	No	Yes	4.2 (2.3, 7.4)	3.9 (1.7, 4.5)
75-79	Yes	No	3.7 (1.5, 6.1)	2.2 (1.1, 4.2)
75-79	Yes	Yes	3.3 (1.4, 5.6)	2.6 (1.2, 4.1)
80-84	No	No	3.6 (1.8, 6.6)	2.8 (1.9, 4.3)
80-84	No	Yes	3.1 (1.5, 6.0)	4.7 (2.2, 5.2)
80-84	Yes	No	3.0 (1.2, 5.2)	2.6 (1.3, 4.5)
80-84	Yes	Yes	2.6 (1.1, 4.5)	2.8 (1.2, 3.3)
85+	No	No	3.2 (1.3, 5.3)	2.6 (2.4, 7.0)
85+	No	Yes	4.4 (1.5, 5.6)	1.0 (0.9, 1.6)
85+	Yes	No	2.1 (0.7, 3.7)	1.7 (1.3, 2.2)
85+	Yes	Yes	1.9 (0.5, 3.9)	2.7 (1.7, 5.2)

Cause of Death

The focus of this section is on deaths reported during 2016. The cause of death reported to ANZDATA is not necessarily the same as that reported on the death certificate¹. In particular, ANZDATA specifically records a range of reasons for “withdrawal from treatment”. The cause of death in these instances is a person’s underlying renal failure, however, these data help to understand the reasons why individuals choose to cease renal replacement therapy. This often relates to an underlying comorbidity and is further explored in table 3.7.

For the purposes of these analyses, deaths were attributed to the modality in use at the time of death. A greater proportion of deaths due to cancer is seen among patients with kidney transplants, whereas among dialysis patients’ deaths to cardiovascular causes and withdrawal from treatment predominate.

Figure 3.5 - Cause of Death - Deaths Occurring During 2016

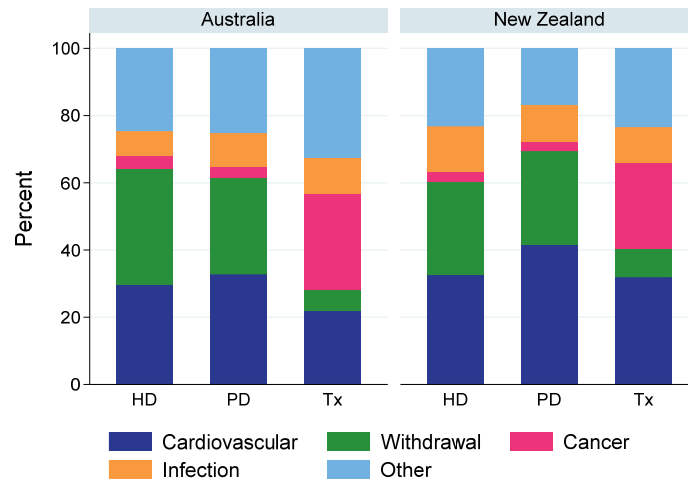


Figure 3.6 - Cause of Death by Modality and Age at Death - Deaths Occurring During 2016

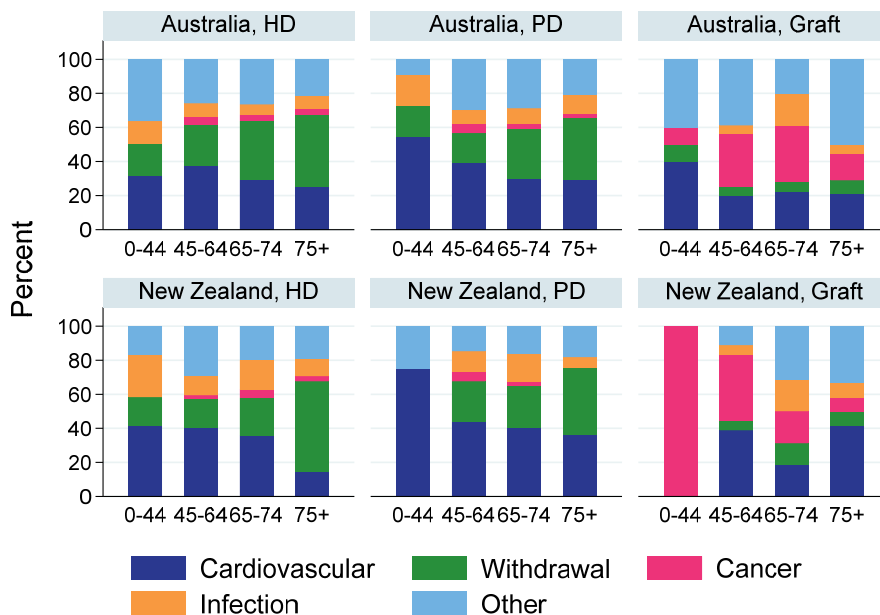


Table 3.6 Cause of Death by Modality and Age at Death - 2016

Country	Cause of Death	Haemodialysis					Peritoneal Dialysis					Graft				
		0-44	45-54	65-74	75+	Total	0-44	45-54	65-74	75+	Total	0-44	45-54	65-74	75+	Total
Australia	Cardiovascular	22	134	118	155	429	6	29	30	34	99	4	16	23	8	51
	Withdrawal	13	86	138	259	496	2	13	30	42	87	1	4	6	3	14
	Cancer	0	17	15	23	55	0	4	3	3	10	1	25	34	6	66
	Infection	9	28	24	46	107	2	6	9	13	30	0	4	19	2	25
	Other	25	92	106	132	355	1	22	29	24	76	4	31	21	19	75
	Total	69	357	401	615	1442	11	74	101	116	302	10	80	103	38	231
New Zealand	Cardiovascular	5	45	29	10	89	3	15	15	12	45	0	7	3	5	15
	Withdrawal	2	19	18	36	75	0	8	9	13	30	0	1	2	1	4
	Cancer	0	2	4	2	8	0	2	1	0	3	1	7	3	1	12
	Infection	3	13	14	7	37	0	4	6	2	12	0	1	3	1	5
	Other	2	32	16	13	63	1	5	6	6	18	0	2	5	4	11
	Total	12	111	81	68	272	4	34	37	33	108	1	18	16	12	47

Withdrawal from Renal Replacement Therapy

During 2016 there were 597 deaths in Australia and 109 in New Zealand attributed to withdrawal from therapy (table 3.7). The vast majority of these were among patients receiving dialysis therapy. “Psychosocial” reasons were the most commonly cited reasons for withdrawal in patients receiving all modalities. However, the coding of these categories is clearly somewhat subjective.

Table 3.8 shows a breakdown of patients who withdrew and died in 2016 by age and duration of RRT.

Table 3.7 Reason for Withdrawal from Renal Replacement Therapy - 2016

Country	Reason for Withdrawal	HD	PD	Graft
Australia	Withdrawal-Psycho Social Reasons	196	38	5
	Patient Refused Treatment (Specify)	14	0	0
	Withdrawal-Cardiovascular Comorbid Conditions	100	15	3
	Withdrawal-Cerebrovascular Comorbid Conditions	41	5	2
	Withdrawal-Peripheral Vascular Comorbid Conditions	40	15	0
	Withdrawal-Malignancy	70	11	4
	Withdrawal-Dialysis Access Difficulties	35	3	0
New Zealand	Withdrawal-Psycho Social Reasons	16	16	2
	Patient Refused Treatment (Specify)	1	1	0
	Withdrawal-Cardiovascular Comorbid Conditions	29	4	0
	Withdrawal-Cerebrovascular Comorbid Conditions	10	0	1
	Withdrawal-Peripheral Vascular Comorbid Conditions	7	6	0
	Withdrawal-Malignancy	9	2	1
	Withdrawal-Dialysis Access Difficulties	3	1	0

Table 3.8 Time from Renal Replacement Therapy Start to Death, in Patients Who Withdrew and Died in 2016

Time from First RRT (years)	Australia					New Zealand				
	0-44	45-64	65-74	75+	Total	0-44	45-64	65-74	75+	Total
<1 year	3	15	26	36	80	1	3	7	7	18
1-2 years	3	14	21	27	65	0	2	5	6	13
2-5 years	6	37	52	96	191	0	10	4	15	29
5+ years	4	37	75	145	261	1	13	13	22	49
Total	16	103	174	304	597	2	28	29	50	109

¹ Sypek MP, Dansie KB, Clayton P, Webster AC, McDonald S. Comparison of cause of death between ANZDATA and the Australian National Death Index. *Nephrology*. 2018 Mar 1. doi: 10.1111/nep.13250. [Epub ahead of print]